

Murray River Adventure Trail: Flora and fauna assessment

FINAL REPORT

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Biosis acknowledges the Aboriginal and Torres Strait Islander peoples as Traditional Custodians of the land on which we live and work.

We pay our respects to the Traditional Custodians and Elders past and present and honour their connection to Country and ongoing contribution to society.

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Summary

Biosis Pty Ltd was commissioned by Parks Victoria (PV) to undertake a flora and fauna assessment of Section 8 to 11 of the proposed Murray River Adventure Trail (MRAT). Once complete, the MRAT is envisioned to be a multi-use adventure network following the course of the Murray River from Lake Hume to east of Mildura over approximately 1,040 kilometres. Sections 8 to 11 follow the approximate path of the Murray River over 270 kilometres, between Picnic Point in Barmah National Park and the township of Koondrook in northern Victoria.

Biosis completed field-based ecological assessments of the proposed Section 8–11 alignments during August 2022 and provided four separate preliminary ecological assessment reports to Parks Victoria at that time (one for each section).

Following alignment changes and an adjustment of the project scope, Parks Victoria confirmed their intended alignment and areas of proposed construction impacts proposed in 2024.

The proposed trail includes approximately 21.2 kilometres of new trail to be constructed between existing informal and formal walking and vehicle tracks. Two waterway crossings are proposed. Campsites including toilets, carparking, signage, formalised camping sites and water launches are proposed at intervals along the trail.

Avoidance and minimisation of impacts on threatened species and communities, development of a suitable construction method, calculating native vegetation removal requirements and determining approvals pathways for works are key considerations within this report.

Ecological values

Key ecological values identified across the assessment corridor are as follows:

- Eight Ecological Vegetation Classes (EVCs) across the Murray Fans and Victorian Riverina bioregions:
 - Floodplain Riparian Woodland EVC 56 (Bioregional Conservation Status [BCS]: Depleted) of low to moderate quality, supporting native sedges, grasses and herbs and with a high cover of introduced annual pasture grasses at the time of assessment.
 - Riverine Chenopod Woodland EVC 103 (BCS: Endangered) of moderate to high quality, supporting a diverse range of chenopods, herbs and native grasses in the understorey.
 - Grassy Riverine Forest EVC 106 (BCS: Depleted) of moderate quality, supporting a low density of large trees and logs.
 - Riverine Grassy Woodland EVC 295 (BCS: Vulnerable) of low to moderate quality, supporting a variably diverse native understorey and high cover of annual weeds at the time of assessment.
 - Plains Woodland EVC 803 (BCS: Endangered) of moderate to high quality, supporting a diversity of herbs and grasses in the understorey.
 - Riverine Swamp Forest EVC 814 (BCS: Depleted) of low to moderate quality, supporting a low density of large trees and logs, and high cover of annual weeds at the time of assessment.
 - Riverine Swampy Woodland EVC 815 (BCS: Vulnerable) of low quality, supporting a high density of logs and high cover of introduced annual grasses and herbs at the time of assessment.



- Sedgy Riverine Forest EVC 816 (BCS: Depleted)
- A rich and diverse range of plants and animals, including:
 - Recorded or potential habitat for 50 threatened flora species including nine (9) species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and 41 species listed under the *Flora and Fauna Guarantee Act 1988* (FFG Act; Appendix 2).
 - Recorded or potential habitat for 84 threatened fauna species predicted to occur. Of these, 33 species were recorded or considered likely to occur, including one species listed under the EPBC Act, nine species listed under the EPBC Act and FFG Act, and 23 species listed under the FFG Act alone (Appendix 3).
- Areas of vegetation (within EVC 803) consistent with the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EPBC Act listed threatened ecological community (Endangered).
- Habitat for the FFG-listed Lowland Riverine Fish Community and Victorian Temperate Woodland Bird community.
- Vegetation contiguous with significant tracts of native vegetation along the Murray River riparian corridor, and within the Lower Goulburn National Park, River Murray Reserve and proposed Murray River Park.
- Within Barmah and Gunbower Ramsar wetland sites, and adjacent to New South Wales (NSW) Central Murray State Forests Ramsar site.
- Within Barmah-Millewa Forest 'icon site' which receives environmental water to achieve floodplain health improvements following the implementation of the joint national-state Living Murray Program.
- Within Koondrook-Perricoota and Gunbower Forest 'icon site' which receives environmental water to achieve environmental health improvements following the implementation of the joint national-state Living Murray Program.
- Part of the Gunbower National Park Floodplain Restoration Project.



Government legislation and policy

An assessment of the project in relation to key biodiversity legislation and policy is summarised below.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
Environment Protection and Biodiversity Conservation Act 1999	 Potential habitat for 9 flora species Potential habitat for 10 fauna species Vegetation consistent with Grey Box Grassy Woodland threatened ecological community The study area is within Barmah Forest and Gunbower Forest Ramsar sites and is adjacent to NSW Central Murray State Forests Ramsar site. 	Assessment of the need for an EPBC referral has considered the combined biodiversity impacts associated with Sections 8 to 11 of the project. Based on the proposed trail and campsite construction works, a significant impact on MNES is considered unlikely and therefore a referral is not recommended. However Parks Victoria may choose to refer the project for legal certainty. Further information is provided in Section 4.1 and Appendix 6.	This impact assessment has been informed by arborist advice that impacts on adjacent canopy trees are unlikely to occur during trail construction, provided the alignment avoids structural root zones as far as practicable. Any selective removal or trimming of trees for safety reasons is likely to be minor in nature. Trail and campsite construction works are likely to require the removal of understorey vegetation only. Habitat suitable for threatened flora and fauna will not be significantly impacted.
Flora and Fauna Guarantee Act 1988	 Known or potential habitat for multiple threatened species and communities: 49 flora species 32 fauna species Lowland Riverine Fish Community and Victorian Temperate Woodland Bird Community. Victorian Temperate Woodland Bird community. Protected flora recorded within the assessment corridor. 	Protected flora permit required.	The study area includes public land. DEECA consultation is required regarding any impacts on FFG Act listed species and communities on public land. Parks Victoria must also consider their obligations under the Public Authority Duty
<i>Planning & Environment Act 1987</i>	Native vegetation to be removed, destroyed or lopped.	Under the Moira, Campaspe and Gannawarra Planning Schemes there are two	Clause 42.01 - ESO A planning permit is required within Moira and Gannawarra Shires under the ESO and a permit



Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
		 permit triggers relevant to the proposed works: Clause 42.01 - ESO A permit to remove any vegetation (including dead vegetation) is required under Clause 42.01 due to the land being covered by an Environmental Significance Overlay. Clause 52.17 A permit to remove, destroy or lop native vegetation (including dead native vegetation) under Clause 52.17. See further discussion in Section 4.2.3. 	application will need to respond to the application requirements and decision guidelines within the ESO. Within Campaspe Shire, a permit may not be required as an exemption is available forthe removal, destruction or lopping of vegetation for public works, including public roads and water authority works. Clause 52.17 Under the Procedure to remove, destroy or lop native vegetation on Crown land, compensatory native vegetation offsets would not be required, however counter balancing measures are required. Losses of biodiversity value are counterbalanced with improvements to native vegetation and biodiversity. Such activities include increases to the condition, extent or security of native vegetation. If the Crown Land exemption is not applicable, a planning permit will be required under Clause 52.17. Best practice environmental management on public land requires avoidance, minimisation and offsetting of native vegetation in accordance with the <i>Guidelines for the removal,</i> <i>destruction or lopping of</i> <i>native vegetation</i> .
Catchment and Land Protection Act 1994	Any noxious weeds and pest animals.	Weed infestations have been identified during detailed ecological surveys and are shown in Figure 2.	Parks Victoria will need to comply with requirements to control/eradicate pest species.
Water Act 1989	Tributaries and wetlands associated with the Murray River, including Deep Creek and Mullers Creek.	Referral to Goulburn Broken and North Central CMA for a works on waterways permit for any	Parks Victoria to consult with Goulburn Broken and North Central CMA for waterway determination.



Legislation / policy	Relevant ecological	Permit / approval	Notes
	feature on site	required	
		bridges, elevated structures, and culverts in or near the bed and banks of waterways and in riparian zones.	
Fisheries Act 1995	Protected aquatic biota may be impacted if in-stream or bank works are proposed for any waterway crossings	Provided appropriate mitigation actions are taken, a permit is unlikely to be required.	Waterway crossings have been considered during the detailed site assessment. Crossings are proposed to be constructed over Deep Creek and Muller Creek.
National Parks Act 1975	Barmah, Lower Goulburn and Gunbower National Park	Trail development to comply with the Joint Management Plan for Barmah National Park. Trail development to comply with the River Red Gum Parks Management Plan for Lower Goulburn and Gunbower National Parks.	Discussions would be required to ensure trail development does not contravene the priority of the zoning within either park's management plan. See further discussion in Section 4.2.5.
Environment Effects Act 1978	Removal of native vegetation and threatened species habitat impacts.	An EES referral is not triggered by criteria relating to biodiversity alone when assessing impacts of the proposed MRAT. Partial clearing of mostly understorey vegetation results in 6.8 ha from depleted, vulnerable and endangered EVCs and is unlikely to have regional or state significant environmental impacts.	This impact assessment has been informed by arborist advice that impacts on adjacent canopy trees are unlikely to occur during trail construction, provided the alignment avoids structural root zones as far as practicable. Any selective removal or trimming of trees for safety reasons is likely to be minor in nature. The Ministerial guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning.
Environment Protection Act 2017	Instream and riparian habitats	Undertake biological and physicochemical monitoring of waterways where works are proposed.	Biological and physicochemical monitoring should be undertaken in appropriate locations and seasons prior to and following any proposed instream / riparian zone works to determine if there has been any negative impact on the health of



Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
			waterways as a result of the project.

Biosis' view is that the Guidelines will not apply to an application under the ESOs and no offsets are required. The avoidance and minimisation already demonstrated in the design of the project will be important to demonstrate and any localised revegetation works in the vicinity of the impact area.

Avoid and minimise statement

The following design principles and measures have been adopted across the project design phase and will underpin the construction and operation phases to adequately describe and quantify biodiversity impacts and to ensure these impacts are avoided and minimised:

- Detailed project planning including feasibility studies and desktop constraints assessments.
- Preliminary assessments to identify ecological values along the trail and potential areas of high ecological constraint.
- Aligning trails on existing informal trails or disturbed areas wherever possible.
- Minimising trail development near sensitive areas such as waterways.
- The engagement of a professional arborist to review existing conditions for trees in the project area, and provide sensitive construction techniques that can be applied to ensure encroachment into tree protection zones and structural root zones does not lead to the long-term decline of adjacent trees (Appendix 9).
- Committing to the principle of pre-construction micro-siting to achieve avoidance of key habitat features for threatened fauna, avoid threatened flora, minimise disturbance of wildlife habitat, minimise indirect impacts on sensitive areas such as waterways.
- Committing to the development of a weed management plan to monitor and control weeds along the trail post-construction.

Recommendations

The design of the proposed MRAT and associated works has given consideration to avoiding and minimising ecological impacts by undertaking feasibility and ecological constraints assessments of trail concepts. Key impact avoidance and minimisation strategies, and mitigation measures are outlined in Section 5 and Section 7.3. Biosis recommends that these strategies be conferred through to the detailed design and construction phase of the project, and that the appointed construction contractor be accountable for achieving a high level of environmental compliance and an endorsed CEMP that is subject to regular third-party compliance monitoring.



Glossary

Project abbreviations and acronyms

Abbreviation	Definition
BCS	Bioregional Conservation Status
CaLP Act	Catchment and Land Protection Act 1994
СЕМР	Construction Environmental Management Plan
СМА	Catchment Management Authority
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Federal)
DEECA	Department of Energy, Environment and Climate Action
DELWP	Department of Environment, Land, Water and Planning (State)
EE Act	Environment Effects Act 1978
EPA Act	Environment Protection Act 2017
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EVC	Ecological Vegetation Class
FFG Act	Flora and Fauna Guarantee Act 1988
IBRA	Interim Biogeographic Regionalisation for Australia
MNES	Matter of National Environmental Significance
MRAT	Murray River Adventure Trail
PMST	Protected Matter Search Tool
TEC	Threatened Ecological Community



1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Parks Victoria (PV) to undertake an ecological assessment of Sections 8 to 11 of the proposed Murray River Adventure Trail (MRAT) which follows the approximate path of the Murray River between Barmah National Park and Koondrook in northern Victoria.

- Section 8 of the trail is 47 kilometres long and runs between Picnic Point in Barmah National Park and Barmah township.
- Section 9 of the trail is 49.4 kilometres long and runs between Barmah township and Echuca.
- Section 10 of the trail is 60.4 kilometres long and runs between Echuca and Torrumbarry Weir.
- Section 11 of the trail is 64 kilometres long and runs between Torrumbarry Weir and Koondrook township.

Once complete, the MRAT is envisioned to be a multi-use adventure network following the course of the Murray River from Lake Hume to east of Mildura over approximately 1,040 kilometres in length.

This total length of trail was broken up into 20 sections within the 2014 Feasibility Study, with Sections 8 to 11 comprising Stage 1 of the project. In 2020, GHD engaged Biosis to complete a preliminary ecological constraints and opportunities assessment for Sections 8 to 11 (Biosis 2021). In 2022, Parks Victoria engaged Biosis to complete preliminary flora and fauna assessments for Sections 8 to 11, and four separate reports were produced (Biosis 2022a, Biosis 2022b, Biosis 2022c, Biosis 2022d).

Following adjustments to the project scope and proposed trail alignment, Parks Victoria engaged Biosis to complete an ecological impact assessment for the Sections 8 to 11 project works (current assessment). This report summarises the ecological values documented during all of Biosis' previous ecological field studies. It also outlines legislative considerations as they relate to biodiversity impacts and provides impact avoidance and minimisation recommendations.

1.2 Scope of assessment

The objectives of the flora and fauna investigation are to:

- Review databases relating to flora and fauna (terrestrial and aquatic) issues relevant to the study area, including the Victorian Biodiversity Atlas (VBA) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST).
- Conduct a detailed field assessment of the flora and fauna values present within the assessment corridor where works are proposed.
- Identify and map Ecological Vegetation Classes and threatened flora and fauna species.
- Identify and broadly map high threat weed infestations along the proposed trail alignment.
- Assess the potential for the assessment corridor to support habitat for threatened species.
- Undertake Vegetation Quality Assessments.
- Review the implications of relevant biodiversity legislation and policy, including:



- Guidelines for the removal, destruction, or lopping of native vegetation (DELWP 2017b).
- Use of the Crown land management planning permit exemption for native vegetation removal (Clause 52.17 of the Victoria Planning Provisions). This exemption is implemented through Department of Energy, Environment and Climate Action's (DEECA) *Procedure for the removal destruction or lopping of native vegetation on Crown land* (DELWP 2018).
- Assess potential impacts and discuss mitigation options relevant to trail design and siting.
- Recommend any further assessments of the study area that may be required (such as targeted searches for listed species).

1.3 Location of study area

The study area runs along the Murray River, beginning at Picnic Point in Barmah National Park (25 kilometres north-east of Barmah township) and ending in Koondrook (22 kilometres north-east of Kerang) in northern Victoria (Figure 1). The study area crosses the municipalities of Moira, Campaspe and Gannawarra Shire Councils.

The study area encompasses a multitude of planning zones, the most common along the trail alignment being Public Conservation and Resource Zone (PCRZ). Other zones include Farming Zone (FZ, FZ1), Urban Floodway Zone (UFZ), General Residential Zone (GRZ), Low Density Residential Zone (LDRZ), Rural Activity Zone (RAZ), Public Use Zone (PUZ1), Public Park and Resource Zone (PPRZ), Commercial 1 Zone (C1Z) and Township Zone (TZ).

The following overlays cover parts of the study area and are of relevance to biodiversity: Environmental Significance Overlay – Schedule 1 (Campaspe, Gannawarra) and 2 (Moira) (ESO), Flood Overlay (FO), Land Subject to Inundation Overlay (LSIO), Bushfire Management Overlay (BMO).

The study area is within the:

- Murray Fans and Victorian Riverina Bioregions.
- Murray River Basin.
- Management area of Goulburn Broken Catchment Management Authority (CMA) and North Central Catchment Management Authority (CMA).
- Moira, Campaspe and Gannawarra Shire Council municipalities.
- Barmah National Park, proposed Murray River Park, Gunbower National Park (PV managed), Gunbower State Forest (DEECA managed) and Koondrook Historic and Cultural Features Reserve (PV managed).
- Barmah Forest Ramsar site.
- Adjacent to and upstream of NSW Central Murray State Forests Ramsar site and Gunbower Forest Ramsar wetland site.
- The Barmah-Millewa Forest icon site as part of The Living Murray Program.
- Koondrook-Perricoota and Gunbower Forest 'icon site' which receives environmental water to achieve environmental health improvements following the implementation of the joint national-state Living Murray Program (MDBA 2018).



- Gunbower National Park Floodplain Restoration Project which aims to return a more natural flooding regime to improve the ecological condition across approximately 632 hectares of the Murray River floodplain within Gunbower National Park (VMFRP 2021).
- River Murray Reserve (PV or DEECA managed), Lower Goulburn National Park and Echuca Regional Park (PV managed), Deakin Reserve (Campaspe Shire managed), Echuca Historic and Cultural Features Reserve (DEECA managed), Hare Street and Pakenham Street Road Reserves (Campaspe Shire managed), Baillieu Lagoon Wildlife Reserve (PV managed), Warren Street and Wharparilla Drive Road Reserves (Campaspe Shire managed) and Will's Bend (proposed Murray River Park, PV managed).

1.4 Project details and definitions

Term	Definition
Search area	The trail alignment/works area buffered outwards by 5 kilometres. This area is used to conduct the database review of biodiversity values.
Study area	The trail alignment/works area centreline buffered outwards by 40 metres. This is the area shown in Figures within which broad EVCs were mapped and likelihood of occurrence was considered, however this area was not assessed in detail. Detailed vegetation mapping occurred within the assessment corridor, which sits within the study area.
Assessment corridor	 The assessment corridor sits within the study area and is the area in which detailed biodiversity data has been collected. Information collected includes flora and fauna species lists, large tree mapping and vegetation quality assessments. The width of assessment corridor varies depending on the treatment type proposed. Assessment corridor widths were stipulated by Parks Victoria and include the following: 5 metres from the edge of existing tracks in areas of potential minor works. 10 metres from the edge of existing tracks in areas of potential major works. 10 metres from the trail centreline in areas of potential new trail. 20 metres on either side of a potential major crossing. 10 metres around proposed boat launch points. Note that where the alignment is close to the Murray River, the assessment corridor was buffered from the high bank of river and did not include the water way or steep riverbank itself. Since the time of assessment of the broader alignment in 2022, Parks Victoria's intended project scope has been significantly reduced. Where 'as is' treatment was identified, it was assumed that no vegetation removal would be required and consequently an assessment under the Guidelines/Crown Land Procedure would not be required. While these areas was not undertaken and likelihood of occurrence assessments do not apply to these areas.

Table 1 Project terms and definitions



Term	Definition
Impact/construction/works footprint	The proposed construction area as provided by Park Victoria in 2024.
Stage 1	Approximately 270 kilometres long comprising Sections 8, 9, 10 and 11 travelling from Barmah/Picnic Point to Koondrook in northern Victoria.



2 Methods

2.1 Database review

In order to provide a context for the study area, information about flora and fauna from within 5 kilometres of the study area (the 'local area') was obtained from relevant biodiversity databases, many of which are maintained by the Victorian Government Department of Energy, Environment and Climate Action (DEECA) (formerly Department of Environment, Land, Water and Planning (DELWP)) or the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW). Records from the following databases were collated and reviewed:

- DEECA's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets (DSE 2009).
- DCCEEW's Protected Matters Search Tool for matters protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other sources of biodiversity information were examined including:

- DEECA's NatureKit mapping tool.
- Planning Scheme overlays relevant to biodiversity based on http://planningschemes.dpcd.vic.gov.au.
- Species profiles and Threats databases (DAWE 2020).
- EPBC Act threatening processes list (DAWE 2021a).
- FFG Act potentially threatening processes list (DELWP 2016).
- FFG action statements.
- Murray River Adventure Trail Stage One Picnic Point to Koondrook Mapbook.
- Joint Management Plan for Barmah National Park (YYTOLMB 2020).
- The Living Murray Barmah-Millewa Forest Icon Site (GB CMA 2012).
- River Red Gum Parks Management Plan (Parks Victoria 2018).
- Strategic Management Plan for the Gunbower Forest Ramsar Site (DSE 2003).
- Environment Report Consultation Plan Guttrum-Benwell and Gunbower Floodplain Restoration Projects (VMFRP 2021).

2.2 Definitions of threatened species and communities

Threatened species and communities are listed under the EPBC Act and/or Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act). The conservation status of a species or ecological community is determined by its listing status under Commonwealth or State legislation/policy (Table 2).

Table 2	Conservation status of threatened species and ecological communities
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Government level	Conservation status
National	Listed as nationally critically endangered, endangered or vulnerable under the EPBC Act.



Government level	Conservation status
State	Listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or
	conservation dependent in Victoria under the FFG Act.

Lists of threatened species generated from the databases are provided in Appendix 3 (flora) and Appendix 4 (fauna). Each species has been assessed to determine its likelihood of occurrence based on the following process.

2.3 Determining likelihood of occurrence of threatened species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the study area. It is based on expert opinion, information in relevant biodiversity databases and reports, and an assessment of habitats on the site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded. The rationale for the rank assigned is provided for each species in Appendix 3 (flora) and Appendix 4 (fauna). Those species for which there is little or no suitable habitat within the study area are assigned a likelihood of low or negligible and are not considered further.

Only those species listed under the EPBC Act or the FFG Act (hereafter referred to as 'threatened species') are assessed to determine their likelihood of occurrence. The habitat value for threatened species is calculated by the Habitat Importance Modelling produced by DEECA (DELWP 2017a). Where threatened species are recorded in the study area this is noted in Appendix 3 (flora) and Appendix 4 (fauna).

Threatened species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered.

2.4 Site investigation

2.4.1 Flora assessment

Flora assessments of the entire alignment were undertaken over two weeks (25 to 29 July 2022 and 22 to 26 August 2022) by a team of four botanists each week (comprising Ewan Kelly, Georgina Zacks, Jane Kenny, Sarah Hilliar, Nicholas Lloyd and Jessica Chapman), spending approximately 280 person hours in the field. A list of flora species was collected and will be submitted to DEECA for incorporation into the Victorian Biodiversity Atlas. Planted species were not recorded unless they were naturalised.

Additional assessments were undertaken in 2024 following confirmation of proposed impact areas by Parks Victoria. Additional data was collected in areas of proposed impact where the areas had not previously been assessed in 2022. Fieldwork was undertaken by two botanists (Georgina Zacks and Cassandra Kalafatakis) on 8 to 11 April 2024, spending approximately 70 person hours in the field.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses' (Clause 73.01).

The Guidelines classify native vegetation into two categories (DELWP 2017b):

- A **patch** of native vegetation (measured in hectares) is one of the following:
 - An area of native vegetation, with or without trees, where at least 25% of the total perennial understorey cover is native.



- An area with three or more native canopy trees where the drip line (i.e. the outermost boundary
 of a tree canopy) of each tree touches the drip line of at least one other tree, forming a
 continuous canopy.
- Any mapped wetland included in the Current wetlands map, available in DEECA systems and tools.
- A **scattered tree** is defined as a native canopy tree that does not form part of a patch of native vegetation.

Patch vegetation is classified into ecological vegetation classes (EVCs), which are the standard unit for classifying vegetation types in Victoria. They are described through a combination of floristics, lifeforms and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC contains one or more floristic (plant) communities. The EVC benchmarks are standard descriptions that allow the vegetation quality on a given site to be determined under the Guidelines (DELWP 2017b).

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the relevant EVC. The extent of a small scattered tree is the area of a circle with a 10-metre radius (i.e. 0.031 hectares), while the extent of a large scattered tree is a circle with a 15-metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DEECA's NVR Map.

A Vegetation Quality Assessment (VQA) was undertaken for all patches of native vegetation based on DEECA's habitat hectare method (DSE 2004) and the Guidelines (DELWP 2017b). For the purposes of this assessment the limit of the resolution for identification of a patch of native vegetation was taken to be 0.001 habitat hectares (Hha). If a discrete patch of native vegetation had sufficient cover but its condition and extent would not result in the identification of at least 0.001 habitat hectares the vegetation patch was not mapped.

The location of large trees within the assessment corridor was collected, along with information on the tree species, a visual estimation of the DBH after calibration of the field team using DBH tapes, a canopy health-measure of the tree, whether it had multiple stems and whether the tree was hollow-bearing.

Where relevant, notes were made on specific issues such as noxious weed infestations or illegally dumped rubbish.

Species nomenclature for flora follows the Victorian Biodiversity Atlas (VBA).

2.4.2 Fauna assessment

The Section 8 to 11 assessment corridor was investigated on 25 July 2022 and 22 to 25 August 2022 by zoologist/ecologists Jonathan Botha, Zahlia Payne and Ewan Kelly, spending approximately 20 person hours in the field to determine its values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for significant species and their habitats. Fauna species were recorded with a view to characterising the values of the site and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.



Targeted Sloane's Froglet surveys

Potential habitat for the EPBC Act listed Sloane's Froglet *Crinia sloanei* was identified during general fauna assessment. A targeted survey was recommended and then commissioned by Parks Victoria. The targeted survey was conducted between 22 to 25 August 2022 by two zoologists (Jack Fursdon and Wyn Russell), spending approximately 30 person hours in the field. Further details on the method is included in Appendix 1.

2.4.3 Permits

Biosis undertakes flora and fauna assessments under the following permits and approvals:

- Wildlife Authorisation issued by DEECA under the Victorian *Wildlife Act 1975* (Permit Number 10010193).
- Permit to Take/Keep Protected Flora issued by DEECA under the FFG Act (Permit Number 10010194).
- Permit to Take Protected Fish issued by DEECA under the FFG Act (Permit Number 10010195).
- Permit to Conduct Research in areas managed by the Parks Victoria issued by DEECA under the Victorian *National Parks Act 1975, Crown Land (Reserves) Act 1978* and *Parks Victoria Act 2018* (Permit Number 10010071).
- Permit to catch and release fish issued by the Victorian Fisheries Authority under the Victorian *Fisheries Act 1995* (Permit Number RP 1220, Personal File Number 13041).
- Approvals 18.21 and 20.21 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government.
- Scientific Procedures Fieldwork Licence issued by the Victorian Government Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020).

2.5 Qualifications

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species may be detected at a site during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions, and migration and breeding behaviours. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

Assessment of the broader alignment (Section 8 to 11) was conducted in mid-winter (July and August 2022), with some additional areas assessed or revisited during autumn (April 2024). Neither of these periods is optimal time for survey. Many perennial flora species do not have any reproductive material available for identification to the species level, and many annual species are not yet emergent/are not identifiable even to the genus level. During winter, the cover of annual weed species is high, often obscuring smaller native species in the understorey. Despite this, the survey effort is considered sufficient to assess the general values of the study area and undertake the biodiversity impact assessments that are required. It is also deemed sufficient for the detection of habitat for threatened flora species, which has informed recommendations on the need for targeted survey.

Weather conditions were generally fine during assessments, with one afternoon of poor conditions (i.e. rain).

All sections where treatment type is not 'as is' were walked or driven. Sections of trail with a treatment type of 'as is' were not assessed.



Native Vegetation Removal Reports are prepared through DEECA's NVR Map online application or requested through DEECA's Ensym NVR Tool Support team. Biosis supplies relevant site-based spatial information as inputs to DEECA and we are reliant on DEECA's output reports for all assessment pathway applications. Biosis makes every effort to ensure site and spatial information entered into the NVR Map, or supplied to DEECA, is an accurate reflection of proposed native vegetation removal.

2.6 Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- Matters listed under the EPBC Act, associated policy statements, significant impacts guidelines, listing advice and key threatening processes.
- Threatened taxa, communities and threatening processes listed under Section 10 of the FFG Act and associated action statements and listing advice.
- Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017b).
- Procedure for the removal, destruction or lopping of native vegetation on Crown land (DELWP 2018a).
- *Planning and Environment Act 1987*, specifically Clauses 12.01-2, 52.17 and 66.02 and Overlays in the Moira, Campaspe and Gannawarra Planning Schemes
- Noxious weed and pest animal lists under the *Catchment and Land Protection Act 1994* (CaLP Act).
- Environment Effects Act 1978.
- Fisheries Act 1995.
- Water Act 1989.
- National Parks Act 1975.

2.7 Mapping

Parks Victoria supplied design plans, including:

- A shapefile of the entire alignment (provided on 4 October 2024).
- Data on vegetation loss in the following files:
 - MRAT Environmental Assessment shapes.zip and Day Visitor Area Canoe Launch.zip (provided by email 6 February 2024)
 - Banyule_Detour_on_Public_Land_Only.zip and MRAT_Trailhead_Activity_Areas.zip (provided 22 March 2024)
 - MRAT Section 10.zip (provided 12 September 2024).
- PDF documents of campground and water launch designs provided by email 22 March 2024 and additional data for Farley Bend campground on 12 September 2024.
- Data on waterway crossings was provided by email on 24 June 2024 (JJR-4211023D-9-BR (2).pdf, DeepCreek MullersCreek.zip).

Mapping was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the tablets (generally ±7 metres) and dependent on the limitations of aerial photo rectification and registration.



Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However, this mapping may not be sufficiently precise for detailed design purposes.

2.7.1 Mapping vegetation removal

Based on the trail construction methods provided, it is proposed to remove understorey vegetation only during construction of the trail surface. As confirmed by the arborist assessment (Appendix 9), canopy forming trees and immature trees according the EVC benchmark will not be impacted during construction, provided the alignment avoids structural root zones as far as practicable. Vegetation removal within the construction footprint includes the 1.5 metre built trail surface and a 0.5 metre construction buffer either side. Although much of the proposed alignment follows existing informal trails, existing informal trails are mostly in poor condition. Where the proposed trail will be construction. Vegetation removal is therefore assessed using a 2.5 metre wide footprint and applied along the length of the trail.

Impacts from the construction of campsites are considered to be relatively similar to that of trail construction, including minor grading and laying gravel as the finished campsite surface. The impact area of each campsite is a circle with a 5-metre diameter.

Construction of toilet blocks and canoe launches that may require more significant ground disturbance and encroachment into adjacent trees protection zones has been considered. The impact footprint for campsite amenities has been developed from the proposed designs provided plus a 0.5 metre construction buffer.

As all proposed removal for construction of the above components of the project occurs within forest and woodland vegetation types, a partial clearing score has been applied as outlined in the Guidelines (DELWP 2017b) and Assessors Handbook (DELWP 2018b).

For areas where significant infrastructure is proposed and construction has the potential to impact the health of adjacent trees (including the large across Deep Creek and a culvert across Mullers Creek) full clearing has been applied.



3 Results

The ecological features of the study area are described below and mapped in Figure 2 (Appendix 1).

Species recorded during the flora and fauna assessment are listed in Appendix 3 (flora) and Appendix 4 (fauna). Unless of particular note, these species are not discussed further.

Threatened species recorded or predicted to occur in the local area are also listed in these appendices, along with an assessment of the likelihood of the species occurring within the study area.

3.1 Vegetation and fauna habitat

The assessment corridor supports a range of ecological features including large hollow-bearing trees within riparian forest and woodland, organic litter and logs, seasonal and permanent waterways, as well as swamps and wetlands.

- The Section 8 trail alignment is within Barmah National Park.
- The Section 9 trail alignment is within the proposed Murray River Park, River Murray Reserve and Lower Goulburn National Park, located on the Victorian side of the Murray River. It passes through areas of remnant native vegetation and previously disturbed areas.
- The Section 10 trail alignment begins in the township of Echuca and travels west following the Murray River, finishing at Torrumbarry Weir. The trail passes through areas of remnant native vegetation of varying quality, derived grassland and disturbed areas with predominantly introduced vegetation.
- The Section 11 trail alignment is within Gunbower National Park and Gunbower State Forest.

The following EVCs were recorded in the study area:

- Riverine Swamp Forest EVC 814 (Trail section 8)
- Grassy Riverine Forest EVC 106 (Trail sections 8, 9, 10 & 11)
- Riverine Grassy Woodland EVC 295 (Trail sections 8, 9, 10 & 11)
- Plains Woodland EVC 803 (Trail sections 9, 10 & 11)
- Floodplain Riparian Woodland EVC 56 (Trail sections 9 & 10)
- Riverine Chenopod Woodland EVC 103 (Trail sections 9 & 10)
- Riverine Swamp Forest EVC 814 (Trail sections 9 & 11)
- Riverine Swampy Woodland EVC 815 (Trail section 9)
- Sedgy Riverine Forest EVC 816 (Trail section 11)

The vegetation and features of each of these trail sections are described further in Table 3 and mapped in Figure 2 (Appendix 1). Photos are provided in Appendix 5.



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
Section 8				
Riverine Swamp Forest EVC 814 MuF Bioregional Conservation Status (BCS): Depleted Photo 1, Photo 2	 This EVC is characterised by a River Red- gum <i>Eucalyptus camaldulensis var.</i> <i>camaldulensis</i> canopy to 30 metres tall. A mid-storey is absent with ground cover supporting sparse native grasses, herbs and sedges, and a high native organic litter content. Common understorey species comprise Couch <i>Cynodon dactylon var.</i> <i>pulchellus</i>, Common Spike-sedge <i>Eleocharis</i> <i>acuta</i>, Common Blown-grass <i>Lachnagrostis</i> <i>filiformis</i> and Capeweed <i>Arctotheca</i> <i>calendula*</i>. Moderate cover of weeds including Drain Flat-sedge <i>Cyperus eragrostis</i>, Veldt-grasses <i>Ehrharta spp.</i> and Capeweed. Under natural flood regime conditions this EVC would be inundated every 1–3 years (Frood and Papas 2016). VQA condition score: 67 out of 100 	Around Broken Creek.	 EVC 814 provides a range of habitat values for hollow dependent fauna with numerous large hollow-bearing trees present as well as hollow logs on the ground. This abundance of hollows is likely to provide critical habitat for hollow- dependent fauna including birds, possums, microbats and small mammals. While the River Red-gum canopy is relatively monotypic and is generally not considered a highly melliferous species, the proximity to stagnant and free flowing water indicates a high concentration of insects both in the canopy and understorey. This is likely to attract a range of omnivorous canopy and understorey dwelling species including passerines such as honeyeaters, thornbills and robins. This EVC contains a relatively high litter cover and cover of rush and grass species and reptiles are likely to be prolific and include skinks, snakes and geckos. Macropods are present in this vegetation type and would forage on a range of native grass and herb species, and introduced plant species. This EVC's proximity to the Murray River and propensity to hold flood waters is also likely to provide some value to waterbirds, amphibian species and turtles, although this EVC does not contain extensive reedbeds or stagnant/slow moving water year-round. 	 Potential habitat for threatened flora species and threatened woodland bird species within floodplain eucalypt forest. Trees provide nesting and foraging habitat for a range of common and threatened birds and arboreal mammals. Potential habitat for threatened species comprising: Jerry-jerry Ammannia multiflora Winged Water-starwort <i>Callitriche umbonata</i> Cotton Sneezeweed <i>Centipeda nidiformis</i> Bear's Ear Cymbonotus lawsonianus Downs Nutgrass Cyperus bifax Lax Flat-sedge Cyperus flaccidus Slender Love-grass <i>Eragrostis exigua</i>

Table 3Summary of vegetation and habitat types within the study area



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
				• Dwarf Brooklime <i>Gratiola</i> pumilo
Grassy Riverine Forest EVC 106 MuF BCS: Depleted Photo 3, Photo 4	 This EVC occurs on the floodplain adjacent to the Murray River and is characterised by a River Red-gum canopy to 30 metres tall. The sparse mid-storey is composed of Pale-fruit Ballart <i>Exocarpos strictus</i>. The sparse grass and rush-dominated understorey is characterised by species including Warrego Summer-grass <i>Paspalidium jubiflorum</i> and Common Spike-rush <i>Eleocharis acuta</i>, with a scattered herbaceous component made up of Cotton Fireweed <i>Senecio quadridentatus</i> and Ferny Small-flower Buttercup <i>Ranunculus pumilio</i>. The EVC supports a high native organic litter content. High cover of weeds including Ferny Cotula <i>Cotula bipinnata</i>, Wimmera Rye-gras <i>Lolium rigidum</i>, Annual Veldt-grass <i>Ehrharta longifolia</i>, Squirrel-tail Fescue <i>Vulpia bromoides</i> and Hare's-foot Clover <i>Trifolium arvense</i>. Under natural flood regime conditions this EVC would be inundated less than 3 years in every 10 (Frood and Papas 2016). VQA condition score: 64 out of 100 	Majority of the assessment corridor.	The habitat values of EVC 106 are almost identical to those described above for EVC 814. With the principal difference in the EVCs being EVC 106 is a drier EVC with a more infrequent flooding regime than EVC 814. This leads to a slightly open understorey with a higher proliferation of graminoid species. This is unlikely to preclude any of the fauna habitat values described above from occurring in this EVC.	 Potential habitat for threatened flora species and threatened woodland bird species within riparian eucalypt forest. Trees provide nesting and foraging habitat for a range of birds and arboreal mammals. Potential habitat for Broad- shelled Turtle <i>Chelodina</i> <i>expansa</i> along the banks of the Murray River and Broken Creek. Potential habitat for threatened species including: Mueller Daisy <i>Brachyscome muelleroides</i> Ridged Water-milfoil <i>Myriophyllum porcatum</i> Cotton Sneezeweed Pale Swamp Everlasting <i>Coronidium gunnianum</i> Bear's Ear Silky Umbrella-grass <i>Digitaria Ammophila</i> Dwarf Brooklime Smooth Minuria <i>Minuria</i> <i>integerrima</i>



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
				 Floodplain Violet Viola betonicifolia subsp. novaguineensis
Riverine Grassy Woodland EVC 295 BCS: Vulnerable Photo 5, Photo 6	This EVC is characterised by a River Red- gum canopy to 20 metres tall. The sparse to moderately dense dense-mid-storey is dominated by Black Roly-poly <i>Sclerolaena</i> <i>muricata</i> to 0.5 metre tall. The groundcover supports sparse native grasses and forbs including Bristly Wallaby-grass <i>Rytidosperma</i> <i>setaceum</i> , Sand Spurrey <i>Spergularia</i> spp. and Bluebells <i>Wahlenbergia</i> spp. High cover of weeds including Smooth Mustard <i>Sisymbrium erysimoides</i> , Squirrel- tail Fescue and Ferny Cotula. Moderate to high weed cover of White Fumitory <i>Fumaria</i> <i>capreolata</i> in the ground layer.	Around the Dharnya Centre.	EVC 295 is again drier than EVC 814 and EVC 106 being higher on the floodplain and not subject to regular inundation. This drives the development of a more open canopy and the presence of a short shrub layer consisting of saltbush (chenopod) species. Again, the majority of fauna habitat values described for the preceding two EVCs are present in EVC 295, the major difference being the slightly sparser canopy and the presence of a mid-storey. This mid-storey is likely to contribute to a higher diversity of small woodland birds, particularly ground and mid-storey foraging species such as robins, gerygone, whistlers and trillers.	 Trees provide nesting and foraging habitat for a range of birds and arboreal mammals Potential habitat for threatened species including: Pale Swamp Everlasting Bear's Ear Dwarf Brooklime Smooth Minuria
Predominantly introduced vegetation Photo 7	At the time of assessment, ground cover was dominated by emergent annual species including White Fumitory and Capeweed.	Throughout terrestrial habitat within and adjacent to previously disturbed areas.	May provide some habitat value for reptiles, some amphibians, macropods and passerine species.	Within terrestrial areas, predominantly introduced vegetation does not provide any significant values to fauna except to locally common terrestrial fauna species.



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
Section 9				
Plains Woodland EVC 803 MuF Bioregional Conservation Status (BCS): Endangered Photo 9	 This EVC is characterised by a Black Box <i>Eucalyptus largiflorens</i> and Grey Box <i>Eucalyptus microcarpa</i> canopy to 15 metres tall. The sparse to moderately dense mid-storey supported shrubby species including Palefruit Ballart <i>Exocarpos strictus</i>, Drooping Cassinia <i>Cassinia sifton</i> and Gold-dust Wattle <i>Acacia acinacea</i>. The groundcover is generally species-rich supporting a range of grasses and herbs, including Wallaby-grass <i>Rytidosperma</i> species, Rough Spear-grass <i>Austrostipa scabra</i>, Nodding Saltbush <i>Einadia nutans</i>, Rough Burr-daisy <i>Calotis scapigera</i> and Sand Spurrey. The low to moderate weed cover is predominantly annual species including Annual Veldt-grass <i>Ehrharta longiflora</i>, Capeweed and Wimmera Rye-grass <i>Lolium rigidum</i>, with some cover contributed by perennial species including Soursob <i>Oxalis pes-caprae</i>, Small Nettle <i>Urtica urens</i> and Ribwort <i>Plantago lanceolata</i>. VQA condition score: 63 or 67 out of 100 	Generally, this EVC is in areas further away from the Murray River where the landscape is drier. Often alternating with Riverine Grassy Woodland EVC 295.	The amount of hollow-bearing habitat (including large trees and logs) within areas of this EVC varies from abundant to entirely absent depending on the level of modification and location of the patch. Where present this is likely to provide critical habitat for hollow-dependent fauna including birds, possums, microbats and small mammals. In narrow sections of road reserve where the surrounding landscape is heavily cleared these values are more scarce or even absent. The eucalypt canopy in this EVC supports melliferous species such as Grey Box, and its proximity to stagnant and free flowing water indicates a high concentration of insects both in the canopy and understorey. This is likely to attract a range of omnivorous canopy and understorey dwelling species including passerines such as honeyeaters, thornbills and robins. The presence of a mid-storey within this EVC is likely to contribute to a high diversity of small woodland birds, particularly ground and mid-storey foraging species such as robins, gerygone, whistlers and trillers. Macropods are present in this vegetation type and would forage on a range of native grass and herb species and introduced plant species.	 Where Grey Box dominates the canopy, patch vegetation within the assessment corridor meets the community description for Grey Box Woodland threatened ecological community (EPBC Act listed). Potential habitat for threatened species including: Turnip Copperburr <i>Sclerolaena napiformis</i> Buloke <i>Allocasuarina</i> <i>luehmannii</i> (recorded) Buloke Mistletoe <i>Amyema</i> <i>linophylla</i> subsp. <i>orientalis</i> Blue Burr-daisy <i>Calotis</i> <i>cuneifolia</i> Pale Flax-lily <i>Dianella</i> <i>longifolia var grandis</i> (recorded) Late-flower Flax-lily <i>Dianella tarda</i> (recorded) Scaly Mantle <i>Eriochlamys</i> <i>squamata</i> Basalt Podolepis <i>Podolepis</i> <i>linearifolia</i> Hairy Tails <i>Ptilotus</i> <i>erubescens</i> Fuzzy New Holland Daisy

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Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
				Squirrel Glider Petaurus norfolcensis
				Brown Treecreeper Climacteris picumnus
				• Diamond Dove <i>Geopelia</i> cuneata
				Diamond Firetail Stagonopleura guttata
				Hooded Robin Melanodryas cucullata
				Grey-crowned Babbler Pomatostomus temporalis
				Bush-stone Curlew Burhinus grallarius
				Lace Monitor Varanus varius
Floodplain Riparian Woodland EVC 56 MuF BCS: Depleted	This EVC is characterised by a River Red- gum canopy to 20 metres tall. The sparse mid-storey is made up of Pale-fruit Ballart and Silver Wattle <i>Acacia dealbata</i> . The groundcover supports sedges, grasses and	Majority of the assessment corridor. Alternates with areas of Riverine	This EVC occurs on the banks and floodplains of the larger meandering rivers and major creeks. It provides similar habitat values as those described for EVC 803 above. Its proximity to large watercourses and propensity to hold	Potential habitat for threatened species including: Ridged Water-milfoil Dwarf Brooklime
Photo 10	herbs including Tall Sedge Carex appressa,	Swampy Woodland EVC 815 in the western end of Section 9.	floodwaters is also likely to provide some value to waterbirds, amphibian species and turtles, although this EVC does not contain extensive	 Superb Parrot <i>Polytelis</i> <i>swainsonii</i> Swift Parrot <i>Lathamus</i>
			reedbeds or stagnant/slow moving water year- round.	discolor Grey-headed Flying-fox
	The low to moderate weed cover is predominantly annual species including			<i>Pteropus poliocephalus</i>Squirrel Glider
	Annual Veldt-grass, Great Brome Bromus diandrus and Spear Thistle Cirsium vulgare.			Bush-stone Curlew



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
	Under natural flood regime conditions this EVC may be subject to inundation every 3–7 years out of 10. However, periods of inundation occurring less than 3 years out of 10 may also be a natural regime for this EVC (Frood and Papas 2016). VQA condition score: 62 or 67 out of 100			 Little Eagle Hieraaetus morphnoides Black Falcon Falco subniger White-bellied Sea-eagle Haliaeetus leucogaster Barking Owl Ninox connivens Diamond Dove Hooded Robin Diamond Firetail Carpet Python Morelia spilota metcalfei
Riverine Chenopod Woodland EVC 103 MuF BCS: Endangered Photo 11	This EVC is characterised by a Black Box dominated canopy to 15 metres tall, sometimes interspersed with Grey Box (non-dominant). The sparse mid-storey and understorey both have a high diversity of chenopods. The sparse mid-storey supports Gold-dust Wattle, and chenopods including Ruby Saltbush <i>Enchylaena tomentosa</i> and Black Roly-poly <i>Sclerolaena muricata</i> . Common chenopods in the understorey include Berry Saltbush <i>Atriplex semibaccata</i> , Prickly Saltwort <i>Salsola tragus</i> and Nodding Saltbush, with a range of grasses and herbs also present including Wallaby-grasses, Spider Grass <i>Enteropogon acicularis</i> , Australian Carrot <i>Daucus glochidiatus</i> and New Holland Daisy <i>Vittadinia gracilis</i> .	In the northern end and centre of the Section 9 alignment, generally adjacent to and alternating with Floodplain Riparian Woodland EVC 56 and Riverine Grassy Woodland EVC 295.	This EVC occurs on elevated riverine terraces and the margins of riverine floodplains and is only very rarely, if ever, inundated by major flood events. This EVC provides similar habitat values as those described for EVC 803 above.	 Potential habitat for threatened species including: Squirrel Glider Grey-headed Flying-fox Diamond Dove Diamond Firetail Hooded Robin Brown Treecreeper Grey-crowned Babbler Bush-stone Curlew Lace Monitor



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
	Moderate weed cover including Annual Veldt-grass, Wimmera Rye-grass, Onion Grass <i>Romulea rosea</i> and Smooth Mustard. Under natural flood regime conditions this EVC may be subject to inundation less than every 3 years out of 10 (Frood and Papas 2016). VQA condition score: 60 or 66 out of 100			
Riverine Grassy Woodland EVC 295 MuF BCS: Vulnerable Photo 12	This EVC is characterised by a River Red- gum dominated canopy to 20 metres tall. Mid-storey generally absent. The occasionally shrubby understorey supports Black Cotton-bush <i>Maireana decalvans</i> and Ruby Saltbush. The understorey also supports a range of grasses, sedges and herbs including Wallaby-grasses, Common Wheat-grass <i>Anthosachne scabra</i> , Cottony Fireweed <i>Senecio quadridentatus</i> , Tall Sedge, Poong'ort <i>Carex tereticaulis</i> and Warrego Summer-grass. Moderate to high cover of weeds including common annual grass species, Capeweed, Flatweed <i>Hypochaeris radicata</i> , Spear Thistle, African Box-thorn <i>Lycium ferocissimum</i> and Soursob.	Generally, this EVC is in areas further away from the Murray River where the landscape is drier. Often alternating with Riverine Grassy Woodland EVC 295.	This EVC occurs on the floodplain of major rivers and is subject to only infrequent inundation. This EVC generally provides similar habitat values as those described for EVC 803 above. A chenopod dominated mid-storey provides habitat for a diversity of small woodland birds, particularly ground and mid storey foraging species such as robins, Gerygone, Rufous or Golden Whistlers and Trillers.	Potential habitat for threatened species including: Dwarf Brooklime Superb Parrot Swift Parrot Grey-headed Flying-fox Squirrel Glider Brown Treecreeper Bush-stone Curlew Little Eagle White-bellied Sea-eagle Black Falcon Barking Owl Diamond Dove Hooded Robin Diamond Firetail Carpet Python



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
Grassy Riverine Forest EVC 106 MuF BCS: Depleted Photo 13	This EVC occurs on the floodplain adjacent to the Murray River and is characterised by a River Red-gum canopy to 30 metres tall. The sparse mid-storey is made up of Pale- fruit Ballart. The sparse grass and rush- dominated understorey is characterised by species including Warrego Summer-grass, Knob Sedge <i>Carex inversa</i> , with a scattered herbaceous component made up of Cotton Fireweed and Ferny Small-flower Buttercup. The EVC supports a high native organic litter content. High cover of weeds including common annual grass species, Capeweed, Flatweed, Spear Thistle and Chickweed <i>Stellaria media</i> . Under natural flood regime conditions this EVC would be inundated every less than 3 years in every 10 (Frood and Papas 2016).VQA condition score: 63 out of 100	Majority of the assessment corridor.	This EVC occurs on the floodplain of major rivers and is subject to only infrequent inundation. The River Red-gum dominated canopy is less melliferous than some other EVCs and mid- storey is sparse to absent, however it generally provides similar habitat values as those described for EVC 803 above. Additionally, the relatively high litter cover and cover of rush, sedge and grass species provides ample habitat for reptiles which are likely to be prolific including skinks, snakes and geckos.	Potential habitat for threatened species including: Superb Parrot Swift Parrot Grey-headed Flying-fox Squirrel Glider Barking Owl Black Falcon White-bellied Sea-eagle Little Eagle Broad-shelled Turtle.
Riverine Swamp Forest EVC 814 MuF BCS: Depleted Photo 14	This EVC is characterised by a River Red- gum dominated canopy to 30 metres tall. The mid-storey is absent with ground cover supporting sparse native grasses, herbs and sedges, and a moderate native organic litter content. Common understorey species comprise native Couch, Common Spike- rush, Common Nardoo <i>Marsilea</i> <i>drummondii</i> , Ferny Small-flower Buttercup, Tall Sedge and Knob Sedge. High cover of weeds including Capeweed, Ribwort, Drain Flat-sedge, Hare's-foot Clover and Bastard's Fumitory <i>Fumaria bastardii</i> .	In small sections that cross a Murray River tributary and occurring in the centre of Section 9 alignment.	This EVC occurs in low-lying areas including lower river terraces and is subject to reasonably regular flooding. This propensity to flood at regular intervals is likely to provide some value to waterbirds, amphibian species and turtles, although this EVC does not contain extensive reedbeds or stagnant/slow moving water year- round. This EVC generally provides similar habitat values as those described for EVC 803 above, however the mid-storey is absent and consequently does not support habitat for mid storey foraging species.	 Potential habitat for threatened species including: Riverina Bitter-cress <i>Cardamine moirensis</i> Superb Parrot Swift Parrot Grey-headed Flying-fox Squirrel Glider Barking Owl Little Eagle



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
	Under natural flood regime conditions this EVC would be inundated every 1–3 years (Frood and Papas 2016). VQA condition score: 59 out of 100.			
Riverine Swampy Woodland EVC 815 MuF BCS: Vulnerable Photo 15	This EVC is characterised by an open River Red-gum and Black Box canopy to 15 metres tall. The mid-storey was moderately dense to dense and supported Pale-fruit Ballart, Silver Wattle, Golden Wattle <i>Acacia</i> <i>pycnantha</i> , and Drooping Cassinia. Within the assessment corridor this EVC is highly modified in the understorey, with native cover mostly formed by grasses including Bristly Wallaby-grass and Warrego Summer- grass and a smaller component of herbs including Common Cotula <i>Cotula australis</i> and Poison Pratia <i>Lobelia concolor</i> . The high weed cover included species such as Bridal Creeper <i>Asparagus asparagoides</i> , Spear Thistle, Flatweed, Hare's-foot Clover and Capeweed.	At the western end of Section 9 alignment, north of Echuca in two areas alternating with areas of Floodplain Riparian Woodland EVC 56.	This EVC occurs in the fringes of riverine terraces and floodplains and is subject to flooding, although this is not as frequent as described for EVC 814 above. Soils are water-retentive and typically winter-wet, and likely to provide some value amphibian species and turtles. Additionally, the high cover of rush, sedge and grass species provides ample habitat for reptiles which are likely to be prolific including skinks, snakes and geckos. The absence of a mid-storey means this EVC does not provide habitat for mid storey foraging species.	 Potential habitat for threatened species including: Superb Parrot Swift Parrot Grey-headed Flying-fox Squirrel Glider
Predominantly introduced vegetation Photo 16	At the time of assessment, ground cover was dominated by emergent annual species including Panic Veldt-grass <i>Ehrharta erecta</i> , Annual Veldt-grass, Wimmera Rye-grass and Capeweed. High threat weeds include African Box-thorn, Bridal Creeper and Horehound <i>Marrubium vulgare</i> .	Throughout terrestrial habitat within and adjacent to previously disturbed areas.	Predominantly introduced vegetation provides limited habitat values for most fauna species with the exception of reptiles, some amphibians, macropods and passerine species.	Within terrestrial areas, predominantly introduced vegetation does not provide any significant values to fauna except to locally common terrestrial fauna species.



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
Section 10				
Riverine Chenopod Woodland EVC 103 MuF BCS: Endangered VicRiv BCS: Vulnerable Photo 17 and Photo 18	 This EVC is characterised by a Black Box dominated canopy to 15 metres tall, sometimes interspersed with Grey Box (non-dominant). The mid-storey includes Gold-dust Wattle, Tangled Lignum <i>Duma florulenta</i> and Turkey Bush <i>Eremophila deserti</i>. The understorey supports a range of herbs, shrubs and grasses including Nodding Saltbush, Ruby Saltbush, Grey Copperburr <i>Sclerolaena diacantha</i>, Berry Saltbush <i>Atriplex semibaccata</i>, Fuzzy New Holland Daisy <i>Vittadinia cuneata</i> and Grassland Wood-sorrel <i>Oxalis perennans</i>. Moderate cover of weeds including Ferny Cotula and Wimmera Rye-grass, also including a component of high threat species such as Soursob. Under natural flood regime conditions this EVC may be subject to inundation less than every 3 years out of 10 (Frood and Papas 2016). MuF VQA condition score: 70 out of 100 VicRiv VQA condition score: 66 out of 100 	Throughout the length of the assessment corridor and along smaller tributaries of the Murray River, alternating with areas of Grassy Riverine Forest EVC 106.	This EVC occurs on elevated riverine terraces and the margins of riverine floodplains and is only very rarely, if ever, inundated by major flood events. The amount of hollow-bearing habitat (including large trees and logs) within areas of this EVC varies from abundant to entirely absent depending on the level of modification and location of the patch. Where present this is likely to provide critical habitat for hollow-dependent fauna including birds, possums, microbats and small mammals. In narrow sections of road reserve where the surrounding landscape is heavily cleared these values are more scarce or even absent. The eucalypt canopy in this EVC supports melliferous species such as Grey Box, and its proximity to stagnant and free flowing water indicates a high concentration of insects both in the canopy and understorey. This is likely to attract a range of omnivorous canopy and understorey dwelling species including honeyeaters, passerines, thornbills and robins. The presence of a species diverse mid-storey within this EVC is likely to contribute to a high diversity of small woodland birds, particularly ground and mid storey foraging species such as robins, Gerygones, Rufous or Golden Whistlers and Trillers. Macropods are present in this vegetation type and would forage on a range of native grass and herb species, and introduced plant species.	 Potential habitat for threatened species including Floodplain Rustyhood <i>Pterostylis cheraphila</i> Squirrel Glider Grey-headed Flying-fox Brown Treecreeper Diamond Dove Diamond Firetail Hooded Robin Grey-crowned Babbler Bush-stone Curlew Lace Monitor



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
Grassy Riverine Forest EVC 106MuF BCS: DepletedVicRiv BCS: DepletedPhoto 19 and Photo 20	This EVC occurs on the floodplain adjacent to the Murray River in slightly elevated positions that infrequently flood. This EVC is characterised by a River Red-gum canopy to 25 metres tall. The mid-storey features Silver Wattle and the understorey is dominated by grasses and some sedges including Common Wheat-grass, Common Reed <i>Phragmites australis</i> , Rush <i>Juncus</i> spp. and Common Spike-rush. High cover of weeds at the time of assessment including Onion Grass, Capeweed, Ribwort and high threat species including Horehound. Under natural flood regime conditions this EVC would be inundated every less than 3 years in every 10 (Frood and Papas 2016).MuF VQA condition score: 61 out of 100 VicRiv VQA condition score: 57 or 59 out of 100	Throughout the length of the assessment corridor and along smaller tributaries of the Murray River, alternating with areas of Riverine Chenopod Woodland EVC 103	This EVC occurs on the floodplain of major rivers and is subject to only infrequent inundation. The River Red-gum dominated canopy is less melliferous than some other EVCs and mid- storey is sparse to absent thus providing less habitat for mid-storey foragers, however it generally provides similar habitat values as those described for EVC 103 above. Additionally, the relatively high litter cover and cover of rush, sedge and grass species provides ample habitat for reptiles which are likely to be prolific including skinks, snakes and geckos.	 Potential habitat for threatened flora species and within riparian eucalypt forest. Potential habitat for threatened species including: Stiff Groundsel Senecio behrianus Slender Darling-pea Swainsona murrayana Red Swainson-pea Swainsona plagiotropis Yellow-tongue Daisy Brachyscome chrysoglossa Cut-leaf Burr-daisy Calotis anthemoides Small Scurf-pea Cullen parvum Long Eryngium Eryngium paludosum Smooth Minuria Basalt Podolepis Superb Parrot Swift Parrot Grey-headed Flying-fox Squirrel Glider Barking Owl Black Falcon White-bellied Sea-eagle Little Eagle



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
				Broad-shelled Turtle.
Riverine Grassy Woodland EVC 295	This EVC is characterised by River Red-gum dominant canopy with some Grey Box, to 20 metres tall. The mid-storey is made up of Silver Wattle and Pale-fruit Ballart. The understorey supports grasses, herbs and shrubs including Ruby Saltbush, Nodding Saltbush, Hedge Saltbush <i>Rhagodia</i> <i>spinescens</i> , Common Tussock-grass <i>Poa</i> <i>labillardierei</i> , Cottony Fireweed and Fuzzy New Holland Daisy. High cover of weeds at the time of assessment, predominantly made up of annual species including Annual Veldt-grass and Wimmera Rye-grass and Capeweed, as well as Flatweed and high threat species including Bridal Creeper. MuF VQA condition score: 54, 56, 62 or 64 out of 100 VicRiv VQA condition score: 58 out of 100	Extensive tracts in most of the drier sections of the assessment corridor, further away from the Murray River, alternating with Plains Woodland EVC 803.	This EVC occurs on the floodplain of major rivers and is subject to only infrequent inundation. This EVC generally provides similar habitat values as those described for EVC 103 above.	Potential habitat for threatened species including: Slender Darling-pea Small Scurf-pea Smooth Minuria Basalt Podolepis Southern Swainson-pea Swainsona behriana Silky Swainson-pea Swainsona sericea Superb Parrot Superb Parrot Swift Parrot Grey-headed Flying-fox Squirrel Glider Brown Treecreeper Bush-stone Curlew Little Eagle White-bellied Sea-eagle Black Falcon Barking Owl Diamond Dove Hooded Robin Diamond Firetail Carpet Python.



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
Plains Woodland EVC 803 MuF BCS: Endangered VicRiv BCS: Endangered Photo 23 and Photo 24	This EVC is characterised by Black Box and Grey Box canopy to 15 metres tall hosting Creeping Mistletoe <i>Muellerina eucalyptoides</i> in some areas. This EVC also features a component of River Red-gum in some areas. The mid-storey is supports a range of shrubby species including Gold-dust Wattle, Hedge Saltbush, Turkey Bush and Ruby Saltbush. The understorey supports sedges, grasses and herbs including Ferny Small- flower Buttercup, Common Wheat-grass, Berry Saltbush, Variable Plantain <i>Plantago</i> <i>varia</i> , Cottony Fireweed and Spreading Crassula <i>Crassula decumbens</i> . There was a low to moderate cover of weeds mostly made up of annual species such as Annual Veldt-grass and occasional high threat species such as African Box- thorn. MuF VQA condition score: 34, 45, 51, 64 or 66 out of 100 VicRiv VQA condition score: 66 out of 100	Extensive tracts in most of the drier sections of the assessment corridor, further away from the Murray River, alternating with Riverine Grassy Woodland EVC 295.	This EVC occurs on floodplains and occasionally has seasonally waterlogged, mostly silty, loamy or clay soils. This EVC generally provides similar habitat values as those described for EVC 103 above.	In some areas this EVC meets the key diagnostics and condition thresholds for the EPBC listed community Grey Box Grassy Woodland and Derived Native Grasslands of South-Eastern Australia (EPBC Act listed). Potential habitat for threatened species including: Turnip Copperburr Red Swainson-pea Ausfeld's Wattle Acacia ausfeldii (recorded) Buloke (recorded) Buloke Mistletoe Blue Burr-daisy Small Scurf-pea Late-flower Flax-lily (recorded) Basalt Podolepis Hairy Tails Southern Swainson-pea Silky Swainson-pea Fuzzy New Holland Daisy Vittadinia cuneata var. morrisii



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
				 Squirrel Glider Brown Treecreeper Diamond Dove Diamond Firetail Hooded Robin Grey-crowned Babbler Bush-stone Curlew Lace Monitor.
Floodplain Riparian Woodland EVC 56 VicRiv BCS: Vulnerable Photo 27	This EVC occurs on the floodplain adjacent to the Murray River and is characterised by a River Red-gum canopy to 20 metres tall. Mid-storey of sparse Pale-fruit Ballart. The understorey is made up on predominantly introduced species. Under natural flood regime conditions this EVC may be subject to inundation every 3-7 years out of 10. However, periods of inundation occurring less than 3 years out of 10 may also be a nature regime for this EVC (Frood and Papas 2016). VicRiv VQA condition score: 42 out of 100	In the eastern end of the Section 10 alignment, in Echuca township.	This EVC occurs on the banks and floodplains of the larger meandering rivers and major creeks. It provides similar habitat values as those described for EVC 103 above. Its proximity to large water courses and propensity to hold flood waters is also likely to provide some value to waterbirds, amphibian species and turtles, although this EVC does not contain extensive reedbeds or stagnant/slow moving water year- round.	 Potential habitat for threatened species including: Stiff Groundsel Umbrella Grass <i>Digitaria</i> <i>divaricatissima</i> var. <i>divaricatissima</i> var. <i>divaricatissima</i> Long Eryngium Smooth Minuria Basalt Podolepis Superb Parrot Swift Parrot Swift Parrot Grey-headed Flying-fox Squirrel Glider Bush-stone Curlew Little Eagle Black Falcon White-bellied Sea-eagle



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
				 Barking Owl Diamond Dove Hooded Robin Diamond Firetail Carpet Python.
Predominantly introduced vegetation Photo 28	At the time of assessment, ground cover was dominated by emergent annual species including Annual Veldt-grass, Wimmera Rye- grass, Annual Meadow-grass and Capeweed. Common high threat species included African Box-thorn, Patterson's Curse <i>Echium plantagineum</i> , Spear Thistle and Horehound.	Throughout terrestrial habitat in the assessment corridor, within and adjacent to previously disturbed areas.	Predominantly introduced vegetation provides limited habitat values for most fauna species with the exception of reptiles, some amphibians, macropods and passerine species.	Within terrestrial areas, predominantly introduced vegetation does not provide any significant values to fauna except to locally common terrestrial fauna species.
Section 11				
Riverine Swamp Forest EVC 814 MuF Bioregional Conservation Status (BCS): Depleted Photo 29 and Photo 30	This EVC is characterised by a River Red- gum canopy to 30 metres tall. The mid- storey is sparse and dominated by Pale-fruit Ballart. Common understorey species comprise Fuzzy New Holland Daisy, Common Spike-sedge and Ruby Saltbush. Moderate to high cover of weeds including Bastard's Fumitory, Paterson's Curse and Capeweed. Under natural flood regime conditions this EVC would be inundated every 1–3 years (Frood and Papas 2016). MuF VQA condition score: 62 or 63 out of 100	Generally this EVC is in areas adjacent to or nearby the Murray River where the landscape is regularly flooded and/or water is present for extended periods of time.	The amount of hollow-bearing habitat (including large trees and logs) within areas of this EVC varies from abundant to entirely absent depending on the level of modification and location of the patch. Where present this is likely to provide critical habitat for hollow-dependent fauna including birds, possums, microbats and small mammals. While the River Red-gum canopy is relatively monotypic and is generally not considered a highly melliferous species, the proximity to stagnant and free flowing water indicates a high concentration of insects both in the canopy and understorey. This is likely to attract a range of omnivorous canopy and understorey dwelling species including honeyeaters, passerines, thornbills and robins. The absence of a mid-	 Potential habitat for threatened flora species within floodplain eucalypt forest. Potential habitat for threatened species including: Winged Peppercress <i>Lepidium monoplocoides</i> Stiff Groundsel Riverina Bitter-cress Dwarf Brooklime Water Nymph Najas tenuifolia Wavy Marshwort Nymphoides crenata



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
			storey means this EVC does not provide habitat for mid storey foraging species. This EVC contains a relatively high litter cover and cover of rushes and grasses, and reptiles are likely to be prolific and include skinks, snakes and geckos. Macropods are present in this vegetation type and would forage on a range of native grass and herb species, and introduced plant species. This EVCs proximity to the Murray River and propensity to hold floodwaters is also likely to provide some value to waterbirds, amphibian species and turtles, although this EVC does not contain extensive reedbeds or stagnant/slow moving water year-round	 Squat picris <i>Picrus</i> squarrosa Dwarf Bitter-cress <i>Rorippa</i> eustylis Floodplain Fireweed Senecio campylocarpus Branching Groundsel Senecio cunninghamii var. cunninghamii Riverina Fireweed Senecio longicollaris Squirrel Glider Barking Owl Little Eagle
Grassy Riverine Forest EVC 106 MuF BCS: Depleted Photo 31 and Photo 32	This EVC is characterised by a River Red- gum canopy to 30 metres tall. The sparse mid-storey is made up of Pale-fruit Ballart. The sparse grass, sedge and rush- dominated understorey is characterised by species including Warrego Summer-grass and Common Spike-sedge, with a scattered herbaceous component made up of Cotton Fireweed and Ferny Small-flower Buttercup. The EVC supports a high native organic litter content. Moderate cover of weeds including Ferny Cotula, Squirrel-tail Fescue and Hare's-foot Clover.	This EVC occurs on the floodplain adjacent to the Murray River.	The habitat values of EVC 106 are almost identical to those described above for EVC 814. With the principal difference in the EVCs being EVC 106 is a drier EVC with a more infrequent flooding regime than EVC 814. This leads to a slightly open understorey with a higher proliferation of graminoid species. This is unlikely to preclude any of the fauna habitat values described above from occurring in this EVC.	 Potential habitat for threatened flora species and threatened woodland bird species within riparian eucalypt forest. Potential habitat for threatened species including: Winged Peppercress Long Eryngium Dwarf Brooklime Squat Picris <i>Picris</i> squarrosa Dwarf Bitter-cress Floodplain Fireweed Branching Groundsel



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
	Under natural flood regime conditions this			Riverina Fireweed
	EVC would be inundated every less than 3			Superb Parrot
	years in every 10 (Frood and Papas 2016).			Swift Parrot
	MuF VQA condition score: 53 or 56 out of			Squirrel Glider
	100			Barking Owl
				Little Eagle
				• White-bellied Sea-eagle
				Broad-shelled Turtle
				• Murray River Turtle Emydura macquarii
Plains Woodland EVC 803 MuF BCS: Endangered	This EVC is characterised by a Black Box, River Red-gum and Grey Box canopy to 15 metres tall. Where Grey Box dominates this EVC is consistent with the Grey Box Grassy Woodland EPBC-listed community. The sparse to moderately dense mid-storey is generally dominated by Gold-dust Wattle	Generally, this EVC is in areas further away from the Murray River where the landscape is drier.	This EVC generally provides similar habitat values as those described for EVC 814 above. The presence of a species diverse mid-storey within this EVC is likely to contribute to a high diversity of small woodland birds, particularly ground and mid storey foraging species such as robins, Gerygones, Rufous or Golden Whistlers	In some areas this EVC meet the key diagnostics and condition thresholds for the EPBC listed community Grey Box Grassy Woodland and Derived Native Grasslands o South-Eastern Australia (EPB
Photo 33 and	Acacia acinacea. The groundcover supports		and Trillers.	Act listed).
Photo 34	<i>Rytidosperma</i> species, Grassland Wood- sorrel, Nodding Saltbush and Variable			 Potential habitat for threatened species including: Blue Burr-dais
including Annual Veldt-و Small Nettle.	Plantain. Low to moderate weed cover including Annual Veldt-grass, Soursob and			Riverina Fireweed
				Fuzzy New Holland Daisy
	MuF VQA condition score: 66 or 71 out of			• Waterbush <i>Myoporum montanum</i> (recorded)
	100			Squirrel Glider
				Brown Treecreeper
				Diamond Dove
				Diamond Firetail



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
				 Hooded Robin Grey-crowned Babbler Bush-stone Curlew Bearded Dragon Lace Monitor.
Sedgy Riverine Forest EVC 816 MuF BCS: Endangered Photo 35 and Photo 36	This EVC is characterised by a River Red- gum canopy to 25 metres tall. The sparse to moderately dense mid-storey is dominated by Pale-fruit Ballart. The groundcover supports a range of graminoids and herbs, including Warrego Summer-grass, Tall Sedge, Berry Saltbush and Wallaby-grasses. High cover of weeds, predominantly made up of annual pasture species including Annual Veldt-grass and Wimmera Rye-grass. Under natural flood regime conditions this EVC may be subject to inundation every 3-7 years out of 10. However, periods of inundation occurring less than 3 years out of 10 may also be a nature regime for this EVC (Frood and Papas 2016). MuF VQA condition score: 60, 68, 69 or 71 out of 100.	Adjacent to the Murray River	This EVC generally provides similar habitat values as those described for EVC 814 above.	 Potential habitat for threatened species including: Stiff Groundsel Branching Groundsel Riverina Fireweed Superb Parrot Squirrel Glider
Riverine Grassy Woodland EVC 295 MuF BCS: Vulnerable	This EVC is characterised by a River Red- gum dominated canopy to 20 metres tall. Mid-storey generally absent. Predominantly grassy/sedgey understorey supporting species including including Wallaby-grasses, Common Wheat-grass, Cottony Fireweed,	Alternating with EVC 803 in the southern end of Section 11 alignment.	This EVC occurs on the floodplain of major rivers and is subject to only infrequent inundation. This EVC generally provides similar habitat values as those described for EVC 814 above. A chenopod dominated mid-storey provides habitat for a diversity of small woodland birds, particularly ground and mid storey foraging	Potential habitat for threatened species:Winged PeppercressStiff GroundselLong Eryngium



Vegetation or habitat type	Description	Location	Fauna habitat values	Significant values
Photo 37 and Photo 38	Tall Sedge, Poong'ort and Warrego Summer-grass. Moderate to high cover of weeds including common annual grass species, Capeweed, Horehound and African Box-thorn. MuF VQA condition score: 58 out of 100		species such as robins, Gerygones, Rufous or Golden Whistlers and Trillers.	 Dwarf Brooklime Smooth Minuria Riverina Fireweed Superb Parrot Swift Parrot Squirrel Glider Brown Treecreeper Bush-stone Curlew Little Eagle White-bellied Sea-eagle Black Falcon Barking Owl Diamond Dove Hooded Robin Diamond Firetail Carpet Python
Predominantly introduced vegetation Photo 39	At the time of assessment, ground cover was dominated by emergent annual species including White Fumitory and Capeweed.	Throughout terrestrial habitat within and adjacent to previously disturbed areas.	Predominantly introduced vegetation provides limited habitat values for most fauna species with the exception of reptiles, some amphibians, macropods and passerine species.	Within terrestrial areas, predominantly introduced vegetation does not provide any significant values to fauna except to locally common terrestrial fauna species.



3.2 Landscape context

The majority of assessment corridor is within the Murray Fans bioregion, however some parts of the assessment corridor in Section 10 are within the Victorian Riverina bioregion. Both bioregions are characterised by a flat to gently undulating landscape, showing evidence of former stream channels, braided former river meanders and palaeochannels, and broad floodplain areas associated with major river systems and prior steams.

The assessment corridor generally follows the Murray River riparian corridor, which forms part of a significant and contiguous tract of native vegetation along its length in both Victoria and New South Wales. This riparian corridor is of ecological significance in supporting a range of habitat types and vegetation communities including waterways, riparian forest, swamps and wetlands, as well as woodlands and grasslands on higher ground further from the waterways. Barmah-Millewa Forest (part of Section 8) is recognised as the largest extent of River Red-gum dominated forest in Australia (YYTOLMB 2020). Adjacent to and contiguous with Section 11 is the NSW State Forests of Koondrook and Perricoota. Both these forests support ecologically significant habitat types and vegetation communities. The Lower Goulburn River floodplain is considered a nationally important wetland. It also provides ecosystem services through regulating the flow of water on the floodplain of the Goulburn and Murray Rivers and through carbon sequestration.

The study area sits within Gunbower Forest and Barmah Forest Ramsar sites which support vast tracts of River Red-gum dominated open forest and woodland which provide habitat for many wetland-dependent wildlife species. These forests are recognised as particularly important in providing breeding habitat for waterbirds, frogs, native fish and turtles during times of inundation. The sites can periodically support thousands of colonial nesting waterbirds and are considered a drought refuge for waterbirds and native fish (Hale & Butcher 2011a).

In terms of its cultural and anthropogenic values, the River Red-gum forests of the Murray River riparian corridor are recognised for their cultural significance to Aboriginal people and provide a popular destination for recreational activities such as camping and fishing.

The flows of the Murray River and Campaspe River (and many of its tributaries) are highly regulated, with much of the water let downstream being used for irrigation during spring and summer. This has altered the natural flow regime of these systems, and many areas which historically would have received annual flooding are now rarely inundated. As such the ecotone between terrestrial and aquatic areas has constricted, which has corresponded to a decline in quality, change in composition and increase in weed cover of some adjacent areas, and a reduction in the extent of seasonally wet areas.

Logging and grazing occurred throughout Barmah Forest (Section 8) until its proclamation as national Park in June 2010 (YYTOLMB 2020). Despite this, the riparian habitat within Barmah National Park offers a range of habitat values for local fauna. Eucalypt forest in these areas offers foraging and nesting habitat for a range of birds and arboreal mammals. Past logging of River Red-gum forests around the Murray River, including those within the study area, has reduced the density of large hollow-bearing trees than would occur in unlogged areas, however some are still present. The banks of Barmah Creek and Deep Creek provide refuge for a diverse frog fauna and foraging/nesting habitat for waterbirds.

Much of the landscape adjacent to the vegetated riparian corridors of the Murray River, Goulburn River, Campaspe River and Deep Creek has been heavily cleared. The flat floodplains with fertile alluvial soils are predominantly used for agricultural activities including cropping and grazing, and the landscape is dissected by road infrastructure. Around regional towns such as Echuca and Barmah the rural land use gives way to urban and commercial development. In these fragmented landscapes, remnant native vegetation is generally



restricted to narrow corridors along road reserves and fence lines, and as scattered paddock trees where the surrounding vegetation is predominantly introduced.

3.3 Threatened species

Threatened species recorded or predicted to occur within 5 kilometres of the study area or from the relevant catchment (aquatic species) are listed in Appendix 3 (flora) and Appendix 4 (fauna). An assessment of the likelihood of these species occurring in the study area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included.

3.3.1 Threatened flora

Fifty-one threatened flora listed under the EPBC Act and/or FFG Act were recorded, or are considered to have a medium or higher likelihood of occurring in the study area.

Seven threatened flora listed under the FFG Act were recorded within or adjacent to the study area:

- Ausfeld's Wattle Acacia ausfeldii (Section 10, within EVC 803).
- Umbrella Wattle Acacia oswaldii (Section 10 within EVC 803).
- Buloke Allocasuarina luehmannii (Section 9 and 10 within EVC 803).
- Pale Flax-lily *Dianella* sp. aff. *longifolia* (Section 9 within 803).
- Late-flower Flax-lily *Dianella tarda* (Section 9 within EVC 803).
- Waterbush *Myoporum montanum* (Section 11 within EVC 803).
- Riverina Fireweed Senecio longicollaris (Section 9 within EVC 815).

An additional 44 threatened flora species were not recorded during the field assessments but are considered to have a medium or higher likelihood of occurrence. A summary of those flora recorded or with a medium or higher likelihood of occurring in the study area is provided in Table 4 below.

Table 4Summary of EPBC Act and FFG Act listed flora species most likely to occur in the study
area

Species name	Listing status	Area of value within the study area
River Swamp Wallaby- grass Amphibromus fluitans	Listed as Vulnerable under the EPBC Act	Fringes of slow moving waterways including swamps, lagoons, and billabongs in all sections of the assessment corridor but particularly Section 8 and 11. Some other suitable habitat in Section 9, east of Echuca.
Mueller Daisy Brachyscome muelleroides	Listed as Vulnerable under the EPBC Act Listed as Endangered under the FFG Act	River Red-gum dominated floodplain forest within Section 8.
Winged Peppercress Lepidium monoplocoides	Listed as Endangered under the EPBC Act Listed as Endangered under the FFG Act	Floodplain grassland and grassy woodland communities within Section 11.
Ridged Water-milfoil <i>Myriophyllum porcatum</i>	Listed as Vulnerable under the EPBC Act Listed as Critically Endangered under the FFG Act	Tributaries of the Murray River and adjacent floodplain wetlands in Section 8, ephemeral channels in the Lower Goulburn National Park in Section 9.



Species name	Listing status	Area of value within the study area
Floodplain Rustyhood Pterostylis cheraphila	Listed as Vulnerable under the EPBC Act Listed as Endangered under the FFG Act	In tracts of Black Box dominant Chenopod Woodland with low litter cover within Section 10.
Turnip Copperburr Sclerolaena napiformis	Listed as Endangered under the EPBC Act Listed as Critically Endangered under the FFG Act	High-quality Plains Woodland EVC 803 around Echuca, Sections 9 and 10.
Stiff Groundsel Senecio behrianus	Listed as Endangered under the EPBC Act Listed as Critically Endangered under the FFG Act	In heavy, winter-wet and inundated clay soils across Sections 10 and 11.
Slender Darling-pea Swainsona murrayana	Listed as Vulnerable under the EPBC Act Listed as Endangered under the FFG Act	Seasonally inundated areas and derived grassland habitat within Section 10.
Red Swainson-pea Swainsona plagiotropis	Listed as Vulnerable under the EPBC Act Listed as Endangered under the FFG Act	Open Plains Woodland and derived grassland patches in Section 10.
Ausfeld's Wattle Acacia ausfeldii	Listed as Endangered under the FFG Act	Recorded in dry Plains Woodland habitat in Section 10.
Umbrella Wattle Acacia oswaldii	Listed as Critically Endangered under the FFG Act	Recorded in Plains Woodland habitat in Section 11.
Buloke Allocasuarina luehmannii	Listed as Critically Endangered under the FFG Act	Recorded in dry Plains Grassy Woodland with Grey Box dominant canopy in Sections 9 and 10.
Jerry-jerry Ammannia multiflora	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 8.
Buloke Mistletoe <i>Amyema linophylla</i> subsp. <i>orientalis</i>	Listed as Critically Endangered under the FFG Act	In dry Plains Woodland where its host plant Buloke is present; Sections 9 and 10.
Yellow-tongue Daisy Brachyscome chrysoglossa	Listed as Endangered under the FFG Act	In inundated clays habitat found in Section 10.
Winged Water-starwort Callitriche umbonata	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 8.
Cut-leaf Burr-daisy Calotis anthemoides	Listed as Critically Endangered under the FFG Act	Heavy soils that area seasonally inundated and prone to flooding across Section 10.
Blue Burr-daisy Calotis cuneifolia	Listed as Endangered under the FFG Act	Plains Woodland habitat fund across Sections 9, 10 and 11.
Riverina Bitter-cress Cardamine moirensis	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Sections 9 and 11.
Cotton Sneezeweed Centipeda nidiformis	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 8.
Pale Swamp Everlasting Coronidium gunnianum	Listed as Critically Endangered under the FFG Act	Riparian River Red-gum dominated floodplain forest in Section 8.
Small Scruf-pea Cullen parvum	Listed as Endangered under the FFG Act	Intact and disturbed grassland habitat along Section 10.
Bear's Ear Cymbonotus Iawsonianus	Listed as Endangered under the FFG Act	Riparian River Red-gum dominated floodplain forest in Section 8.



Species name	Listing status	Area of value within the study area
Downs Nutgrass <i>Cyperus bifax</i>	Listed as Critically Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 8.
Lax Flat-sedge Cyperus flaccidus	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 8.
Button Rush Cyperus leptocarpus	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 8.
Pale Flax-lily <i>Dianella</i> sp. aff. <i>longifolia (D.</i> var. grandis)	Listed as Vulnerable under the FFG Act	Recorded in Section 9. Suitable habitat in grassland and grassy woodland in Sections 9 and 10.
Late-flower Flax-lily Dianella tarda	Listed as Critically Endangered under the FFG Act	Recorded in Sections 9 and 10 within River Red-gum dominant woodland habitat.
Silky Umbrella-grass Digitaria ammophila	Listed as Endangered under the FFG Act	Riparian River Red-gum dominated floodplain forest in Section 8.
Umbrella Grass Digitaria divaricatissima var. divaricatissima	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 10.
Slender Love-grass Eragrostis exigua	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 8.
Scaly Mantle Eriochlamys squamata	Listed as Endangered under the FFG Act	In drier Grey Box woodland habitat in Section 10.
Long Eryngium <i>Eryngium paludosum</i>	Listed as Endangered under the FFG Act	Along margins of watercourses in River floodplain habitat in Section 10 and 11.
Dwarf Brooklime Gratiola pumilo	Listed as Endangered under the FFG Act	Fringes of seasonally inundated wetlands and watercourses in Sections 8, 9 and 11.
Small-leaf Bluebush Maireana microphylla	Listed as Endangered under the FFG Act	Remnant vegetation on loamy soils across Sections 9 and 10.
Smooth Minuria <i>Minuria integerrima</i>	Listed as Vulnerable under the FFG Act	Riparian River Red-gum dominated floodplain forest in Sections 8, 10 and 11.
Waterbush <i>Myoporum montanum</i>	Listed as Endangered under the FFG Act	Recorded in Section 11 where patches of Riparian woodland were present.
Water Nymph Najas tenufolia	Listed as Endangered under the FFG Act	Slow-moving or still water including inundated areas in Section 11.
Wavy Marshwort Nymphoides crenata	Listed as Endangered under the FFG Act	Seasonally inundated areas and swampy habitat in Section 11.
Squat picris Picrus squarrosa	Listed as Endangered under the FFG Act	River bank and floodplain habitat in Section 11.
Basalt Podolepis Podolepis linearifolia	Listed as Endangered under the FFG Act	Woodland and forests throughout the assessment corridor in Sections 9 and 10.
Hairy Tails <i>Ptilotus</i> erubescens	Listed as Critically Endangered under the FFG Act	Plains Woodland EVC803 within the assessment corridor in Sections 9 and 10.
Dwarf Bitter-cress Rorippa eustylis	Listed as Endangered under the FFG Act	Floodplain forests within the assessment corridor in Section 11.



Species name	Listing status	Area of value within the study area
Floodplain Fireweed Senecio campylocarpus	Listed as Endangered under the FFG Act	Floodplain forests within the assessment corridor in Section 11.
Branching Groundsel Senecio cunninghamii var. cunninghamii	Listed as Endangered under the FFG Act	Floodplain forests within the assessment corridor in Section 11.
Riverina Fireweed Senecio longicollaris	Listed as Endangered under the FFG Act	Recorded in River Red-gum dominated woodlands and forests within the assessment corridor in Section 11.
Southern Swainson-pea Swainsona behriana	Listed as Endangered under the FFG Act	Less-disturbed grassland within the study area in Section 10.
Silky Swainson-pea Swainsona sericea	Listed as Endangered under the FFG Act	Less-disturbed grassland within the study area in Section 10.
Floodplain Violet <i>Viola</i> <i>betonicifolia</i> subsp. <i>novaguineensis</i>	Listed as Endangered under the FFG Act	Riparian River Red-gum dominated floodplain forest in Section 8.
Fuzzy New Holland Daisy <i>Vittadinia cuneata</i> var. <i>hirsuta</i>	Listed as Endangered under the FFG Act	Plains Woodland EVC803 within the assessment corridor in Sections 9, 10 and 11.
Fuzzy New Holland Daisy <i>Vittadinia cuneata</i> var. <i>morrisii</i>	Listed as Endangered under the FFG Act	Plains Woodland EVC803 within the study area in Section 10.

3.3.2 Threatened fauna

Thirty-three threatened fauna listed under the EPBC Act and/or FFG Act were recorded, or considered likely to occur in the study area.

Two threatened species, Diamond Firetail (Vulnerable under the EPBC Act and FFG Act) and Brown Treecreeper (Vulnerable under the EPBC Act) were recorded during field surveys on 25 August 2022. Both species were recorded were recorded in the proposed Murray River Park just south of Barmah, and Brown Treecreeper was additionally recorded near Maloney Street in Barmah. Among other woodland birds, these species regularly occur throughout woodlands and forests along the Murray River and surrounding vegetation patches. Brown Treecreeper favours dry open forests and woodlands, and family groups remain in regular, year-round territories typically from 1 to 10 hectares. This species is highly sociable, typically occurring in small groups and pairs. It is likely that the assessment corridor and broader study area support numerous family groups, particularly where abundant tree hollows and stags provide breeding opportunity. Diamond Firetail similarly prefer open forest and woodland habitat, and are relatively sedentary throughout their home range. The species typically occur in flocks of 5 to 40 individuals (DCCEEW 2023a), and it is likely that the a number of individuals regularly occupy the assessment corridor and broader study area.

An additional 31 threatened fauna species were not recorded during the field assessments but are considered to have a medium or higher likelihood of occurrence. These comprise:

- Five fish and one crayfish
- Seventeen birds
- Five reptiles



• Three mammals

A summary of fauna recorded or with a medium or higher likelihood of occurring, and the corresponding area of value within the study area is provided in Table 5 below. Threatened woodland and woodland-associated bird species are known to occur in the local area and may be resident within the study area and surrounding landscape. The study area provides potential foraging, roosting, and nesting habitat for many of these species. Raptors are highly mobile and wide-ranging, occupying large home ranges and are likely to fly over or forage within the study area. Species such as White-bellied Sea-Eagle *Haliaeetus leucogaster*, Square-tailed Kite *Lophoictinia isura* and Black Falcon *Falco subniger* often construct large stick nests for breeding in tall trees along watercourses, returning to nesting sites for consecutive years. As such, the study area and adjacent treed vegetation provides potential nesting opportunity for these species. Raptor nests also offer sheltered nesting sites for added protection. Other bird species such as White-throated Needletail *Hirundapus caudacutus* and Swift Parrot *Lathamus discolor* are migratory, and may occur within the study area during their non-breeding season. Threatened fish and turtles may be resident within waterways within and adjacent to the study area, if present, though may also occur intermittently when dispersing between breeding grounds.

Species name	Listing status	Area of value within the study area
Superb Parrot Polytelis swainsonii	Listed as Vulnerable under the EPBC Act Listed as Endangered under the FFG Act	Could utilise all habitat within the Section 8 area on occasion and some habitat patches in Sections 9 and 10 throughout River Red-gum dominated habitat. May also utilise tree hollows for nesting.
Swift Parrot Lathamus discolor	Listed as Critically Endangered under the EPBC Act Listed as Critically Endangered under the FFG Act	Occasional visitor may forage on winter flowering <i>Eucalyptus</i> spp. in Sections 9, 10 and 11 when the species occurs on mainland Australia during their non-breeding season in winter. The study area does not support breeding habitat, as the species breeds exclusively in Tasmania.
White-throated Needletail <i>Hirundapus</i> <i>caudacutus</i>	Listed as Vulnerable under the EPBC Act Listed as Vulnerable under the FFG Act	May move through or forage in the airspace above the study area on rare occasion but almost exclusively aerial and unlikely to occur in terrestrial vegetation. However, some birds have been recorded roosting in hollows and canopy foliage of tall trees in forest and woodland. The species may therefore occasionally utilise mature trees in the study area for roosting though the use of roosting habitat in Australia is not well understood.
Hooded Robin Melanodryas cucullata	Listed as Endangered under the EPBC Act Listed as Vulnerable under the FFG Act	Occasional visitor, may utilise Plains Woodland habitat in all sections for foraging, breeding or dispersal.
Diamond Firetail Stagonopleura guttata	Listed as Vulnerable under the EPBC Act Listed as Vulnerable under the FFG Act	Recorded in Section 9 in Grassy River Red-gum woodland habitat which is also present in all other Sections. Woodland habitat within the study area offers suitable breeding, foraging, roosting and dispersal habitat for this species.
Brown Treecreeper	Listed as Vulnerable under the EPBC Act	Recorded numerous times during fauna assessments. Suitable woodland habitat throughout all Sections,

Table 5Summary of EPBC Act and FFG Act listed fauna species most likely to occur in the study
area



Species name	Listing status	Area of value within the study area
Climacteris picumnus		particularly dry open woodland and forest with an abundance of tree hollows. Woodland habitat within the study area offers suitable breeding, foraging, roosting and dispersal habitat for this species.
Grey-headed Flying-fox Pteropus poliocephalus	Listed as Vulnerable under the EPBC Act Listed as Vulnerable under the FFG Act	No camps recorded within the Sections 8, 9 or 10 area but wide-ranging species may forage within the assessment corridor on occasion. Given the nearby resources, surrounding intact vegetation and camp located near Nathalia approximately 20 kilometres to the east of the study area, the species may use the study area for occasional foraging resources.
Trout Cod Maccullochella macquariensis	Listed as Endangered under the EPBC Act Listed as Endangered under the FFG Act	Major water courses across all sections including the Murray and Campaspe River, Broken Creek and Deep Creek.
Murray Cod Maccullochella peelii	Listed as Vulnerable under the EPBC Act Listed as Endangered under the FFG Act	Major water courses across all sections including the Murray and Campaspe River, Broken Creek and Deep Creek.
Silver Perch Bidyanus bidyanus	Listed as Critically Endangered under the EPBC Act Listed as Endangered under the FFG Act	Major water courses across all sections including the Murray and Campaspe River, Broken Creek and Deep Creek.
Diamond Dove Geopelia cuneata	Listed as Vulnerable under the FFG Act	Woodlands throughout all sections provide suitable breeding, foraging, roosting and dispersal habitat for this species.
Bush Stone- curlew <i>Burhinus</i> grallarius	Listed as Critically Endangered under the FFG Act	Across the entire assessment corridor in areas with a grassy understorey in open woodland with River Red-gum or Grey Box canopy. May be an occasional visitor to the study area though the species is rare in Victoria and pairs occupy large home ranges up to 25 hectares. Suitable roosting and foraging habitat is present within the study area in grassy open woodland.
Brolga Grus rubicunda	Listed as Vulnerable under the FFG Act	Flooded riparian habitats in Section 8. May provide occasional foraging or dispersal habitat given availability of wetland habitat in the surrounding landscape, however the study area is unlikely to provide regular roosting or breeding habitat.
Little Egret Egretta garzetta	Listed as Endangered under the FFG Act	Flooded riparian habitats across entire assessment corridor for foraging, roosting and breeding. Species breeds in wetlands within the surrounding landscape, and nests colonially in mixed flock conspicuous heronries in trees over wetlands
Plumed Egret Ardea intermedia plumifera	Listed as Critically Endangered under the FFG Act	Flooded riparian habitats and along Murray River, particularly in Sections 9, 10 and 11. Species breeds in wetlands within the surrounding landscape, and nests colonially in mixed flock conspicuous heronries in trees over wetlands.



Species name	Listing status	Area of value within the study area
Eastern Great Egret <i>Ardea</i> alba modesta	Listed as Vulnerable under the FFG Act	Flooded riparian habitats across entire assessment corridor. Species breeds in wetlands within the surrounding landscape, and nests colonially in mixed flock conspicuous heronries in trees over wetlands.
Little Eagle Hieraaetus morphnoides	Listed as Vulnerable under the FFG Act	Could forage within and over the entire assessment corridor. May roost or nest within large trees within and nearby the study areas.
White-bellied Sea-Eagle Haliaeetus Ieucogaster	Listed as Endangered under the FFG Act	Could forage within and over the entire assessment corridor. May roost or nest within large trees along the Murray River within and nearby the study area. Pairs build and maintain large conspicuous stick nests typically high up in tall trees, which are often used for successive breeding seasons.
Square-tailed Kite Lophoictinia isura	Listed as Vulnerable under the FFG Act	Foraging habitat throughout Section 11. May nest or breed within large trees along watercourses within or nearby the study area.
Black Falcon Falco subniger	Listed as Critically Endangered under the FFG Act	Foraging habitat throughout Sections 9 10 and 11. May nest or breed within large trees along watercourses within or nearby the study area.
Barking Owl Ninox connivens	Listed as Critically Endangered under the FFG Act	Could forage within and over the assessment corridor, particularly in Sections 9, 10 and 11. May utilise large trees within the study area for roosting, and requires large hollows for nesting.
Powerful Owl <i>Ninox strenua</i>	Listed as Vulnerable under the FFG Act	Could forage within and over the assessment corridor, particularly in Section 8. May utilise large trees within the study area for roosting, and requires large hollows for nesting.
Grey-crowned Babbler Pomatostomus temporalis	Listed as Vulnerable under the FFG Act	Woodlands throughout entire assessment corridor. Species is likely to roost and breed within box-dominated woodland habitat.
Squirrel Glider Petaurus norfolcensis	Listed as Vulnerable under the FFG Act	Woodlands throughout entire assessment corridor for for foraging and dispersal, and likely to utilise hollows for nesting.
Platypus Ornithorhynchus anatinus	Listed as Vulnerable under the FFG Act	Major water courses across all sections including the Murray and Campaspe River, Broken Creek and Deep Creek.
Bearded Dragon <i>Pogona</i> barbata	Listed as Vulnerable under the FFG Act	Individuals may be resident within Black Box dominated woodlands throughout Section 9 and 11.
Lace Monitor <i>Varanus varius</i>	Listed as Endangered under the FFG Act	Individuals likely to utilise woodlands throughout entire assessment corridor. Individuals likely to utilise tree hollows, branches, hollow logs or burrows for shelter. Hunts both terrestrially and arboreally and lays eggs in termite mounds.
Broad-shelled Turtle <i>Chelodina</i> <i>expansa</i>	Listed as Endangered under the FFG Act	Major water courses across all sections including the Murray and Campaspe River, Broken Creek and Deep Creek.



Species name	Listing status	Area of value within the study area
Murray River Turtle <i>Emydura</i> <i>macquarii</i>	Listed as Critically Endangered under the FFG Act	Major water courses across all sections including the Murray and Campaspe River, Broken Creek and Deep Creek.
Carpet Python Morelia spilota metcalfei	Listed as Endangered under the FFG Act	Woodlands and riparian habitat throughout entire assessment corridor.
Murray-Darling Rainbowfish Melanotaenia fluviatilis	Listed as Endangered under the FFG Act	Major water courses across all sections including the Murray and Campaspe River, Broken Creek and Deep Creek
Freshwater Catfish Tandanus tandanus	Listed as Endangered under the FFG Act	Major water courses including the Murray River and Broken Creek, particularly in Section 8 and 11.
Murray Spiny Crayfish <i>Euastacus</i> armatus	Listed as threatened under the FFG Act	Likely to occur within Murray River and utilising riverbanks along Section 9, 10 and 11.

3.3.3 Sloane's Froglet targeted survey and nocturnal survey

Sloane's Froglet is a small ground-dwelling frog that superficially resembles other common species of *Crinia*. The species can be distinguished by the distinctive male call (OEH 2017).

Sloane's Froglet historical distribution includes north central Victoria through central western NSW to the Queensland border (Knight 2013, 2014, OEH 2017). Although historically infrequently recorded throughout its range, the species is considered to have undergone a population contraction in recent years. A number of factors have been attributed to this decline, which include habitat modification and reduction via agricultural and residential development (OEH 2017), predation by introduced fish (Knight 2014) and possibly the amphibian disease chytridiomycosis caused by the pathogen *Batrachochytrium dendrobatidis* (chytrid fungus) (OEH 2017).

The life cycle of Sloane's Froglet is poorly understood but the breeding season is typically thought to commence in mid-April throughout winter and into spring, with eggs being deposited on submerged vegetation and metamorphosis observed in spring (Knight 2014). Tadpoles are thought to take 11 weeks to reach metamorphosis but this may vary depending on water temperature (Anstis 2007).

No Sloane's Froglet were recorded during targeted surveys across the study area (Section 8, 10 and 11). The species has a distinctive call and males commonly exhibit a strong response to call playback. This method was used across four survey nights in an attempt to elicit a response from any males which may have been present, however no response was detected. During surveys, much of the potential habitat found to be present during the initial fauna assessment had been heavily flooded, and would provide limited habitat for depositing eggs.

During the nocturnal survey, four non-threatened frog species were recorded within the assessment corridor including Pobblebonk Frog *Limnodynastes dumerilii dumerilii*, Common Froglet *Crinia signifera*, Eastern Signbearing Froglet *Crinia parinsignifera* and Spotted Marsh Frog *Limnodynastes tasmaniensis*. Adjacent to the assessment corridor, Common Spadefoot Toad *Neobatrachus sudellae* was also recorded. Common Brushtail Possum *Trichosurus vulpecula* was recorded throughout Section 8, which is not listed as threatened.



Based on the results of the targeted survey it is considered that Sloane's Froglet has a low likelihood of occurrence within the assessment corridor. No males were heard calling in potential habitat within the assessment corridor or search area, despite males being heard calling at Wangaratta Common Nature Conservation Reserve reference site one week prior to the targeted survey (indicating the survey was conducted within the species' calling period). The species was also noted to be calling at Corowa (NSW) and Rutherglen (Victoria) reference sites during mid to late August 2022. Given that vegetation and potential Sloane's habitat (soaks, permanent and semi-permanent pools and seasonally wet drainage lines) will be retained within the assessment corridor, any potential habitat for this species will be protected from indirect impacts associated with the trail development.

3.4 Threatened ecological communities

Seven EPBC Act listed threatened ecological communities are predicted to occur within 5 kilometres of the study area (Appendix 2, Table A2.3):

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions (Endangered)
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Endangered)
- Natural Grasslands of the Murray Valley Plains (Critically Endangered)
- Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions (Critically Endangered)
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Critically Endangered)
- Weeping Myall Woodlands (Endangered)
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered).

Four FFG Act listed threatened ecological communities are predicted to occur within 5 kilometres of the study area:

- Northern Plains Grassland Community.
- Semi-arid Shrubby Pine-Buloke Woodland Community.
- Victorian Temperate Woodland Bird Community.
- Lowland Riverine Fish Community.

Vegetation within Section 8 to 11 was assessed against the descriptions and requirements for each of the EPBC and FFG Act listed ecological communities.

The dominant canopy species within the assessment corridor of Section 8 is River Red-gum and does not meet the descriptions of any of the above EPBC or FFG Act listed ecological communities.

The Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia community occurs in the Riverina IBRA bioregion of Victoria. The community can occur in a woodland and a grassland form. The woodland form has a tree canopy that is dominated or co-dominated by Grey Box. Shrub density and diversity varies greatly. The ground layer has a large grassy or grass-like component often with additional herbaceous species or chenopods. The key diagnostic criteria and condition thresholds for the community outline minimum patch size, native cover and diversity, and maximum weed cover thresholds for an area to be considered part of this community. Within Sections 9 to 11, some areas of



Plains Woodland EVC 803 are dominated by Grey Box. Although no comprehensive determination using the community flowchart (DSEWPaC 2012) was completed as part of this assessment (outside scope), these areas are likely to meet the community thresholds for extent and condition given their size, relatively intact state and the low cover of non-grass weeds observed. The areas of EVC 803 that are highly likely to be the EPBC Act listed community are shown in Figure 2 (Appendix 1). These areas typically have a sparse to moderately dense shrub cover including species such as Gold-dust Wattle *Acacia acinacea*. The ground layer is dominated by Common Wheat-grass *Anthosachne scabra*, Spear Grasses *Austrostipa* spp., Wallaby Grasses *Rytidosperma* spp. and herbs including Nodding Saltbush *Einadia nutans*.

Where Grey Box was not the dominant canopy species, for example where it was co-dominant or subdominant with Black Box *E. largiflorens* and/or River Red-gum *E. camaldulensis*, these areas were not considered to be part of the threatened community.

Two FFG Act threatened ecological communities are considered likely to occur within the study area: the Lowland Riverine Fish Community of the Southern Murray-Darling Basin and the Victorian Temperate Woodland Bird Community. The Lowland Riverine Fish Community is likely to occur in the study area, but assessment of aquatic fauna values was beyond the scope of this report. This community is characterised by a suite of native fish species associated with the Murray River and its tributaries in Victoria, many of which are declining across their range. A number of threatened species associated with this community were assessed in this report as likely to occur in the waterways within or adjacent to the study area. The combined likelihood of occurrence of these fish species and geographical context of the study area has been used to inform the likelihood of occurrence of the Lowland Riverine Fish Community of the Southern Murray-Darling Basin.

Additionally, the assessment corridor supports habitat for some species that are part of the FFG Act listed Victorian Temperate Woodland Bird community, which is likely to be present within the assessment corridor. The Victorian Temperate Woodland Bird community is characterised by a selection of bird species occurring in drier woodlands that are declining across their primary range (DEECA 2023). This community is typical of the River Red-gum and box-dominated drier woodlands in northern Victoria. Five of the 24 species in this group were recorded during the field assessment, including Brown Treecreeper, Diamond Firetail, Western Gerygone *Gerygone fusca*, Jacky Winter *Microeca fascinans* and Red-capped Robin *Petroica goodenovii*.

No other threatened ecological communities were identified within the assessment corridor.

3.5 Threatening processes

The following threatening processes are listed to inform consideration of cumulative impacts or exacerbation of existing threats in the landscape. Many of these threatening processes are already operating in the study area and surrounding public land but will need to be considered during project planning, especially processes that are likely to lead to the spread of weeds and pathogens, and cause habitat fragmentation.

3.5.1 EPBC key threatening processes

Key threatening processes listed under the EPBC Act (DAWE 2021a) that are either already present or likely to be present within the study area are:

- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*)
- Competition and land degradation by rabbits
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis



- Land clearance
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Novel biota and their impact on biodiversity
- Predation by European red fox
- Predation by feral cats
- Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs.

3.5.2 FFG threatening processes

Potentially threatening processes, as defined in the FFG *Processes List* (DELWP 2016), that are either already present or likely to be present within the study area and surrounds are summarised below:

- Alteration to the natural flow regimes of rivers and streams
- Degradation and loss of habitats caused by feral Horses (Equus caballus)
- Degradation of native riparian vegetation along Victorian rivers and streams
- Habitat fragmentation as a threatening process for fauna in Victoria
- Increase in sediment input into Victorian rivers and streams due to human activities
- Infection of amphibians with Chytrid Fungus, resulting in chytridiomycosis
- Input of toxic substances into Victorian rivers and streams
- Invasion of native vegetation by Blackberry Rubus fruticosus L. agg
- Invasion of native vegetation by 'environmental weeds'
- Loss of coarse woody debris from Victorian native forests and woodlands
- Loss of hollow-bearing trees from Victorian native forests
- Predation of native wildlife by the cat *Felis catus*
- Predation of native wildlife by the introduced Red Fox Vulpes vulpes
- Prevention of passage of aquatic biota as a result of the presence of instream structures
- Reduction in biodiversity of native vegetation by Sambar Cervus unicolor
- Reduction in biodiversity resulting from Noisy Miner (Manorina melanocephala) populations in Victoria
- Reduction in biomass and biodiversity of native vegetation through grazing by the Rabbit *Oryctolagus cuniculus*
- Removal of wood debris from Victorian streams
- Threats to native flora and fauna arising from the use by the feral honeybee *Apis mellifera* of nesting hollows and floral resources
- Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing.



3.6 Ramsar wetlands

A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention and is considered a Matter of National Environmental Significance (MNES) under the EPBC Act.

- Section 8 is within the Barmah Forest Ramsar site and is immediately adjacent to the NSW Central Murray State Forests Ramsar site.
- Section 10 and 11 are within the Gunbower Forest Ramsar site and are immediately adjacent to and upstream of the NSW Central Murray State Forests Ramsar site.

The Barmah Forest Ramsar site is located in northern Victoria over an extensive area on the Murray River flood plain north and north-west of Barmah, and is characterised by River Red-gum forest which undergoes periodic inundation (Hale & Butcher 2011a). The site forms part of the largest River Red-gum forest in Victoria and includes a series of permanent and temporary wetlands, providing important habitat for a diverse bird assemblage. Majority of the wetlands within the Barmah Forest Ramsar site are classified as freshwater, tree-dominated wetlands. A significant abundance of waterbirds and waders are dependent on the Ramsar site, which is considered to be one of Victoria's largest waterbird breeding areas (Hale & Butcher 2011a).

The Gunbower Forest Ramsar site is located on the Murray River floodplain between Torrumbarry and Koondrook, and is a similar River Red-gum dominated forest which undergoes periodic flooding (Hale & Butcher 2011b). The Ramsar site incorporates various temporary and permanent wetlands which support many wetland-dependent flora and fauna, including important breeding habitat for waterbirds and waders.

The key ecological values of the Barmah Forest and Gunbower Forest Ramsar sites are summarised as:

- Significant extents of tree-dominated floodplain wetlands, which are one of the best representatives of this wetland type in the bioregion and forms part of the largest continuous River Red-gum stand.
- Supports a highly diverse and abundant assemblage of native flora and fauna, including at least seven (Barmah Forest) or five (Gunbower Forest) threatened wetland dependant species.
- Provides important breeding habitat for native waterbirds, frogs and fish.
- Facilitates migratory movements between habitat throughout the Murray Darling floodplains for fish spawning and recruitment.

3.7 Weeds, pest animals and pathogens

3.7.1 Noxious weeds

Noxious weeds are introduced plants which are listed under the CaLP Act and classified by region in accordance with the level of action required to control or prevent their spread. There are four categories of noxious weed; state prohibited, regionally prohibited, regionally controlled and restricted. Landowners have legal responsibilities to take action on noxious weeds, depending on their classification in the region. Table 6 presents the noxious weeds recorded in the VBA database within a 5 kilometre buffered search of the trail alignment.

Table 6 No	xious weeds recorded	within search area
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Classification	Species	Legal responsibility (CaLP Act)
State Prohibited	• Alkali Sida Malvella leprosa (S9)	Agriculture Victoria is responsible for these species on all land in Victoria.



Classification	Species	Legal responsibility (CaLP Act)
	Camel Thorn Alhagi maurorum (S11)	
Regionally	• Artichoke Thistle <i>Cynara cardunculus</i> subsp.	Landowners, including public authorities
Prohibited	<i>flavescens</i>Scotch Thistle <i>Onopordum acanthium</i> subsp. <i>acanthium</i>	responsible for crown land management, must take all reasonable steps to eradicate regionally prohibited weeds on their land.
Regionally Controlled	 Khaki Weed Alternanthera pungens (S9, 10) Hairy fiddle-neck Amsinckia calycina (S9,10) Common Fiddle-neck Amsinckia intermedia (S9) Saffron Thistle Carthamus lanatus (S9) Spiny Burr-grass Cenchrus longispinus (S9, 10) Hawthorn Crataegus monogyna (S9) Recurved Thorn-apple Datura inoxia (S11) Common Thorn-apple Datura stramonium (S9, 10, 11) Paterson's Curse Echium plantagineum (S9, 10, 11) Montpellier Broom Genista monspessulana (S9) St John's Wort Hypericum perforatum subsp. veronense (S9, 10, 11) African Box-thorn Lycium ferocissimum (S9, 10, 11) Horehound Marrubium vulgare (S8, 9, 10, 11) Common Prickly Pear Opuntia stricta (S9, 10) Sticky Ground-cherry Physalis hederifolia (S11) Creeping Knapweed Rhaponticum repens (S11) Yellow-flower Devil's-claw Proboscidea lutea (S9) Sweet Briar Rosa rubiginosa (S9, 10, 11) Blackberry Rubus anglocandicans (S9, 10, 11) Variegated Thistle Silybum marianum (S9) Silver-leaf nightshade Solanum elaeagnifolium (S9) 10, 11) Buffalo Buff Solanum rostratum (S9) Caltrop Tribulus terrestris (S9, 10, 11) Gorse Ulex europaeus (S10) Bathurst Burr Xanthium spinosum (S9, 10, 11) Noogoora Burr Xanthium strumarium (S9, 10, 11) 	Landowners have a responsibility to take all reasonable steps to prevent the growth and spread of these weeds on their land.
Restricted	 Bridal Creeper Asparagus asparagoides (S9, 10, 11) Asparagus Fern Asparagus scandens (S9, 10) Winged Slender-thistle Carduus tenuiflorus (S10, 11) Saffron Thistle Carthamus lanatus (S10, 11) Skeleton Weed Chondrilla juncea (S9, 10, 11) Spear Thistle Cirsium vulgare (S8, 9, 10, 11) 	Trade in these weeds and their propagules, either as plants, seeds or contaminants in other materials is prohibited.



Classification	Species	Legal responsibility (CaLP Act)
Classification	 Hemlock Conium maculatum (S11) Common Bindweed Convolvulus arvensis (S10, 11) Hawthorn Crataegus monogyna (S10) Field Dodder Cuscuta campestris (S11) Stinkwort Dittrichia graveolens (S9, 10, 11) Fennel Foeniculum vulgare (S9, 10, 11) Montpellier Broom Genista monspessulana (S10, 11) Riverina Pear Opuntia elata (S11) Hoary Cress Lepidium draba (S10) Stemless Thistle Onopordum acaulon (S10) Prickly Pear Opuntia spp. (S9, 10, 11) Soursob Oxalis pes-caprae (S9, 10, 11) Variegated Thistle Silybum marianum (S10, 11) Buffalo Burr Solanum rostratum (S10) Great Mullein Verbascum thapsus subsp. 	Legal responsibility (CaLP Act)
	thapsus (S11)Crack Willow Salix X fragilis (S9)	

** Where the above species are listed differently in GBCMA and NCCMA, the weed has been included in the higher category.

In addition to any species listed in Table 6 above that were recorded in the assessment corridor, the following woody or environmental weeds have been included in Figure 2 (Appendix 1) due to being considered important as a management priority:

- Montpellier Broom *Genista monspessulana* (S9)
- Queensland Silver Wattle *Acacia podalyriifolia* (S9, 10)
- Agapanthus praecox (S9, 10)
- Cootamundra Wattle Acacia baileyana (S9, 10)
- Cotoneaster spp. (S9, 10)
- Daisies *Dimorphotheca* spp. (S9, 10)
- European Olive Olea europaea (S9, 10)
- Aloe Aloe spp. (S10)
- Desert Ash *Fraxinus angustifolia* (S10)
- Date Palm Phoenix canariensis (S10)
- Sweet Pittosporum Pittosporum undulatum (S10)
- Madeira Winter-cherry Solanum pseudocapsicum (S11).

Relating to Section 8, the Barmah National Park & Ramsar Site Pest Plant and Animal Strategy identifies 26 priority 1 weeds i.e. weeds of the highest importance to treat (Ecology Australia 2013). Of these weeds, Horehound was recorded in the assessment corridor in Sections 8 to 11. Additional species may be present but were not recorded due to species dormancy or due to being inundated at the time of assessment. Of



priority 1 weeds (Ecology Australia 2013) and those recorded during the site assessment, the following are considered highest threat due to their means of spread and invasion pathway:

• Horehound *Marrubium vulgare* – occurred in scattered patches throughout the Section 8 to 11 assessment corridor.

Carpetweed *Aizoon pubescens* – an isolated occurrence was identified on Sand Ridge north of the Dharnya Centre (Section 8), which could be controlled if tackled quickly (Figure 2). This species is noted as a seriously invasive species regionally on the floodplain of the Murray River (Ecology Australia 2013).

The River Red Gum Parks Management Plan specifies control of the following emerging and new terrestrial weeds as a management priority for the area: Chilean Needle-grass, *Aizoon pubescens* (Carpetweed), Thornapple, Willows and Buffel Grass. Priority aquatic weeds include Arrowhead and Cabomba (Parks Victoria 2018).

Relating to Sections 10 and 11, the Gunbower Forest Ramsar Site Strategic Management Plan mentions the following terrestrial weeds are present in Gunbower: Blackberry, Sweet Briar, Prairie Ground Cherry (*Physalis hederifolia*), Paterson's Curse, Bathurst Burr, Noogoora Burr, African Box-thorn and Horehound (DSE 2003). Blackberry and African Box-thorn are of concern due to their displacing waterbird habitat by outcompeting native vegetation. Noogoora Burr exists on the flood-prone areas along the Murray River and its associated tributaries. It is of concern due to its extensive root system and growth rate reducing opportunities for native flora regeneration (DSE 2003).

Weed control and monitoring should focus on the highest traffic areas e.g. Sand Ridge Track between Rice's Bridge north to the Dharnya Centre (Section 8), northern and southern entrances to Gunbower National Park (Sections 10 and 11), Masters Landing (Section 11) and east of Echuca (Section 9) where woody weeds and garden escapes could be transported into the River Murray Reserve, proposed Murray River Park and Lower Goulburn National Park.

3.7.2 Pest Animals

Six declared pest animals under the CaLP Act were recorded in the VBA database within a 5 kilometre buffered search of the trail alignment. These include:

- Domestic Cat (feral)
- House Mouse Mus musculus
- European Rabbit Oryctolagus cuniculus
- European Brown Hare Lepus europaeus
- Pig (feral) Sus scrofa
- Red Fox

Pest animal threats have been identified and prioritised in the Barmah National Park and Ramsar Site Pest Plant and Animal Strategy (Ecology Australia 2013), and pest animal control programs are active within the Barmah National Park.

In addition to the above, feral horses are known to cause significant damage to the ecological values of Barmah National Park (Parks Victoria 2020), and the degradation and loss of habitats caused by feral horses was declared a threatening process under the FFG Act in 2011.



3.7.3 Pathogens

Pathogenic disease detrimental to fauna may be introduced to the study area including Chytridiomycosis *Batrachochytrium dendrobatidis* (detrimental to frogs) and Sarcoptic Mange. These pathogens are introduced via mud and soil debris on vehicle, plant, machinery and footwear and through feral animals respectively.

3.8 Further survey recommendations

Fauna

Most impacts associated with project works will occur within existing informal trails and campsites that are relatively well-defined and do not provide significant habitat for most waterbirds outside of flood-induced bird breeding opportunities. It is reasonable to expect that no construction activities will occur during flooding or nesting periods, hence risk of direct impact on waterbirds is low. Trails and campsites are also likely to be inundated and closed during such flood events so disturbance to waterbird nesting activity is also likely to be low.

Direct impacts including injury and mortality may occur if any sedentary threatened fauna species are present within the construction footprint. Due to identification of suitable habitat and the sedentary nature of the species, a targeted survey for the threatened Sloane's Froglet Crinia sloanei was recommended. The full results of this survey are included in Section 3.3.3. A targeted survey for Sloane's Froglet Crinia sloanei was recommended within Section 8 following the initial identification of suitable habitat during the general field assessment. However, much of the suitable habitat that was intended for survey within Section 8 was inundated at the time of targeted survey (week beginning 22 August 2022). This made much of the previously identified suitable habitat within Section 8 inaccessible. Additionally, the suitability of habitat was reconsidered and deemed unsuitable due to the risk of predation by fish making the area unsuitable for egg deposition. In light of this, targeted survey effort was redirected to potential suitable habitat within Sections 10 and 11, concurrently with the general fauna survey for these sections. Additional sites were also identified in the project area, assessed for potential habitat and then surveyed to help inform the likelihood of occurrence assessment for Sloane's Froglet within the assessment corridor. Following completion of the targeted surveys it is considered that Sloane's Froglet has a low likelihood of occurrence within the assessment corridor. No other sedentary threatened fauna species are considered likely to occur within the assessment corridor.

All resident fauna species may experience indirect impacts including noise, vibration and increased metabolic activity during construction resulting from increased traffic and machinery in the area. The presence of people and equipment along the construction corridor is most likely to result in wildlife temporarily moving away from the works area, if capable. However, these impacts are short term in nature (weeks to several months) and this does not warrant recommendation for targeted survey.

The arboricultural assessment has confirmed that impacts on adjacent canopy trees are unlikely to occur during trail construction, provided the alignment avoids structural root zones as far as practicable. On this basis, canopy dependent species in areas of existing informal trails are unlikely to suffer significant direct impacts from construction works. Targeted survey for species that commonly utilise hollows such as Squirrel Glider *Petaurus norfolcensis* and Barking Owl *Ninox connivens* in these areas is not recommended as minimal impacts on large hollow-bearing trees will occur from the trail construction (Appendix 9).

Most of the threatened fauna considered to have a medium or greater likelihood of occurrence are species that are either known to occur regularly within local area, are relatively efficient dispersers or do not have habitat that is likely to be directly impacted by trail construction. The benefit of undertaking targeted survey for these species is minimal as the outcomes of the survey would not lead to tangible benefits either in



developing avoidance and mitigation measures or gathering required information for future referrals or approvals. As such we recommend that a more effective use of resources is to develop sound construction practices including micro-siting to avoid key habitat features, protection of hollow-bearing trees and construction oversight to ensure that impacts from trail construction and operation are kept to a minimum.

Many threatened and common waterbird species nest colonially in large flocks, including egrets, herons, ibis and spoonbills. Colonial nesting waterbirds in the Murray–Darling Basin breed periodically and are dependent on flooding events to provide sufficient water levels for breeding. Relevant important wetlands which facilitate waterbird breeding includes the Barmah-Millawa site, and Gunbower-Koondrook-Pericoota site (Murray–Darling Basin Authority 2017). Long-term data exists for important waterbird breeding sites in the Murray–Darling Basin which are monitored by government authorities and their partners. Targeted waterbird surveys are not recommended due to the scale of proposed impacts, as well as the difficulty of disproving their presence even with targeted survey, as habitat suitability is driven by seasonal and climactic changes, and water management regimes.

Flora

Threatened flora have a higher chance of being directly impacted during trail and campsite construction due the sedentary nature of flora species. It is worth noting, however, that the areas of proposed works generally occur within existing disturbed areas and consequently the habitat in these areas is degraded.

The broad habitat preferences of some species means they have extensive available habitat across the assessment corridor, or Sections of it (e.g. Fuzzy New Holland Daisy, Late-flower Flax-lily and Small-leaf Bluebush), while for others habitat is more restricted (e.g. River Swamp Wallaby-grass, Turnip Copperburr, *Swainsona* spp.).

The risk of significantly impacting threatened flora can generally be reduced through a combination of detailed assessment and design response. Detailed assessment to characterise the vegetation types, conditions and levels of disturbance along the alignment have been completed. From these surveys, suitability of habitat for threatened species can be inferred. Proposed construction of the new trail is generally aligned with existing informal trails. The construction corridor will be up to 2.5 metres wide, however, as this is aligned with existing informal trails wherever possible, the realised width of vegetation loss will be lower across much of the proposed removal footprint.

If any threatened species do occur within the proposed construction footprint, it is considered unlikely that they occur in ecologically significant numbers. The project is considered unlikely to have the capacity to significantly impact on any threatened species if any individuals do occur within the construction footprint. Whilst the risk of significant impact is considered low, further assessments could include pre-construction micro-siting through areas of highest habitat value for threatened species, e.g. where threatened species or high quality vegetation/habitat was recorded previously. This process would allow trail construction to further reduce/avoid impacts on threatened and protected flora. Where trail construction is unable to avoid threatened flora, accurate counts can be determined for a FFG Protected flora removal permit application.



4 Biodiversity legislation and government policy

This section provides an assessment of the project in relation to key biodiversity legislation and government policy. It does not describe the legislation and policy in detail. Where available, links to further information are provided.

4.1 Commonwealth

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act.

Further information including a guide to the referral process is available at <u>http://www.environment.gov.au/epbc/index.html</u>

The MNES relevant to the project are summarised in Table 7. It includes an assessment against the EPBC Act policy statements published by the Australian Government which provide guidance on the practical application of EPBC Act.

MNES	Project specifics	Assessment against significant impact guidelines
EPBC Act listed species	16 EPBC Act listed flora and 36 EPBC Act listed fauna species are recorded or predicted to occur in the project search area. The likelihood of these species occurring in the study area is assessed in Appendix 3 (flora) and Appendix 4 (fauna).	The following species have been recorded or are considered to have a medium or greater likelihood of occurring within the assessment corridor. Flora River Swamp Wallaby-grass Mueller Daisy Winged Peppercress Ridged Water-milfoil Floodplain Rustyhood Turnip Copperburr Stiff Groundsel Slender Darling-pea Red Swainson-pea The distribution of Mueller Daisy lies generally to the east of the MRAT study area. It has been assessed as having a medium likelihood of occurrence within Section 8 study area where there are previous records of the species, however is considered unlikely to occur in Sections 9, 10 or 11. Within the proposed impact areas in Section 8 (the Gulf campsite and the Day Visitor canoe launch), the species is unlikely to occur given the highly disturbed nature of these locations. A significant impact assessment for this species has not been completed.

Table 7Assessment of project in relation to the EPBC Act



MNES	Project specifics	Assessment against significant impact guidelines
		The closest known Winged Peppercress population is within Gunbower State Forest approximately 2 km from the Section 11 alignment. These records are mostly within Riverine Grassy Woodland EVC 295. The species is considered to have a medium likelihood of occurrence within the Section 11 study area, however is considered unlikely to occur within Section 8, 9 or 10. The proposed construction areas within Section 11 do not support suitable habitat for this species. A significant impact assessment for this species has not been completed.
		Ridged Water-milfoil has extensively suitable habitat within Section 8, as well as in ephemeral channels within Lower Goulburn National Park (Section 9). The species is considered to have a medium likelihood of occurrence within the study area in these sections, however is considered unlikely to occur within Section 10 or 11. The proposed construction areas across Sections 8 and 9 do not support suitable habitat for this species. A significant impact assessment for this species has not been completed.
		The distribution of Floodplain Rustyhood generally lies south-west of the MRAT study area. It has been assessed as having a medium likelihood of occurrence in Section 11, where is has been previously recorded within Gunbower State Forest. However, the species is considered unlikely to occur in sections 8, 9 or 10. Within the proposed impact areas in Section 11 (Yarran Creek, Nursery Bend, Broken River Bend and Masters Landing campsites) the species is unlikely to occur given the highly disturbed nature of these locations. A significant impact assessment for this species has not been completed.
		Assessments against the Significant Impact Criteria (DoE 2013) have been prepared for the other five flora species listed above (Appendix 6.1).
		Fauna
		Superb Parrot
		Swift Parrot
		White-throated Needletail
		Hooded Robin
		Diamond Firetail
		Brown Treecreeper
		Grey-headed Flying-fox
		Trout Cod
		Murray CodSilver Perch
		Impacts on White-throated Needletail will be avoided as this species is unlikely to utilise terrestrial habitats impacted by proposed works.



MNES	Project specifics	Assessment against significant impact guidelines
		Assessments against the Significant Impact Criteria (DoE 2013) have been prepared for other fauna species listed above (Appendix 6.2). It is considered unlikely that the proposed impacts will result in a significant impact on threatened fauna, providing that suitable mitigation measures are implemented as per Section 5.
EPBC Act listed ecological communities	Seven EPBC Act listed ecological communities are recorded or predicted to occur in the project search area.	The Grey Box Grassy Woodlands ecological community was recorded in the study area during the assessment. An assessment against the Significant Impact Criteria (DoE 2013) is provided in Appendix 6.3. None of the other communities is present within the assessment corridor.
Migratory species	Sixteen migratory species are recorded or predicted to occur in the project search area (Appendix 4).	While some of these species would be expected to use the study area on occasions, and some of them may do so regularly or may be resident, it does not provide important habitat for an ecologically significant proportion of any of these species. Further explanation is provided in Section 5.5.
Wetlands of international importance (Ramsar sites)	The study area is identified as being within the catchment of eight Ramsar sites: Banrock Station Wetland Complex, Barmah Forest, Gunbower Forest, Hattah-Kulkyne Lakes, Kerang Wetlands, NSW Central Murray State Forests, Riverland and The Coorong, and Lakes Alexandrina and Albert Wetland.	The study area passes through and drains directly into the Barmah Forest, Gunbower Forest, and NSW Central Murray State Forests Ramsar sites. In the context of Barmah Forest, Forest Gunbower and the adjacent NSW Central Murray State Forests Ramsar site and the habitats they provide, risk of impacts from construction work is unlikely to impact on the ecological character provided the mitigation measures outlined in Section 5 are adhered to.

On the basis of criteria outlined in the relevant Significant Impact Guidelines (DoE 2013) it is considered unlikely that a significant impact on a MNES would result from the proposed action (see Appendix 6). Referral of the proposed action to the Australian Government Minister for the Environment to determine whether the action requires approval under the EPBC Act is therefore unlikely to be required, though Parks Victoria may choose to refer the project for legal certainty.

4.2 State

4.2.1 Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act is a key piece of Victorian legislation on the conservation of threatened species and communities and on the management of potentially threatening processes. Under the Act a permit is required from DEECA to 'take' protected flora species. Permit exemptions under the Act generally apply to the non-commercial removal of protected flora from private land, unless there is 'critical habitat' that has been declared on the land. Authorisation under the Act is required to collect, kill, injure or disturb listed fish on private or public land.



Link for further information: <u>https://www.environment.vic.gov.au/conserving-threatened-species/victorias-framework-for-conserving-threatened-species</u>

The FFG Act defines public land as Crown land or land owned by, or vested in, a public authority, while private land is defined as any land other than public land. A public authority is defined in the FFG Act as a body established for a public purpose by or under any Act and includes:

- an administrative office
- a government department
- a municipal council
- a public entity
- a State-owned enterprise.

The study area is on Crown Land or land owned by or vested in a public authority and is therefore public land for the purposes of the FFG Act. Many protected flora species, seven threatened flora, one threatened fauna and two communities are present (Appendix 3 and Appendix 4), and a protected flora permit from DEECA would be required if any of these species will be affected by the proposal. Consultation with DEECA is required regarding any impacts on FFG Act listed species and communities on public land.

In addition to the requirement for a protected flora permit, it is a requirement of the FFG Act that a public authority, in performing its functions, must consider the objectives of the FFG Act and the impact on biodiversity. Public authorities are also required to consider the Biodiversity 2037 targets (DELWP 2017c), action statements, critical habitat determinations and management plans made under the FFG Act.

A consideration of the public authority duty is included in Table 8 (DELWP 2021).



Impact on biodiversity	Response
Long and short-term impacts	 Short-term impacts that could arise from the proposed development include: Temporary noise disturbance during construction. Risk of entrapment of fauna within excavated areas during construction. Potential for death of individual fauna species during construction. Potential for indirect impacts during construction such as sediment run-off and erosion (although this will be managed by the project CEMP). Long-term impacts that could arise from the proposed development include: Reduction in extent and quality of available habitat through the proposed removal of 6.8 hectares of native vegetation and fauna habitat including eight large trees. Discussion of the value of the study area for threatened flora and fauna is provided in section 3.3, and the quality of native vegetation is outlined below in section 6.1. Increased levels of disturbance due to increased traffic and human presence in the area.
Beneficial and detrimental impacts	 Beneficial impacts include: Formalisation of a trail could reduce the levels of dispersed unauthorised traffic through the local area. Signage to promote awareness of the environment. Increased nature-based engagement. Detrimental impacts include: Removal of habitat. Potential for increased human presence within the area, particularly where facilities are constructed e.g. toilets.
Direct and indirect impacts	 Direct impacts include: Removal of habitat for FFG listed species and communities, as discussed in section 3.3 and 3.4. Indirect impacts include: Increased traffic and human presence in the area. Invasion of pest plants (although weed control measurements will be included in the project CEMP). Increased sediment run-off and erosion (although this will be managed by the project CEMP).
Cumulative impacts	No past removal by Parks Victoria on contiguous land is relevant to the project.
The impacts of potentially threatening processes	 Potentially threatening process already operating in the broader area (not specific to the project) include: Introduction of live fish into waters outside their natural range within a Victorian river catchment after 1770. Invasion of native vegetation by Blackberry <i>Rubus fruticosus</i> L. agg Invasion of native vegetation by 'environmental weeds'. Predation of native wildlife by the cat, <i>Felis catus</i>. Predation of native wildlife by the introduced Red Fox <i>Vulpes vulpes</i>. Prevention of passage of aquatic biota as a result of the presence of instream structures.

Table 8 Public authority duty consideration of impact on biodiversity (DELWP 2021)



Impact on biodiversity	Response
	 Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases. Reduction in biodiversity of native vegetation by Sambar (<i>Cervus unicolor</i>). Reduction in biomass and biodiversity of native vegetation through grazing by the Rabbit <i>Oryctolagus cuniculus</i>.

Results

Seven protected flora species and one threatened fauna species and habitat for two FFG Act threatened communities were recorded within the assessment corridor of MRAT during field assessments.

- Flora species:
 - Ausfeld's Wattle Acacia ausfeldii
 - One occurrence identified within the assessment corridor in Section 10 (within the River Murray Reserve, north of O'Dwyers Road).
 - Umbrella Wattle Acacia oswaldii
 - Two occurrences adjacent to the proposed alignment within Section 11. No construction is proposed in either area.
 - Buloke Allocasuarina luehmannii
 - A number of occurrences were identified within the assessment corridor in Sections 9 and 10. As a large woody species, the trail can be micro-sited to avoid direct removal of the species.
 - Late-flower Flax-lily Dianella tarda
 - One occurrence identified within the assessment corridor during 2022 (Section 9, just south of Barmah township). No construction is proposed in this area.
 - Waterbush *Myoporum montanum*
 - Two occurrences adjacent to the proposed alignment within Section 11. No construction is proposed in either area.
 - Riverina Fireweed Senecio longicollaris
 - One occurrence identified within the assessment corridor during 2022 (Section 9 east of Echuca). The alignment in this area has since moved and avoids this species.
- Fauna species:
 - Diamond Firetails were recorded within the project area.
 - An additional 30 FFG Act listed threatened fauna are considered likely to occur within the project area.
 - Further surveys are not required due to the high mobility of each species and the low likelihood of an impact, with the large extent of surrounding available habitat. Hollow-bearing trees will be avoided by construction techniques and the micro-siting location of trail.
- Habitat for the Lowland Riverine Fish Community and Victorian Woodland Birds community



 Understorey vegetation removal within a narrow corridor in the context of the surrounding available habitat of similar or higher quality unlikely to impact these communities providing the impact mitigation measures are adhered.

4.2.2 Catchment and Land Protection Act 1994 (CaLP Act)

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species.

Declared noxious weeds identified in the study area are listed in Appendix 3.1 and established pest animals are listed in Appendix 4.1.

Parks Victoria must take all reasonable steps to eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds, and prevent the spread of and as far as possible eradicate established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

Further information is at http://agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds

4.2.3 Planning and Environment Act 1987 (incl. Planning Schemes)

The *Planning and Environment Act 1987* controls the planning and development of land in Victoria, and provides for the development of planning schemes for all municipalities.

Of particular relevance to the development proposal are controls relating to the removal, destruction or lopping of native vegetation contained within the Moira, Campaspe and Gannawarra Planning Schemes, including permit requirements. The Schemes (Clause 73.01) define 'native vegetation' as 'Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses'. It is an objective of Clause 12.01-2 of the State Planning Policy Framework (Native Vegetation Management) that removal of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity.

Clause 52.17 (Native Vegetation) requires a planning permit to remove, destroy or lop native vegetation including some dead native vegetation subject to exemptions. As PV is the project proponent, where the land is managed by PV the Crown Land exemption under Clause 52.17-7 of the Victoria Planning Provisions could be used by PV. This exemption is implemented through DEECA's *Procedure for the removal destruction or lopping of native vegetation on Crown land* (DELWP 2018). In this scenario PV would need to comply with the procedure, and native vegetation offsets would not be required however counter balancing measures would need to be undertaken. Compliance with the procedure and compensatory measures would address the overarching state policy about no net loss of native vegetation.

While the Crown Land exemption can apply to the permit requirement under Clause 52.17, it does not apply under other planning scheme controls including the ESO within the Moira, Campaspe and Gannawarra planning schemes.

All areas of proposed vegetation removal are covered by an Environmental Significance Overlay – Schedule 2 (Murray River Corridor - Moira), Schedule 1 (Murray River Corridor - Campaspe) or Schedule 1 (Waterway Environs - Gannawarra).

Under clause 3 of ESO Schedule 1 in the Campaspe planning scheme, there is a permit exemption for... *the removal, destruction or lopping of vegetation for public works, including public roads and water authority works.* Therefore, a permit may not be required for vegetation removal within Campaspe LGA. The relevance of this exemption to the project should be discussed with Campaspe Shire.



A planning permit to remove, destroy or lop any vegetation (including dead vegetation) associated with the project is required under the Moria and Gannawarra planning schemes. Both the ESO schedules in the Gannawarra and Moira planning schemes include decision guidelines related to biodiversity impacts in addition to the decision guidelines of clause 42.01. The decision guidelines in the ESOs will inform the council's decision on the applications.

It is important to note that neither planning scheme identifies the Guidelines as relevant to assessment or decision making on the application. This is relevant to determining if offsets are required. Section 1.1 states that...*The Guidelines must not be applied in relation to the requirements and decision guidelines of these overlays, unless the overlay specifically states otherwise*. Our view is that the Guidelines will not apply to an application under the ESOs and no offsets are required.

However, a Guidelines assessment is required in order for the project to comply with the Crown land procedure. The procedure states that any works requiring the 'new removal of native vegetation' would require a detailed flora and fauna assessment which:

- Considers if the native vegetation removal impacts on important biodiversity values (see Section 3, Figure 2).
- Ensures native vegetation is removed to the minimum extent necessary (see Section 5).
- Records and documents the extent of native vegetation removal (see Section 6, Figure 4).

These requirements are addressed in this report. Native vegetation removal must also be counterbalanced with the corresponding actions specified under the Crown land procedure.

4.2.4 Environment Effects Act 1978

The *Environment Effects Act 1978* establishes a process to assess the environmental impacts of a project. If applicable, the Act requires that an Environment Effects Statement (EES) be prepared by the proponent. The EES is submitted to the Minister for Planning and enables them to assess the potential environmental effects of the proposed development.

The general objective of the assessment process is to provide for the transparent, integrated and timely assessment of the environmental effects of projects capable of having a significant effect on the environment (DTP 2023).

The eighth edition of the 'Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978*' (DTP 2023) provides a range of criteria that can be used to determine whether an EES may be required for a project. These criteria relate to individual potential environmental effects and a combination of (two or more) potential environmental effects.

An assessment of the project against the individual potential effects criteria and the combination of potential effects criteria is in Table 9. However, the guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning.

Table 9Assessment of the project against the individual and combined EES referral criteria
(DTP 2023)

EES referral criteria	Project impact and response
Individual types of effects	



EES referral criteria	Project impact and response
 Potential removal, destruction or lopping of 10 ha or more of native vegetation that consists of, or comprises a combination of: an Ecological Vegetation Class classified as endangered; an EVC that is classified as vulnerable (with a condition score of 0.5 or more) or rare (with a condition score of 0.6 or more); and that is not authorised for removal under an approved forest management plan or fire protection plan. 	 This criterion is not triggered as: While some of the proposed removal is within endangered or vulnerable EVCs, the total removal is less than 10 hectares (6.8 hectares). The project is not part of an approved forest management plan or fire protection plan in Victoria.
Potential clearing of an area determined as 'critical habitat' under the <i>Flora and Fauna</i> <i>Guarantee Act 1988</i> .	This criterion is not triggered by the project. No critical habitat is present within the study area.
Potential for loss of a significant proportion (e.g. 1 percent or greater) of known remaining habitat or population of a threatened species within Victoria	 This criterion is not triggered by the project. Key threatened flora species recorded in the assessment corridor: Ausfeld's Wattle <i>Acacia ausfeldii</i> (endangered under FFG Act) Scattered throughout north-central Victoria, mostly restricted to the western Goldfields bioregion. Umbrella Wattle <i>Acacia oswaldii</i> (critically endangered under FFG Act) Widespread but uncommon. Buloke <i>Allocasuarina luehmannii</i> (critically endangered under FFG Act) Occurs across northern and north-western Victoria. Pale Flax-lily <i>Dianella</i> sp. aff. <i>longifolia</i> (Riverina) Modelled by DEECA as having 'dispersed' habitat Late-flower Flax-lily <i>Dianella tarda</i> (critically endangered under FFG Act) Widespread across north-eastern and north central Victoria. Waterbush <i>Myoporum montanum</i> (endangered under FFG Act) Scattered across northern Victoria where it is uncommon to rare. Riverina Fireweed <i>Senecio longicollaris</i> (endangered under FFG Act) Scattered on floodplains across northern and western Victoria.



EES referral criteria	Project impact and response
	for pre-construction micro-siting is implemented, it is reasonable to expect that all occurrences of threatened flora (if present within the impact footprint) will be able to be avoided. It is therefore considered unlikely that the removal of up to 6.8 hectares of habitat would constitute 1% of the known remaining habitat or population for any flora species.
	Key threatened fauna species recorded in the assessment corridor:Diamond Firetail (vulnerable under FFG Act)
	 Broad distribution throughout south-eastern Australia, from southern Queensland to south-eastern South Australia.
	Additionally, no threatened fauna considered likely to occur in the assessment corridor are likely to have restricted habitat distribution across Victoria. Provided the recommendation for pre-construction micro-siting is implemented, it is reasonable to expect that all occurrences of habitat values for threatened fauna will be able to be avoided.
Potential for long-term change to the ecological character of a wetland listed under the Ramsar Convention or in A Directory of Important Wetlands in Australia.	Ramsar sites within or adjacent to the study area include Barmah Forest, Forest Gunbower and the NSW Central Murray State Forests. DIWA wetlands within the study area include Gunbower Island, Barmah-Millewa Forest and Lower Goulburn River. In the context of these Ramsar sites and DIWA wetlands and the habitats they provide, impacts from construction work are unlikely to impact on the ecological character of these wetlands (including ecosystem components, processes and services).
Potential for extensive or major effects on the use and environmental values of water resources due to changes in water quality, water availability, stream flows, water system function, or regional groundwater levels, or the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term	This criterion has low potential to be triggered. The crossing over Deep Creek will be a clear span elevated structure to avoid impacts on the beds and banks of the creek (freshwater aquatic habitats). The crossing over Muller Creek will be a culvert so will directly impact the beds and banks of that waterway however installation of the crossing will not result in any change to water availability, stream flow, waterway function or regional groundwater levels. Strict sediment control and trail design responses will be put in place to manage soil erosion and waterway sedimentation risks.
Potential for extensive or major effects to human health or the environment, or displacement of residents, from pollution or waste emitted to air, land, water or groundwater	This criterion is not considered applicable due to the low impact nature of the project (i.e. trail construction).
Potential for greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide	This criterion is not considered applicable due to the low impact nature of the project (i.e. trail construction with small machinery).



EES referral criteria	Project impact and response	
equivalent per annum (direct and indirect) attributable to the operation of the facility		
A combination of potential environmental effects		
Potential removal, destruction or lopping of 10 hectares or more of native vegetation, unless it is authorised for removal under an approved forest management plan or fire protection plan	 This criterion is not triggered by the project. Vegetation removal in the narrow (2.5 metre wide) trail construction corridor is for understorey vegetation only and the canopy will be retained. There is 6.8 hectares (i.e. less than 10 hectares) proposed for removal. 	
 Matters listed under the <i>Flora and Fauna</i> <i>Guarantee Act 1988</i>: potential loss of a significant area of a listed ecological community; or potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including from loss or fragmentation of habitats; or potentially significant effects on habitat values of a wetland supporting migratory bird species 	 This criterion is unlikely to be triggered as: While vegetation to be removed provides habitat for a number of species that comprise the Victorian Temperate Woodland Bird Community, habitat for this community will not be significantly impacted by the removal of a narrow corridor of understorey vegetation considering the extent of removal in the context of similar habitat available in surrounding landscape. No genetically important populations of flora occur within the assessment corridor. Recorded threatened species are not within genetically important populations. Residual impacts on FFG Act listed species are likely to be localised and of low impact and not result in the loss of a genetically important population of an endangered or threatened species. While Ramsar wetlands are present surrounding the proposed works, the works are highly unlikely to significantly affect the habitat values of these wetlands. 	
 Potential for extensive or major effects on landscape values of regional importance, especially: where recognised by a planning scheme overlay; declared as a distinctive area and landscape under the <i>Planning and Environment Act 1987</i>; or within or adjoining land reserved under the <i>National Parks Act 1975</i>. 	 This criterion is unlikely to be triggered as: The project occurs within the Barmah National Park and Gunbower National Park which are both reserved under the National Parks Act 1975. In the context of the existing informal use of much of the proposed alignment for walking, camping, and 4WDing, impacts are not considered extensive over the landscape which they occur in. The impacts are not considered to represent a major effect on landscape values of regional importance. 	
Potential for extensive or major effects to the environment due to changes in land stability, disturbance of acid sulphate soils or project- induced soil erosion over the short or long term	This criterion has not been assessed. It is outside the scope of the ecological assessment.	
Potential for extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities	This criterion has not been assessed. It is outside the scope of the ecological assessment.	



EES referral criteria	Project impact and response
Potential for extensive displacement of residents or severance of residents' access to their community resources	This criterion has not been assessed. It is outside the scope of the ecological assessment.
Potential for significant effects on the amenity of a substantial number of residents, due to extensive or major, long-term changes in visual, noise and traffic conditions	This criterion has not been assessed. It is outside the scope of the ecological assessment.
Potential for extensive or major effects on Aboriginal cultural heritage values protected under the <i>Aboriginal Heritage Act 2006</i>	This criterion has not been assessed. It is outside the scope of the ecological assessment.
Potential for extensive or major effects on cultural heritage places and sites listed on the Victorian Heritage Register or the Victorian Heritage Inventory under the <i>Heritage Act 2017</i>	This criterion has not been assessed. It is outside the scope of the ecological assessment.

This assessment has considered criteria relating to biodiversity impacts only. Consideration of social and cultural heritage impacts should also be considered.

Based on the above self-assessment of the MRAT project in relation to ecological criteria, it is considered unlikely that the project will have a significant environment effect. However, the guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning. Parks Victoria may choose to refer the project for legal certainty.

4.2.5 National Parks Act 1975

The *National Parks Act 1975* makes provision for national and other parks and for their management, the appointment of a Director of National Parks and the appointment of a National Parks Advisory Council and park advisory committees. The primary purpose of the *National Parks Act 1975* is for the preservation and protection of the natural environment.

The Joint Management Plan for Barmah National Park (YYTOLMB 2020) specifies five management zones comprising: Gulpa Gaka (Welcome), Walla (Wetland), Dhungalla (Murray River), Biyala (Red Gum) and Reference Area zones. The areas subject to proposed development in Barmah National Park are within the Walla (Wetland) zone (Gulf campsite) and Gulpa Gaka (Welcome) zone (day visitor canoe launch).

The management priority for the Gulpa Gaka (Welcome) zone is the provision of park access including services and facilities for orientation, information, interpretation, and education (YYTOLMB 2020). Canoe launch development is unlikely to contravene the priority of this zone within the park's management plan zoning.

The management priority for the Walla (Wetland) zone is on the conservation of Country and cultural heritage and corresponds to the 'Conservation Zone' in other Victorian national park management plans (YYTOLMB 2020). Campsite development may not be consistent with the priority of this zone within the park's management plan zoning.

The River Red Gum Parks Management Plan outlines the management of more than 100 parks and reserves across northern Victoria, including Gunbower National Park (Parks Victoria 2018). The plan specifies four management zones including: Conservation, Conservation and Recreation, Reference Area and Education.



The areas subject to proposed campsite development in the Gunbower National Park are all within the Conservation and Recreation Zone. The Conservation and Recreation Zone has a management focus on dispersed recreation and nature-based tourism. Campsite development is unlikely to contravene the priority of this zone within the park's management plan zoning.

As the project proponent, consent from Parks Victoria is implied. We understand Parks Victoria is engaging with Yorta Yorta Traditional Owners as joint managers of Barmah National Park.

4.2.6 Fisheries Act 1995

The *Fisheries Act 1995* provides a legislative framework for the regulation, management and conservation of Victorian fisheries including aquatic habitats.

A person must not take, injure, damage, destroy or release any protected aquatic biota. Protected aquatic biota includes all species of the family Syngnathidae (seahorses, sea dragons and pipefish), and any fish or aquatic invertebrate or community that is listed under the FFG Act.

Protected aquatic biota may be impacted by in stream or bank works proposed during canoe launch construction. Protected aquatic biota that may be impacted upon by the development include:

- Trout Cod
- Murray Cod
- Silver Perch
- Murray-Darling Rainbowfish
- Freshwater Catfish
- Murray Spiny Crayfish.

Providing mitigation measures outlined in this report are adhered to (Section 5.3), the potential for protected aquatic biota as listed above, to be injured, damaged or destroyed is considered to be negligible and no permit is required from DEECA.

4.2.7 Water Act 1989

The primary purpose of the *Water Act 1989* is to provide a framework for the allocation and management of surface water and groundwater throughout Victoria. It provides a principal mechanism for maintenance of ecosystem functions including those of aquatic ecosystems. Under Local Laws created by the relevant Authority under the Act, the authorities regulate the works within and in the vicinity of waterways.

The proposed MRAT will involve construction activities that affect beds and banks of waterways, riparian vegetation or quality or quantity of water in multiple designated waterways, and it is recommended that Parks Victoria consult with Goulburn Broken and North Central CMAs for a full list of waterway determinations within the study area.

Bridges, culverts, canoe launches, staircases and other works in the vicinity of designated waterways will require a permit from Goulburn Broken and North Central Catchment Management Authority. Guidelines. Application forms are available from CMAs online (<u>https://www.nccma.vic.gov.au/flood-information/development-advice/works-on-waterways/</u> and <u>https://www.gbcma.vic.gov.au/our-region/waterway-floodplain-management/floodplain-planning/works-on-waterways-permits</u>).



4.2.8 Environment Protection Act 2017: Environmental Reference Standards

The *Environment Protection Act 2017* provides a legal framework for the systematic and strategic management of potential and realised environmental impacts. The *Environment Protection Act 2017*, the Environment Protection Regulations 2021 and Environment Reference Standards (ERS) introduced from 1 July 2021 provide a regulatory framework designed to prevent harm by eliminating or minimising risks of harm to human health and the environment.

Under the regulatory changes, SEPP (Waters) will not continue as a subordinate instrument under the EP Act, and its formal statutory role ended on 1 July 2021. Much of the content of SEPP (Waters) has been saved under the Environment Protection Transitional Regulations 2021 for a period of 2 years after the commencement of the Environment Protection Regulations 2021. As SEPP (Waters) contributes to the state of knowledge and provides guidance on compliance with the General Environmental Duty (GED), the policy remains relevant to the protection and management of Victoria's water environments, including surface waters, estuarine and marine waters and groundwaters.

While not being saved under the Environment Protection Transitional Regulations 2021, the following clauses of SEPP (Waters) applicable to the project remain relevant as they provide guidance for compliance with the GED under the *Environment Protection Act 2017*:

Clause 42 – Construction activities:

- Minimise soil erosion, land disturbance and discharge of sediment and other pollutants to surface waters
- Where construction activities impinge on surface waters, construction managers need to monitor affected surface waters to assess whether beneficial uses are being protected

Clause 45 – Native vegetation protection and rehabilitation:

• Minimise the removal of and rehabilitate native vegetation within or adjacent to surface waters.

The ERS requires that aquatic ecosystem values be protected. Environmental quality objectives and indicators are defined to protect beneficial uses (i.e. the uses and values of the water environment) and an attainment program provides guidance on protection of the beneficial uses. Impacts on surface water quality as a result of the project must not result in changes that exceed background levels and/or the water quality objectives to protect surface water uses and values.

To ensure that direct and indirect (e.g. runoff) impacts on surface water quality do not exceed the background levels and/or water quality objectives, it is recommended that World Trail prepare and implement a site-specific Constructional Environmental Management Plan, which includes all EPA approved erosion control measures. These temporary control measures should be inspected during rainfall events to ensure controls are able to prevent/minimize offsite discharges and longer term impacts. Sediment control measures selected should also reflect the level of protection required to protect the ecological values within the creeks downstream of the project area.

Link to further information: http://www.gazette.vic.gov.au/gazette/Gazettes2021/GG2021S245.pdf



5 Mitigation measures

In order to inform project planning and demonstrate application of an avoid and minimise process, a discussion of potential impacts on biodiversity values that may result from trail construction and operational activities is provided in this section.

5.1 Native vegetation and habitat removal

Removal of native vegetation is required in some areas for trail surface and drainage upgrades, waterway crossings, installation of campsite amenities, canoe launches and trail signage (Figure 4). Most works are occurring on existing informal trails and camping areas and thus have existing levels of disturbance. Construction activities should be microsited to occur within these existing informally disturbed areas as much as practical. Following construction, areas beyond the built or upgraded trail surface should be allowed to regenerate.

An arborist assessment was undertaken by Oldmeadow Arboriculture on 13 and 14 July 2024 (Appendix 9). This assessment confirmed trail construction activities will not impact on adjacent large trees, provided the alignment avoids structural root zones as far as practicable. Additionally, there will likely be substantial benefits to adjacent trees if access roads into campgrounds can be improved by minimising adjacent soil compaction caused by off-road vehicles trying to avoid boggy sections (Appendix 9).

Installation of culverts and bridges (e.g. over Deep Creek, Mullers Creek) and toilet blocks will require deeper excavation and potentially heavier machinery. These types of activities that require more extensive earthworks have a greater possibility of impacting SRZs. A detailed assessment of impacts of these two crossing was not completed during the arborist assessment (Appendix 9). Tree Protection Zones (TPZs) in these areas should be delineated on the ground prior to construction activities occurring and a range of site-specific mitigation measures may need to be developed by the project arborist to avoid impacting the long-term viability of adjacent large and hollow-bearing trees (e.g. through root and trunk damage). In accordance with the Guidelines, trees have been considered lost where the proposed construction footprint will impact >10% of a trees' protection zone.

Considering the above, a large portion of the above will be limited to understorey vegetation impacts. The construction works are unlikely to contribute to habitat fragmentation in many areas as no new trail is proposed to be constructed or an existing informal footpad is being utilised.

Additional potential impacts include edge effects and increased risk of weed introduction and spread during construction activities and ongoing use of the trail. These risks can be mitigated through:

- Development and implementation of a weed management strategy aimed at suppressing and eradicating existing weed populations and preventing establishment of new weeds during construction and operation.
- Implementation of strict vehicle and machinery hygiene protocol to prevent weed or pathogen spread during construction and during operational maintenance activities.
- Having agreed trail management plans and protocols for operational management that address vegetation maintenance and tree management.



5.1.1 Arborist recommendations

Recommendations to avoid and minimise impacts provided by the arborist include (Appendix 9):

- Contain all works within existing road formations or vehicle tracks as far as practicable.
- Excavation must be minimised. Where possible fill should be used to achieve the required grade, rather than excavation.
- Detailed design or a sensitive construction method should be prepared for the Mullers Creek crossing. Avoid excavation within TPZ and SRZs of retained trees. Design needs to consider access with heavy machinery to place culvets, fill material around the culvets, possible screw piles and above grade track construction.
- Detailed design should be prepared for the Deep Creek bridge crossing.
- If the scope of works changes to include road widening, new culvert installations or any further excavation, then detailed construction plans must be drawn up inclusive of adjacent trees which may be impacted and tree protection zones.
- All pruning works must be undertaken by a minimum certificate III qualified arborist and in accordance with natural target pruning as outlined in Australian Standard 4373 Pruning of amenity trees.
 - Trees within the Kiln Bend campsite should be inspected and pruned by a suitably qualified arborist to reduce tree related risk at this location.
- Vehicles used for track construction should remain within the track alignment footprint.
- Stockpiling of materials and equipment set down areas should be cognisant of, and located outside of, tree protection zones which can be calculated as 12x Trunk Diameter (in metres) at Breast height (1.4 m).
- Yarran Creek campsite: Add mulch around trees close to parking areas to mitigate compaction from parking.
- Nursery Bend campsite: Carefully consider the location of stepped canoe launch to avoid large trees. Removal of small recruits may be required.
- Broken River Bend, Masters Landing and Braund Bend campsites: There is sufficient space to locate stepped canoe launch without impacting trees.
- Kiln Bend campsite:
 - Formalising access will significantly reduce compaction from vehicles using multiple alternate routes.
 - Ensure canoe launch is not within the TPZ of the large River Red-gum
 - Condition of trees may necessitate pruning to reduce likelihood of failure
- Gulf campsite: Some small understorey tree removal required for toilet facility.

5.2 Threatened flora

Nine nationally significant and 49 state significant flora species have potential to occur (i.e. medium or higher likelihood of occurrence) in the assessment corridor (see Table 4). The project presents risk of damage or removal to these species if any individuals occur within the construction footprint. Seven FFG listed species



were recorded within the study area during the 2022 assessments, none were recorded during the April 2024 assessment. Due to the accuracy of alignment spatial data provided and of recording equipment used during detailed surveys (generally ±7 metres), it is not possible to confirm whether any threatened species occur within the proposed impact footprint at this stage.

Key strategies to avoid and minimise removal of threatened and non-threatened understorey flora species include:

- Minimising the impacts of construction by 'building from the trail' and from within the construction footprint.
- Clear delineation of work areas during construction, including for vehicle turn around points and temporary materials storage.
- Installation of temporary fencing and no-go zone signage to protect sensitive habitats.
- Implementing best practice trail design, construction and sediment management practices
- Site inductions for construction workers.
- On-site supervision by Parks Victoria/project ecologist.
- Micro-siting of final impact footprint to avoid significant habitat areas, tree protection zones or occurrences of significant species (see below).
- Implementing strict weed and pathogen hygiene protocols during construction and operation of trails.
- Rehabilitation of the trail post-construction.

5.2.1 Pre-construction micro-siting

Whilst the risk of significant impact on threatened flora species is considered low, we recommend preconstruction micro-siting be completed where threatened flora have been previously recorded and within areas of high habitat value for threatened species. This micro-siting process would allow trail construction to ensure avoidance of impacts on threatened species and protected flora where feasible (including habitat features and tree structural root zones). Where trail construction is unable to avoid threatened flora, accurate counts can be determined for a FFG Protected flora removal permit application.

5.3 Threatened fauna

5.3.1 Arboreal, canopy foraging or aerial species

Given most impacts will be restricted to existing informal trails and campsites (per arborist assessment of impacts, Appendix 9) the canopy within the study area will largely be unaffected by construction of the trail itself.

Where other works are proposed e.g. for construction of waterway crossings/other infrastructure which may require more invasive construction methods, eight trees have been deemed lost along the proposed alignment where TPZ encroachment is >10% (in accordance with the Guidelines). Where trees are deemed lost due to indirect impacts (i.e. TPZ encroachment), it has been assumed that trees will be retained on site as habitat rather than removed.



Provided this avoidance is realised, canopy dependent species are unlikely to suffer any significant direct effects from the proposed trail construction activities. Given the existing use of the trail network by vehicles, pedestrians, motorcyclists and cyclists, species with large home ranges, and that are capable of long distance dispersal (such as Superb Parrot, raptors, owls and Grey-headed Flying-fox) should suffer relatively few additional direct or indirect impacts from trail/campsite construction or operation.

Sedentary species and those with small home ranges such as microbats, many woodland birds including Grey-crowned Babbler, Diamond Firetail and Hooded Robin and hollow dependent species such as Squirrel Glider may experience some indirect impacts during construction resulting from increased traffic and machinery in the area. These indirect impacts include noise, vibration and increased metabolic activity due to disturbance.

While these indirect impacts are likely to be temporary in nature they will need to be considered along with direct habitat removal. Avoidance measures should be implemented:

- Avoided tree removal works during from July to February to avoid breeding periods for threatened bird species including Brown Treecreeper, Diamond Firetail, Hooded Robin and Superb Parrot.
- Avoid impacts on trees with hollows and termite nests, which may provide breeding habitat for the threatened Lace Monitor.
- Avoid night works to reduce impacts on threatened nocturnal species including owls and Squirrel Gliders, and other nocturnal fauna including common mammals, reptiles, and invertebrates.
- Avoid high impact and disturbance activities (e.g. groundworks, operating heavy machinery, noise, vibration, and lighting) at dawn and dusk to minimise potential disturbance to the behaviour of nocturnal and crepuscular species such as Grey-headed Flying-fox and other non-threatened fauna.
- Implement a site-specific Fauna Management Plan to ensure suitable salvage techniques and mitigation measures are applied during construction to avoid and/or minimise the death and/or injury of individuals of threatened species.

Impacts on fly-over species, such as White-throated Needletail will be avoided as this species would not utilise terrestrial habitats.

5.3.2 Waterbirds

Impacts of trail construction and operational activities to waterbirds is expected to be minimal. The forest was experiencing significant flooding during 2022 field assessments and is expected to continue to experience these events in the future. These events may attract increased waterbird use and breeding events to areas beyond the Murray River itself and more permanent wetlands. However, it is reasonable to expect that these flood events will coincide with lower visitor numbers in the study area and that no trail construction activities will occur during flooding periods due to park closures. Most impacts occur on existing informal trails or camping areas that are relatively well defined and do not provide significant habitat for most waterbirds outside of significant flood events.

More permanent and significant waterbird habitat is found around Barmah Lakes, Reedy Lagoon and Gunbower Ramsar site. These areas are characterised by slow or still moving water and the proliferation of reedbeds and semi-aquatic fringing vegetation where semi-permanent floodplain wetlands occur. While these habitat types are found in the vicinity of the alignment, they are absent from the assessment corridor and proposed construction areas.



The Murray River and its major tributaries provide habitat for more generalist waterbirds such as ducks, cormorants and egrets that can forage in or adjacent to the faster moving water. However, the steeply eroded banks, faster moving water and general lack of fringing vegetation along much of the Murray River adjacent to the study area means that it does not provide significant nesting habitat for these species or foraging habitat for the majority of waders, or species that rely on still or slow-moving water or fringing vegetation. As such the impacts of MRAT construction and operation on most waterbirds are expected to be minimal.

5.3.3 Amphibians

Following completion of targeted surveys, is considered that Sloane's Froglet has a low likelihood of occurrence within the assessment corridor. As such the risk of direct and indirect impacts on this species is negligible.

However, due to the sedentary nature of frog species more generally, direct impacts including injury and mortality may occur if individuals are present within the construction footprint. Provided vegetation and potential frog habitat (soaks, permanent and semi-permanent pools and seasonally wet drainage lines) are avoided during construction and appropriate mitigation measures (e.g. sediment controls, unexpected finds and salvage protocols) are in place, the risk of direct and indirect impacts to amphibian species can be mitigated. Timing construction activities to avoid key breeding periods will also be important to minimising impacts on frogs and their breeding cycles. Strict hygiene protocol will need to be adhered to in order to minimise risk of introducing or spreading Chytrid fungus.

5.3.4 Reptiles

Similar to amphibian species, the risk of direct and indirect impacts is increased for more sedentary species such as reptiles. Larger bodied species with better dispersal abilities, such as the Lace Monitor and snake species, will be capable of dispersing out of the construction area during construction. Sedentary species such as skinks, blind snakes and geckos may suffer from direct impacts including injury and mortality.

These impacts can be mitigated by restricting construction activities to existing track surfaces, avoiding key habitat features such as fallen timber and areas of dense organic litter, and by developing unexpected finds protocols and salvage protocols for any trenching or entrapment risks.

5.3.5 Construction phase disturbance

It is expected that most of the current anthropogenic noise in the study area occurs during the daytime and is associated with recreational activities, such as boat use on the Murray River, four-wheel drive use, camping and motor bike use. During construction, the project will generate additional noise through use of machinery and equipment. For nocturnal fauna species that are utilising tree hollows or have daytime roost sites in the study area there is potential that construction noise could lead to disturbance. For daytime-active (diurnal) species the presence of people and equipment along the construction corridor is most likely to result in wildlife temporarily moving away from the works area, if capable. Disturbance from noise is difficult to avoid, however this impact is expected to be temporary and short-term in nature (weeks to several months) as construction crews move along the alignment as works are completed.

5.3.6 Ongoing disturbance

Increased visitation and camping in the area following completion of the project may result in indirect impacts including firewood collection, creation of fireplaces, rubbish dumping, trampling off-track and creation of



informal vehicle/motorbike tracks. However, given the existing the long-term use of the area by recreational campers and four-wheel drivers, it is not expected that these impacts will be significantly increased from present levels. These risks can be mitigated through construction of formal fireplaces, installation of rubbish bins, information signage and community education.

5.4 Aquatic ecosystems and associated significant fauna and communities

Three nationally significant and six state significant aquatic and semi-aquatic fauna species are considered to have a medium or high likelihood of occurrence in the assessment corridor where it crosses tributaries of the Murray River (see Appendix 4.2). The FFG listed Lowland Riverine Fish community is also likely to be present in the Murray River and other tributaries within the study area that feed into the Murray.

Direct impacts on these species and this community could arise from works on the beds and banks of waterways. Indirect impacts could occur through temporary modification to the flow of surface water during construction, soil disturbance contributing to sedimentation and erosion into adjacent waterways, noise/vibration transferring into waterbodies and chemical or other pollutants being spilled during construction. Temporary obstruction to longitudinal connectivity is also possible if coffer dams are required.

The key strategies to minimise disturbance and impacts to these species include:

- Undertake high impact construction works (eg. installation of footings) during periods of no/low flow, likely in summer and autumn. It is understood that this may not always be feasible and water diversions and coffer dams around the construction area may be utilised.
- Identifying and avoiding any turtle nests or Platypus burrows at or near crossing points (Deep Creek and Mullers Creek), within several hundred metres.
- Where possible, use clear-span structures to span waterways to avoid direct impacts to the beds and banks of waterways.
- Eliminating any pollution sources that could be spilled during construction (e.g. fuels and chemicals).
- Avoiding construction during and immediately after rain.
- Use of sediment fencing and erosion control measures during construction.
- Locating all stockpiles and fill above the flood levels and away from receiving water bodies.
- The chosen trail substrate should be able to withstand seasonal inundation (i.e. not be at risk of being washed into local waterways during flood events) and should not present any biological hazards to aquatic ecosystems.
- Retention of large woody-debris and preservation or reformation and revegetation of bank form following works.
- Design should direct runoff through a buffer of vegetation (preferably > 30 m in width) rather than directly into waterways defined above.

The proposed trail alignment has been designed to utilise existing tracks and water crossings where possible. This includes use of the existing bridge at Stewarts Bridge Road where the trail crosses the Goulburn River (Section 9), Broken Creek uses the existing track to the Dharnya Centre (Section 8), and existing bridges and creek crossings at Walhalla Creek (Section 9), Yarran Creek (Section 11) and Cameron Creek (Section 10). Several tributaries throughout Section 11 occur along the existing trail and will not be directly impacted.

A boardwalk bridge is proposed to be constructed at Deep Creek. The construction of this bridge has the potential to impact on aquatic species and must be constructed and designed carefully to minimise impacts



on native fauna. The current design proposed a boardwalk style bridge approximately 1.5 metres wide and 58 metres in length, though the detailed design is yet to be finalised. Direct impact on Deep Creek will be minimised at the design phase by developing a design that requires two towers with footings at either side of the creek, with supporting cable wire ropes across the length of the bridge. Footings should be set back from the creek banks as much as possible to reduce impacts to fauna habitat for species such as native fish, crayfish and Platypus. The detailed design should also consider incorporating natural surfaces, and suitable humidity, temperature, and light levels to minimise potential impacts on flora and fauna. During construction, activities should be avoided at dawn and dusk when Platypus are most likely to be active. Laydown and stockpiling areas and access to the site will be restricted to the adjacent cleared farmland. Removal of and disturbance to large woody debris within the impact area must be avoided, as such organic matter can provided critical habitat to threatened aquatic fauna.

A crossing is also proposed to be constructed at Mullers Creek. The design of this crossing has been refined to a culvert style crossing to reduce impacts on biodiversity. Site laydown areas and facilities will be located west of the creek on cleared land, with access through existing tracks on private property. The detailed design of the culvert must be designed to minimise barriers to aquatic fauna movement. Consideration should also be given to maintaining natural light and moisture levels to maintain a natural microclimate consistent with the surrounding environment.

5.5 Ramsar site and migratory species

In the context of Barmah Forest, Forest Gunbower and the adjacent NSW Central Murray State Forests Ramsar site and the habitats they provide, risk of impacts from construction work is unlikely to impact on the ecological character of these Ramsar sites (including ecosystem components, processes and services) nor on migratory species. This is because the works are likely to be restricted to short term impacts to understorey vegetation (i.e. will not affect breeding habitat for any species), will not contribute to habitat fragmentation and will not exacerbate the threat of pest species. While human visitation of the area may increase, use of the area will not dramatically change post-construction.



6 Victoria's Guidelines for the removal, destruction or lopping of native vegetation

The Guidelines set out and describe the application of Victoria's statewide policy in relation to assessing and compensating for the removal of native vegetation in order to achieve the objective of 'no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation' (DELWP 2017b).

This objective is to be achieved through Victoria's planning system using an assessment approach that relies on strategic planning and the permit and offset system. The key policy for achieving no net loss to biodiversity is the three-step approach of avoid, minimise and offset.

The trigger for a permit to remove vegetation for this project relates to the presence of ESOs within the Moira, Campaspe and Gannawarra planning schemes (Clause 42.01). None of these planning schemes identify the Guidelines as relevant to assessment or decision making on the application for vegetation removal under the ESOs. Section 1.1 states that...*The Guidelines must not be applied in relation to the requirements and decision guidelines of these overlays, unless the overlay specifically states otherwise*. Our view is that the Guidelines will not apply to an application under the ESOs and no offsets are required.

However, a Guidelines assessment is useful in order for the project to comply with the Crown land procedure. The procedure states that any works requiring the 'new removal of native vegetation' would require a detailed flora and fauna assessment which:

- Considers if the native vegetation removal impacts on important biodiversity values see Section 3 and below.
- Ensures native vegetation is removed to the minimum extent necessary (avoid and minimise) see below.
- Records and documents the extent of native vegetation removal see below.

Avoid and minimise

The strategic and site level steps taken during the design of the development to minimise biodiversity impacts resulting from the removal of native vegetation are outlined below:

- Detailed project planning including feasibility studies and desktop constraints assessments.
- Preliminary assessments to identify ecological values along the trail and potential areas of high ecological constraint.
- Aligning trails on existing informal trails or disturbed areas.
- Minimising trail development near sensitive areas such as waterways.
- The engagement of a professional arborist to review existing conditions for trees in the project area, and provide sensitive construction techniques that can be applied to ensure encroachment into tree protection zones and structural root zones does not lead to the long-term decline of adjacent trees (Appendix 9).
- Committing to the principle of pre-construction micro-siting to achieve avoidance of key habitat features for threatened fauna, avoid threatened flora, minimise disturbance of wildlife habitat, minimise indirect impacts on sensitive areas such as waterways



• Committing to the development of a weed management plan to monitor and control weeds along the trail post-construction.

6.1 Proposed removal of native vegetation

The extent of native vegetation patches, the location of large trees within patches and any scattered trees were mapped within the assessment corridor (Figure 4), and the vegetation condition was assessed in relation to standard methods (DSE 2004) and pre-determined EVC benchmarks: https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks.

The proposed removal of native vegetation was assessed in accordance with the concept designs provided (refer to Section 2.7).

The development proposes to remove 6.8 hectares of native vegetation, including eight large trees (Figure 4). The Native Vegetation Removal Report is provided in Appendix 8.

6.1.1 Vegetation quality assessment

A continuous area of the same EVC is termed a 'habitat zone'. Different habitat zones exists where there are different EVCs present and/or discrete (non-continuous) patches of the same EVC. A separate vegetation quality assessment was conducted for each habitat zone. The vegetation quality assessment score was multiplied by the extent of the habitat zone to give a value in habitat hectares.

Multiple habitat zones were identified. The results of the vegetation quality assessment are provided in Appendix 7.

The locations of large trees within patches deemed lost are shown Figure 4 and the circumference of each large tree proposed for removal is provided in Appendix 7.2.



7 Key ecological values and recommendations

This section identifies the key ecological features of the assessment corridor, provides an outline of potential implications of the proposed MRAT on those values and includes recommendations to assist Park Victoria to avoid, mitigate and offset impacts on biodiversity.

The location of the proposed MRAT, largely within the Murray River riparian corridor and its associated National Parks and reserves, has resulted in an alignment that contains a diverse array of ecological values. Parks Victoria has demonstrated consideration of these values throughout the early stages of project planning by actively engaging in analysis of site values, formulating design responses and selecting alignments that minimise impacts on significant ecological features where possible.

This report outlines the potential impacts of the proposed trail and contains recommendations to minimise and mitigate these impacts at the design, construction and operational stages of the project.

7.1 Ecological values

Key ecological values identified within the assessment corridor and broader study area are as follows:

- Eight Ecological Vegetation Classes (EVCs) across the Murray Fans and Victorian Riverina bioregions:
 - Floodplain Riparian Woodland EVC 56 (Bioregional Conservation Status [BCS]: Depleted) of low to moderate quality, supporting native sedges, grasses and herbs and with a high cover of introduced annual pasture grasses at the time of assessment.
 - Riverine Chenopod Woodland EVC 103 (BCS: Endangered) of moderate to high quality, supporting a diverse range of chenopods, herbs and native grasses in the understorey.
 - Grassy Riverine Forest EVC 106 (BCS: Depleted) of moderate quality, supporting a low density of large trees and logs.
 - Riverine Grassy Woodland EVC 295 (BCS: Vulnerable) of low to moderate quality, supporting a variably diverse native understorey and high cover of annual weeds at the time of assessment.
 - Plains Woodland EVC 803 (BCS: Endangered) of moderate to high quality, supporting a diversity of herbs and grasses in the understorey.
 - Riverine Swamp Forest EVC 814 (BCS: Depleted) of low to moderate quality, supporting a low density of large trees and logs, and high cover of annual weeds at the time of assessment.
 - Riverine Swampy Woodland EVC 815 (BCS: Vulnerable) of low quality, supporting a high density of logs and high cover of introduced annual grasses and herbs at the time of assessment.
 - Sedgy Riverine Forest EVC 816 (BCS: Depleted).
- A rich and diverse range of plants and animals, including:
 - Recorded or potential habitat for 50 threatened flora species including nine (9) species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) /and the *Flora and Fauna Guarantee Act 1988* and 41 species listed under the FFG Act (Appendix 2).



- Recorded or potential habitat for 33 threatened fauna species including ten listed under the EPBC Act and FFG Act and 23 species listed under the FFG Act (Appendix 3).
- Areas of vegetation (within EVC 803) consistent with the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EPBC Act listed threatened ecological community (Endangered).
- Habitat for the FFG Act listed Lowland Riverine Fish Community and Victorian Temperate Woodland Bird community.
- Vegetation contiguous with significant tracts of native vegetation along the Murray River riparian corridor, and within the Lower Goulburn National Park, River Murray Reserve and proposed Murray River Park.
- Within Barmah and Gunbower Ramsar wetland sites, and adjacent to New South Wales (NSW) Central Murray State Forests Ramsar site.
- Within Barmah–Millewa Forest 'icon site' which receives environmental water to achieve floodplain health improvements following the implementation of the joint national-state Living Murray Program.
- Within Koondrook-Perricoota and Gunbower Forest 'icon site' which receives environmental water to achieve environmental health improvements following the implementation of the joint national-state Living Murray Program.
- Part of the Gunbower National Park Floodplain Restoration Project (VMFRP 2021).

7.2 Summary of potential impacts

Construction of the MRAT is likely to result in the following impacts:

- Up to 6.8 hectares of native vegetation removal for trails (understorey only), campsites and waterway crossings. Impacts are summarised below:
 - Victorian Riverina bioregion:
 - 0.528 hectares of Grassy Riverine Forest EVC 106
 - 0.679 hectares of Riverine Grassy Woodland EVC 295
 - 0.330 hectares of Plains Grassy Woodland EVC 803.
 - Murray Fans bioregion:
 - 1.285 hectares of Floodplain Riparian Woodland EVC 56
 - 0.724 hectares of Riverine Chenopod Woodland EVC 103
 - 0.278 hectares of Grassy Riverine Forest EVC 106
 - 2.051 hectares of Riverine Grassy Woodland EVC 295
 - 0.687 hectares of Plains Grassy Woodland EVC 803
 - 0.153 hectares of Riverine Swampy Woodland EVC 815
 - 0.082 hectares of Sedgy Riverine Forest EVC 816.
- The loss of eight large trees for construction of waterway crossings.



- Potential impacts on threatened species may occur, most of which are temporary in nature (e.g. during the construction phase), or of a relatively minor scale due to the linear nature of the impact and the restriction of the impact to understorey habitat. Potential impacts include:
 - Disturbance of habitat for 5 EPBC Act listed flora species that have suitable habitat in the proposed impact footprint, including: River Swamp Wallaby-grass, Turnip Copperburr, Still Groundsel, Slender Darling-pea and Red Swainson-pea.
 - Disturbance of confirmed or potential habitat for 10 EPBC Act listed fauna species, including: Superb Parrot, Swift Parrot, White-throated Needletail, Hooded Robin, Diamond Firetail, Brown Treecreeper, Grey-headed Flying-fox, Trout Cod, Murray Cod and Silver Perch
 - Disturbance of habitat for 41 FFG Act listed flora species (Table 4).
 - Disturbance of habitat for 23 FFG Act listed fauna species (Table 5).
- Potential spread of high threat or noxious weeds into the study area.

Targeted surveys are not recommended for flora due to the very broad habitat preferences of some threatened flora species, and the lack of the modification of habitat within the study area, however preconstruction micro-siting is recommended.

A summary of potential implications of development of the study area and recommendations to minimise impacts during the construction and operational phase of the project is provided in Table 10.

Ecological feature (Figure 2)	Implications of development	Recommendations
Native vegetation	The permanent removal of 6.8 hectares of mostly understorey vegetation. The application will be assessed on	Where native vegetation removal is unavoidable then minimise impacts in accordance with No Net Loss policy. Refer to Section 6. Implement the trail rehabilitation component of the CEMP
	the Detailed Assessment Pathway.	to assist trail rehabilitation during and post-construction. Undertake ongoing weed control as required.
Threatened species and ecological communities	Removal of known and potential habitat for threatened species (as identified in Table 4 and Table 5).	 Per arborist recommendations, ensure the alignment avoids tree structural root zones as much as practicable. Avoid the removal of hollow-bearing trees.
	Removal of vegetation consistent with the EPBC Act listed Grey Box Woodland community.	• Implement a site-specific CEMP to manage erosion and pollutants during construction to prevent indirect impacts to threatened species habitat in adjacent aquatic environments.
	Minor removal of habitat for the FFG Act listed Riverine Lowland Fish community due to the proposed impacts at Deep Creek and Mullers Creek crossings, where this community/associated fish species may occur.	• For any trees proposed for removal, inspect for raptor nests and/or tree hollows prior to removal.
		• Avoid night works to reduce impacts to threatened nocturnal species including owls and Squirrel Gliders, and other nocturnal fauna including common mammals, reptiles, and invertebrates.
		 Undertake tree removal works outside of threatened bird nesting and fledging seasons, to avoid impacts to

Table 10Summary of key ecological values, potential implications of developing the study area and
recommendations to minimise ecological impacts during the design phase.



Ecological feature (Figure 2)	Implications of development	Recommendations
	Habitat removal for the FFG Act listed Victorian Temperate Woodland Bird community.	 Brown Treecreeper (July to February), Diamond Firetail (August to January), Hooded Robin (July to November) and Superb Parrot (September to December). Removal should be timed to occur in March to June, to avoid disturbing the key breeding season of these species and most other resident bird species which breed during spring and summer. Implement a site-specific Fauna Management Plan to ensure suitable salvage techniques and mitigation measures are applied during construction to avoid and/or minimise the death and/or injury of individuals of threatened species.
Aquatic habitat features	Loss of, or alterations to, riparian and in-stream habitat within and in the vicinity of the assessment corridor (e.g. downstream) via: direct removal, notable hydrological changes, deterioration in water quality (including pollution event) and, sedimentation.	 Conduct pre-construction survey to identify and avoid any turtle nests or Platypus burrows at or near crossing points (Deep Creek and Mullers Creek), within several hundred metres. Undertake high impact construction works (eg. installation of footings) during periods of no/low flow, likely in summer and autumn. It is understood that this may not always be feasible and water diversions and coffer dams around the construction area may be utilised. The chosen trail substrate should be able to withstand seasonal inundation (i.e. not be at risk of being washed into local waterways during flood events) and should not present any biological hazards to aquatic ecosystems. Implement a site-specific CEMP to ensure appropriate sediment control measures are put in place to ensure run-off during construction does not impact surrounding streams and creeks. Control measures implemented should reflect the level of protection required to protect nearby ecological values and ensure that any impacts as a result of the project do not result in changes that exceed background levels and/or objectives. Avoid instream works wherever possible. Utilise the most sensitive short term (i.e. during construction) and long-term sediment control methods available for all works located in within and in the vicinity of all flowing and all mapped waterways. Design should direct runoff through a buffer of vegetation (preferably > 30 m in width) rather than directly into waterways defined above. Eliminate any pollution sources that could be spilled during construction (e.g. fuels and chemicals). Avoid construction during and immediately after rain. Locate all stockpiles and fill above the flood levels and away from receiving water bodies.



Ecological feature (Figure 2)	Implications of development	Recommendations
		 Retain large woody-debris and preservation or reformation and revegetation of bank form following works.
Other habitat features	Large trees and fallen logs.	• Avoid the removal of large fallen logs and timber whenever possible, and retain these features onsite if required to be moved during train construction.
Habitat connectivity	Small scale fragmentation of habitat connectivity for vertebrate and invertebrate fauna species.	Design waterway crossings in accordance with relevant guidelines from Goulburn Broken and North Central CMA and in accordance with guidelines for fish friendly waterway crossings (Witheridge 2002, Fairfull & Witheridge 2003).

7.3 Avoidance strategies and mitigation recommendations

Key impact avoidance and minimisation strategies, and mitigation measures include:

Project specific recommendations

- Develop a weed control strategy that monitors weed invasion along the trail during construction and on an ongoing basis.
- Create a trail Construction and Environment Management Plan. The CEMP should detail:
 - Strict hygiene methods to be implemented during trail construction.
 - On-going monitoring to assess and treat the spread of weeds.
 - All environmental controls and mitigation measures covering vegetation removal prescriptions/seasonality, work site delineation, weed/pathogen hygiene, sediment control.
 - A site-specific Fauna Management Plan that includes suitable salvage techniques and unexpected finds protocols.
 - Trail rehabilitation measures to be undertaken.
- Conduct pre-construction survey to identify and avoid any turtle nests or Platypus burrows at or near crossing points (Deep Creek and Mullers Creek), within several hundred metres.
- Avoid night works to reduce impacts on threatened nocturnal species including owls and Squirrel Gliders, and other nocturnal fauna including common mammals, reptiles, and invertebrates.
- Avoid high impact and disturbance activities (e.g. groundworks, operating heavy machinery, noise, vibration, and lighting) at dawn and dusk to minimise potential disturbance to the behaviour of nocturnal and crepuscular species such as Grey-headed Flying-fox and other non-threatened fauna
- Avoid impacts on trees with hollows and termite nests, which may provide breeding habitat for the threatened Lace Monitor.
- Avoid the removal of large fallen logs and timber whenever possible.
- For any trees proposed for removal, inspect for raptor nests and/or tree hollows prior to removal.
- Undertake tree removal works outside of threatened bird nesting and fledging seasons (between July to February) to avoid impacts on Brown Treecreeper, Diamond Firetail, Hooded Robin and Superb



Parrot.). Removal should be timed to occur in March to June, to avoid disturbing the key breeding season of these species and most other resident bird species which breed during spring and summer.

General recommendations

General trail construction and maintenance recommendations:

- Avoiding the direct removal of canopy trees along trails, particularly large hollow-bearing trees, through the micro-siting of the trail.
- Restricting disturbance to track margins in areas where existing trails are present.
- To the fullest extent practicable, minimise disturbance to any native vegetation, including aquatic vegetation. This may include the demarcation of areas of native vegetation to be retained during works.
- Site inductions for construction workers.
- Adhering to the construction corridors and vegetation removal footprints outlined in this report.
- Installation of temporary fencing and no-go zone signage to protect sensitive habitats.
- Implementing best practice trail design, construction and sediment management practices.
- Minimising the impacts of construction by 'building from the trail' and from within the construction footprint.
- Implementing strict weed and pathogen hygiene protocols during construction and operation of trails.
- Any plant or equipment used should be washed down and cleaned prior to and following use to reduce the translocation risk of weed species.
- Choose trail substrate that withstands seasonal inundation and poses no biological hazard to aquatic ecosystems.
- Engage a suitably qualified arborist to advise on the management of trees during the construction phase of the project. The project arborist should induct workers prior to commencing trail construction works on:
 - Basic tree functions and impacts from trail.
 - Construction guidelines for working close to trees.
 - Procedure when roots are damaged and if native vegetation offsets are required.
- Should instream or riparian works be proposed, undertake biological and physicochemical monitoring of waterways to be impacted in accordance with *The Environment Protection Act 2017*, the Environment Protection Regulations 2021 and Environment Reference Standards (ERS) introduced from 1 July 2021. Biological and physicochemical monitoring should be undertaken in appropriate locations and seasons prior to and following any proposed instream/riparian zone works to determine if there has been any negative impact on the health of waterways as a result of the project.
- The results of this assessment should be incorporated into any future stages of project design, by ensuring the flora and fauna mapping information is incorporated into or used alongside mapping.



A number of standard precautions and mitigations relevant to the protection of fish habitat are provided in Witheridge (2002), these should be considered and deployed as relevant. Further recommendations specific to the construction of waterway crossings and protection of aquatic habitats include:

- Avoid instream works; if unavoidable, limit to low flow periods and calm weather.
- Conduct high impact construction (e.g., footings) during no/low flow periods, using water diversions and coffer dams if necessary.
- Stockpile sediment away from waterways, securing against at least a 1 in 10 year flood interval.
- Manage runoff from stockpiled sediment to prevent waterway contamination.
- Employ appropriate erosion and sediment controls for works near creeks and floodplains.
- Restore impacted creek banks to pre-works condition where possible.
- Minimize soil transportation to reduce weed spread.
- Eliminate potential pollution sources (e.g., fuels, chemicals) during construction.
- Avoid construction during and immediately after rain.
- Use sediment fencing and erosion control measures.
- Locate all stockpiles and fill above flood levels and away from water bodies.
- Retain large woody debris, reform, and revegetate bank forms after works.
- Design runoff to flow through a vegetation buffer (preferably > 30m wide) before reaching waterways.

Biosis recommends that these strategies be conferred through to the detailed design and construction phase of the project, and that the appointed construction contractor be accountable for achieving a high level of environmental compliance and an endorsed CEMP that is subject to regular third-party compliance monitoring.



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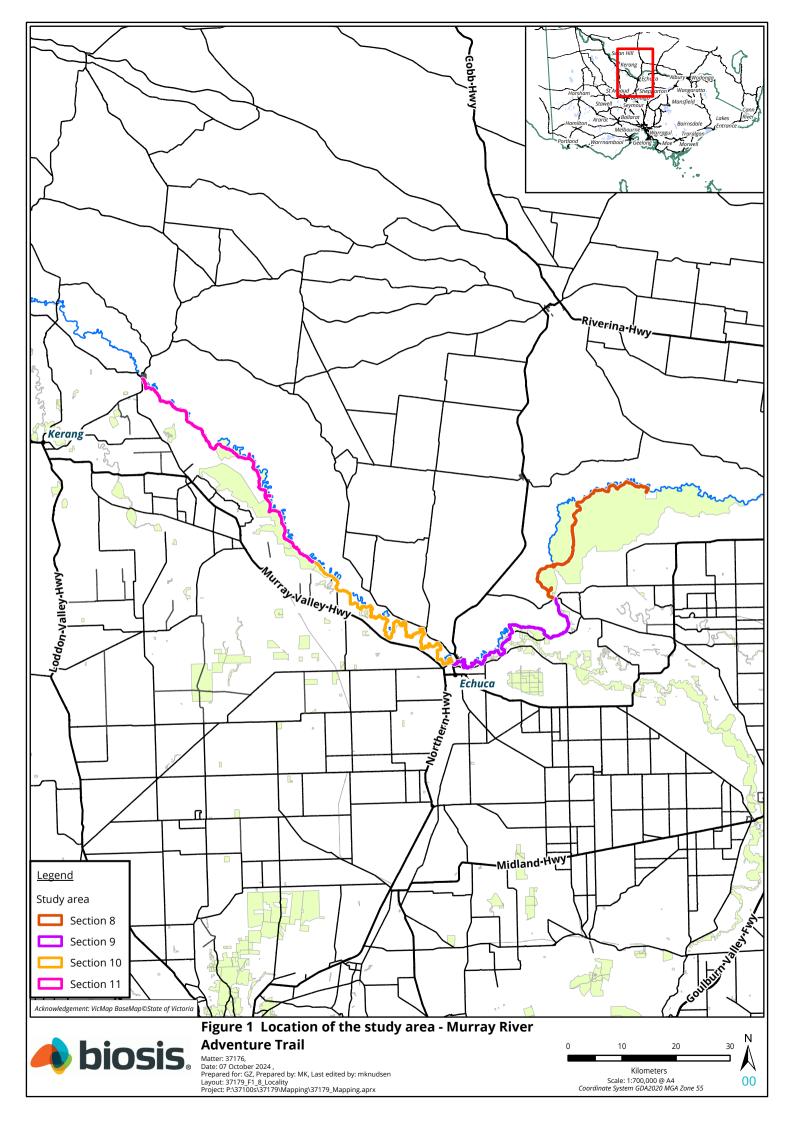
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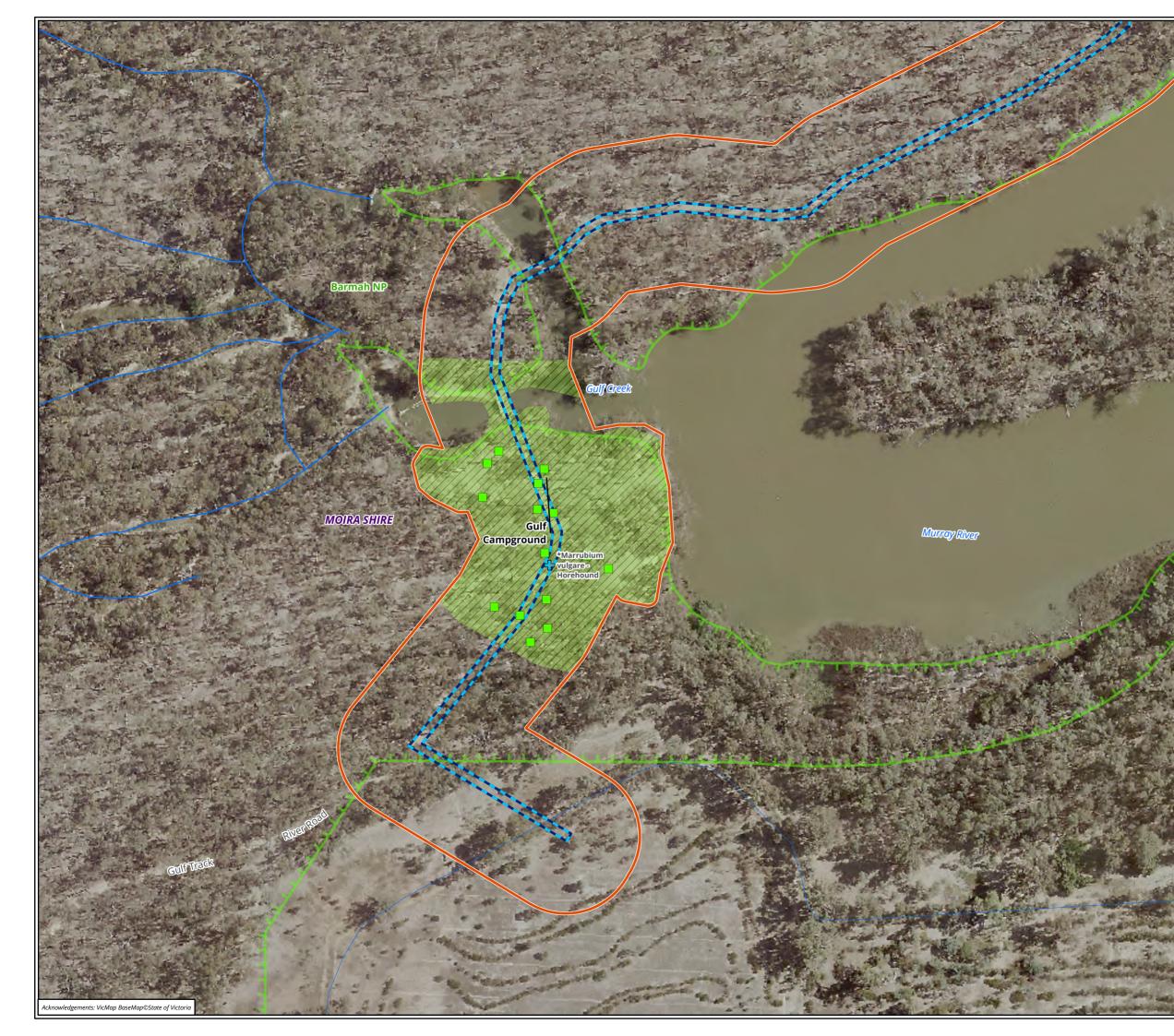


Appendices



Appendix 1 Figures





<u>Legend</u>

Study area

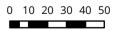
Section 8

- National Park
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0816) Sedgy Riverine Forest

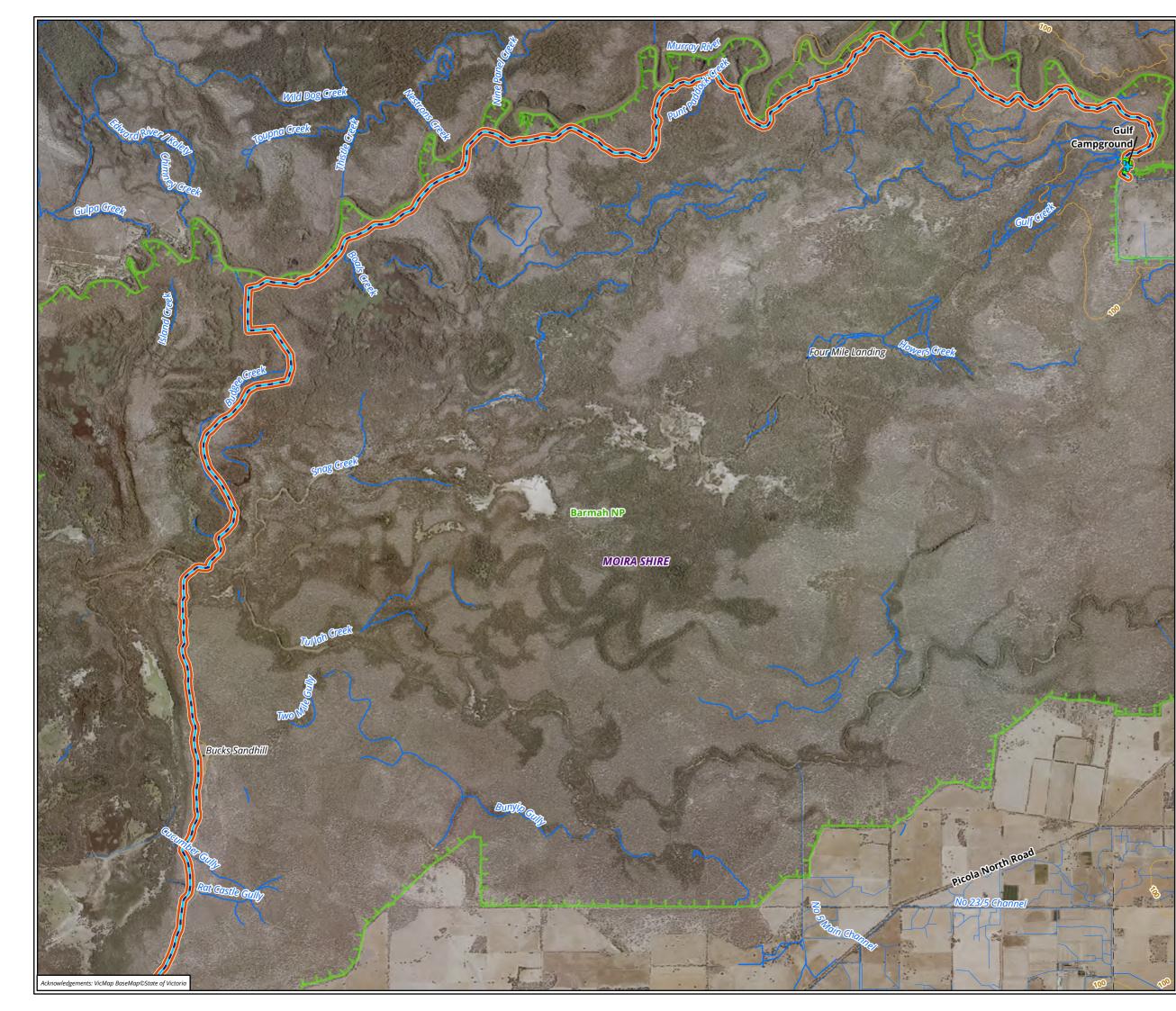
Figure 2.1 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Deniliquin Vairiawonga Echuca Shepparton Benalia

<u>Legend</u>

Study area

Section 8

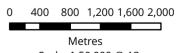
D National Park

- ✤ Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0816) Sedgy Riverine Forest

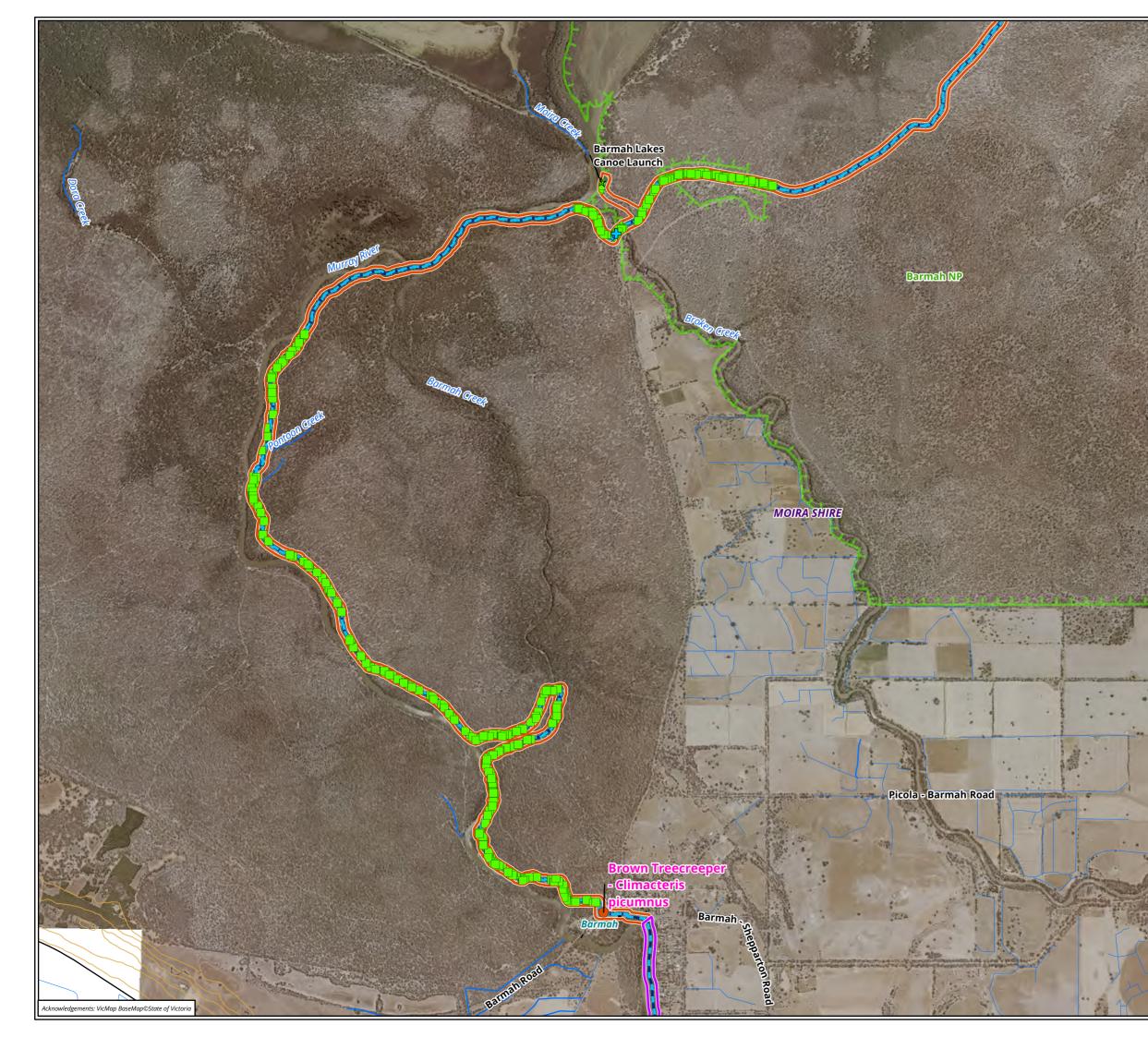
Figure 2.2 Ecological features of the study area

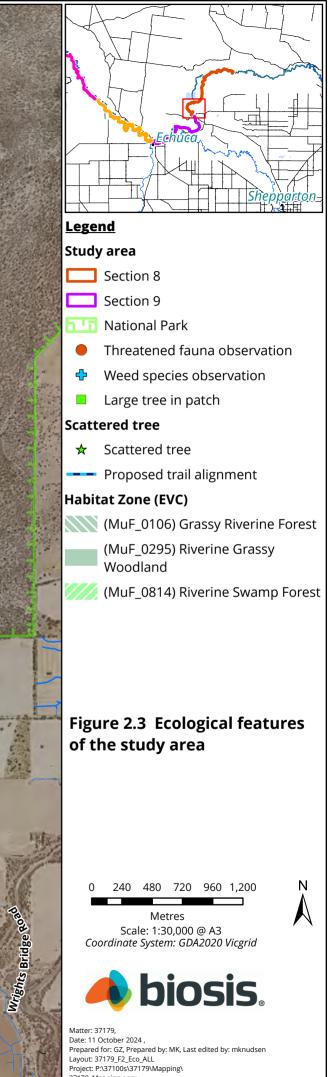




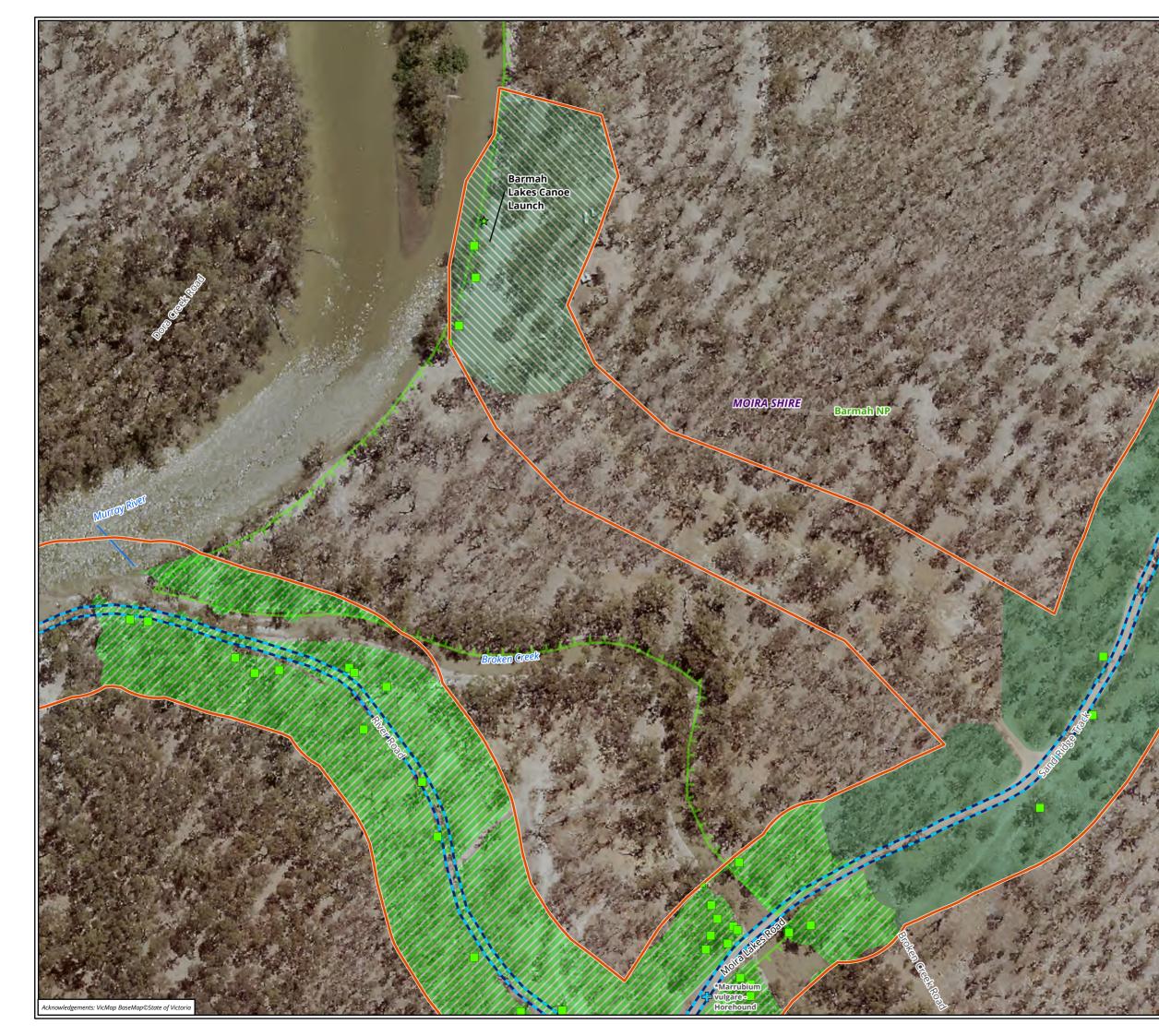
Metres Scale: 1:50,000 @ A3 Coordinate System: GDA2020 Vicgrid







³⁷¹⁷⁹_Mapping.aprx



<u>Legend</u>

Study area

Section	8
 	_

- **National Park**
- Weed species observation
- Large tree in patch

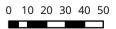
Scattered tree

- ★ Scattered tree
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest (MuF_0295) Riverine Grassy
 - Woodland
- (MuF_0814) Riverine Swamp Forest

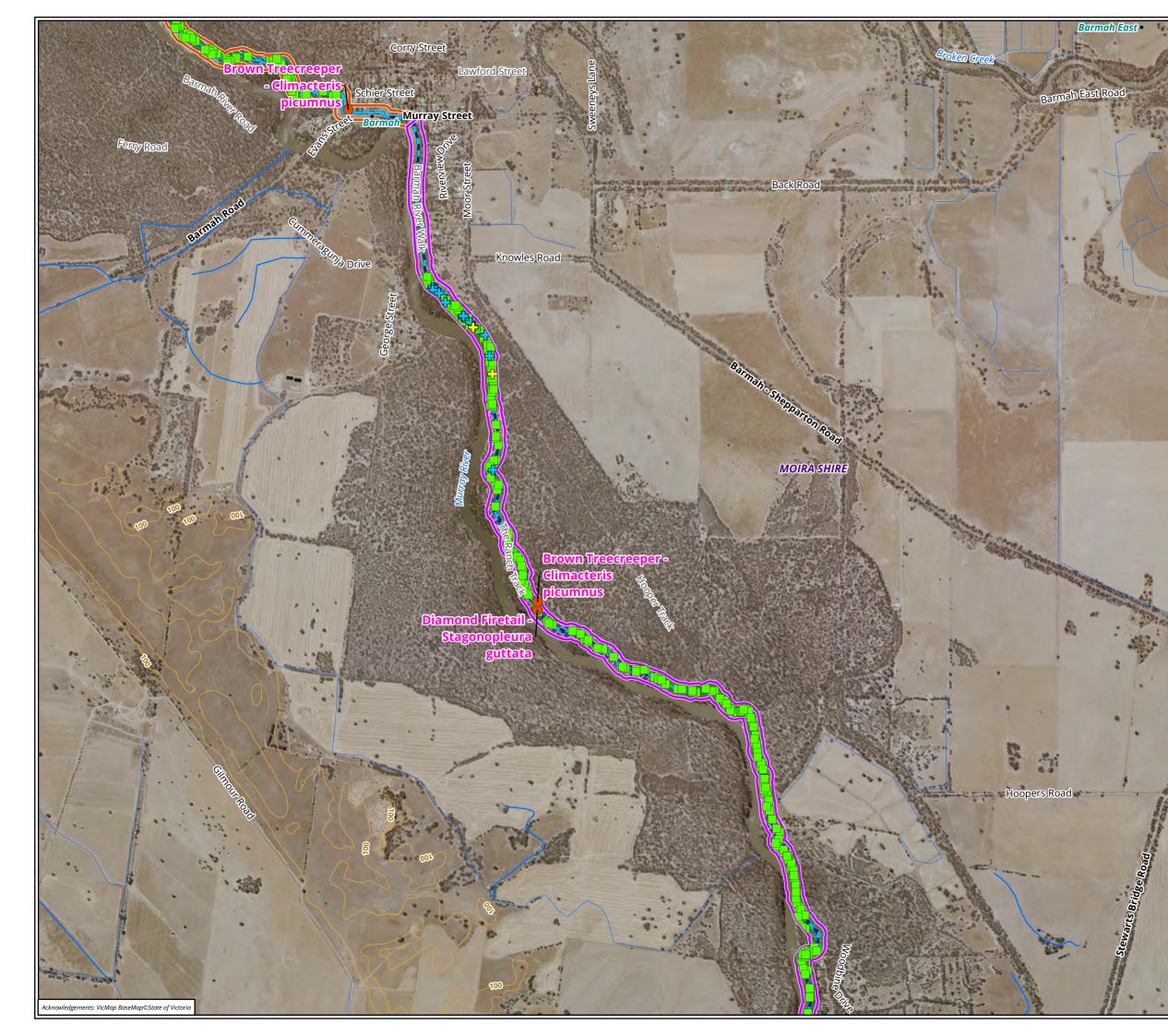
Figure 2.4 Ecological features of the study area

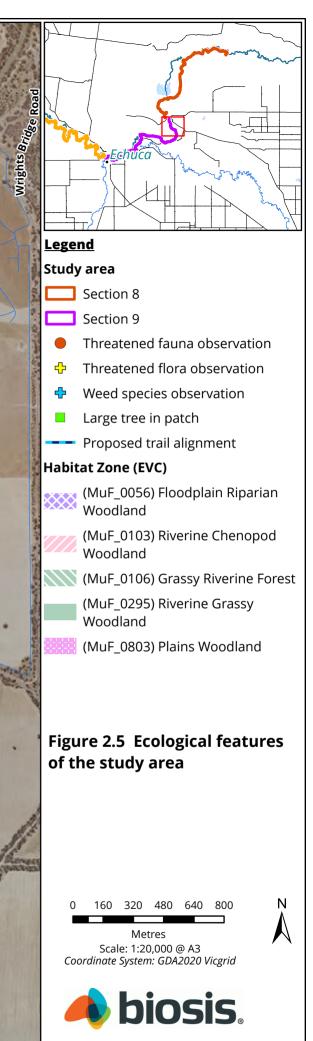


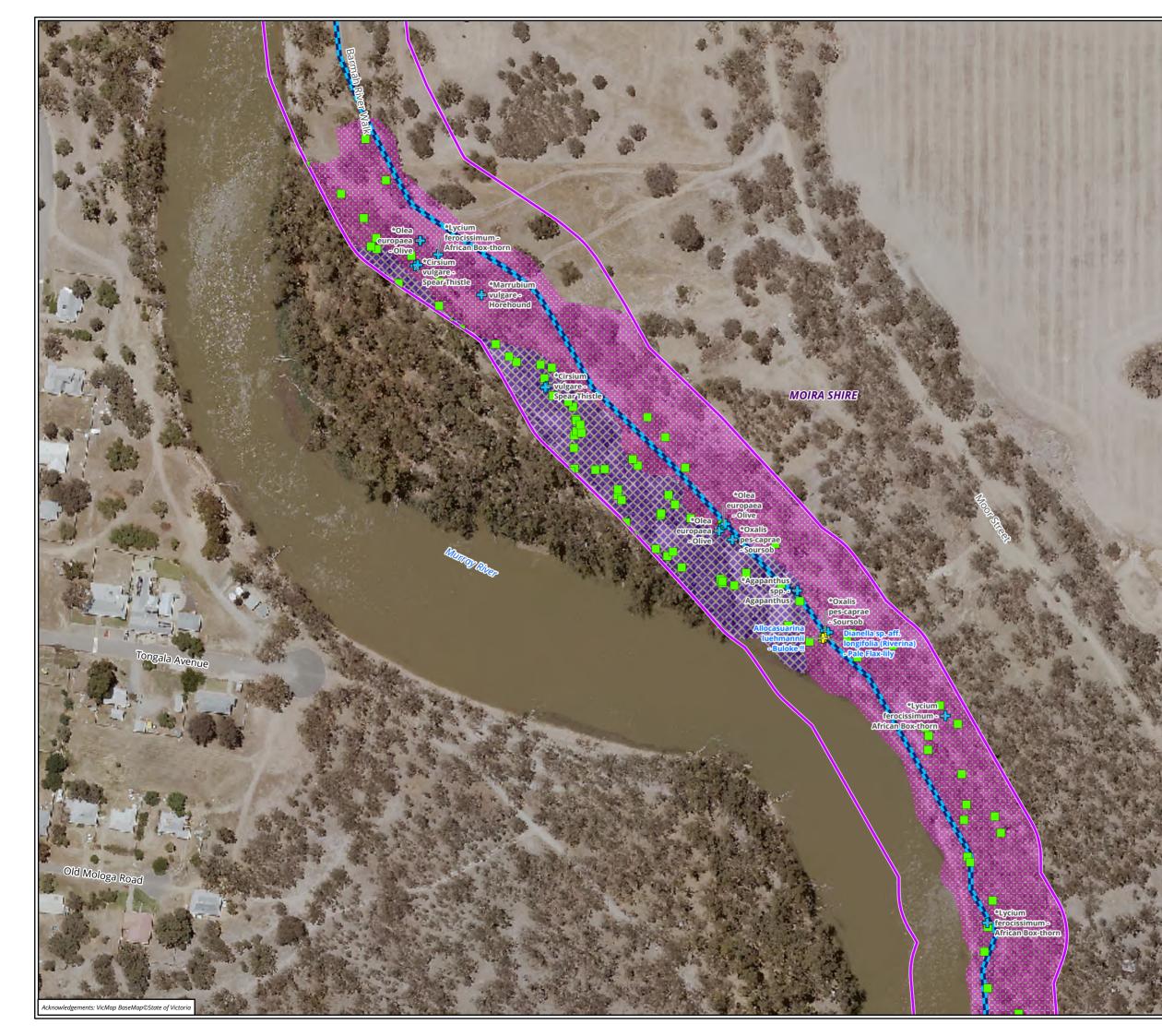


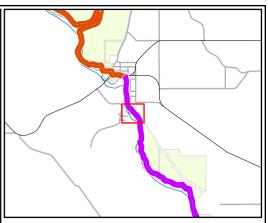
Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid











<u>Legend</u>

Study area

Section 9

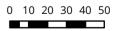
- Threatened flora observation
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)



🛽 (MuF_0803) Plains Woodland

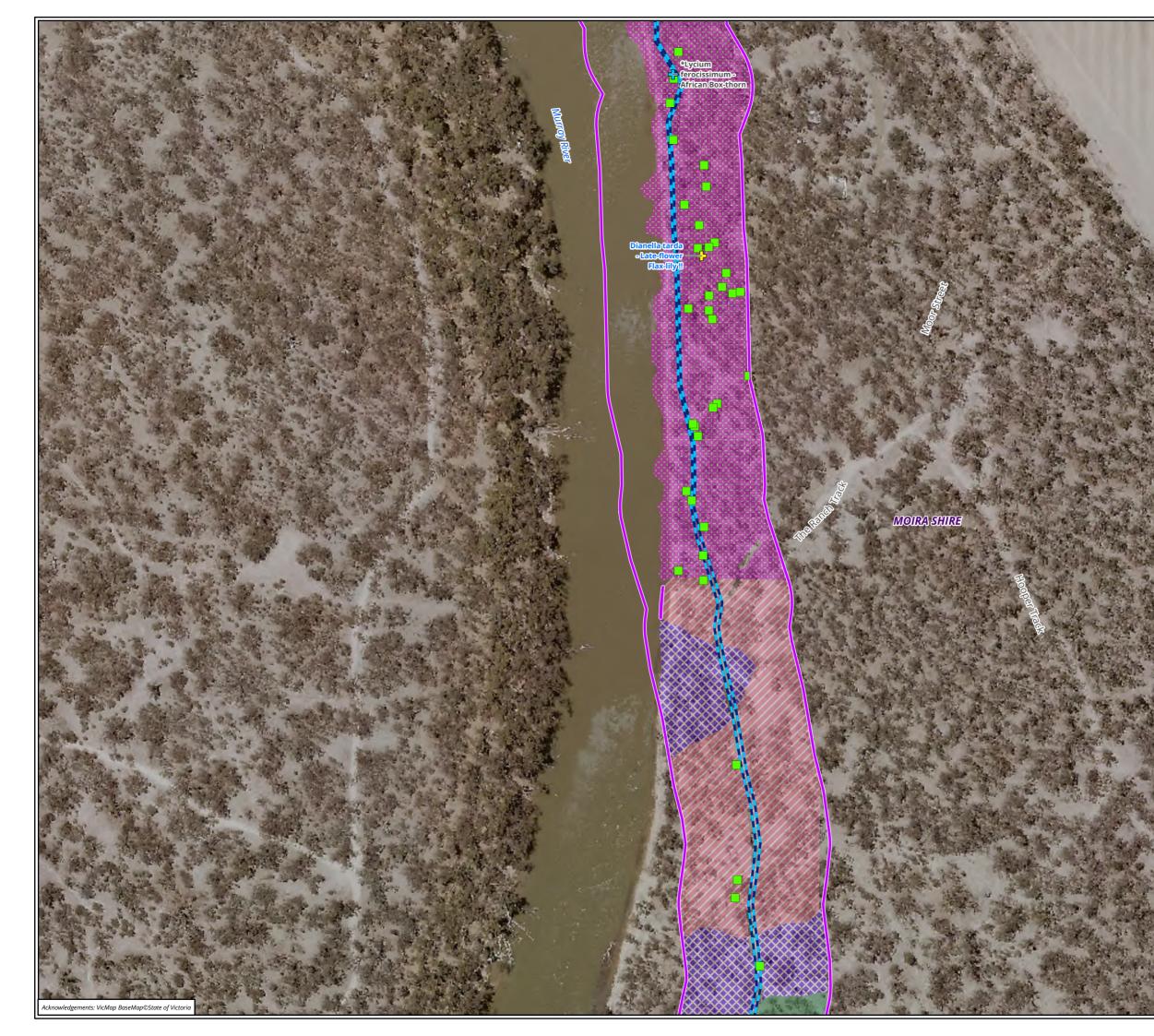
Figure 2.6 Ecological features of the study area

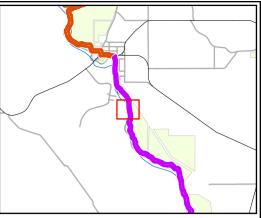




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







<u>Legend</u>

Study area

Section 9

- ✤ Threatened flora observation
- ✤ Weed species observation
- Large tree in patch
- ---- Proposed trail alignment

Habitat Zone (EVC)

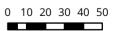
(MuF_0056) Floodplain Riparian Woodland

(MuF_0103) Riverine Chenopod Woodland

(MuF_0295) Riverine Grassy Woodland

🔢 (MuF_0803) Plains Woodland

Figure 2.7 Ecological features of the study area

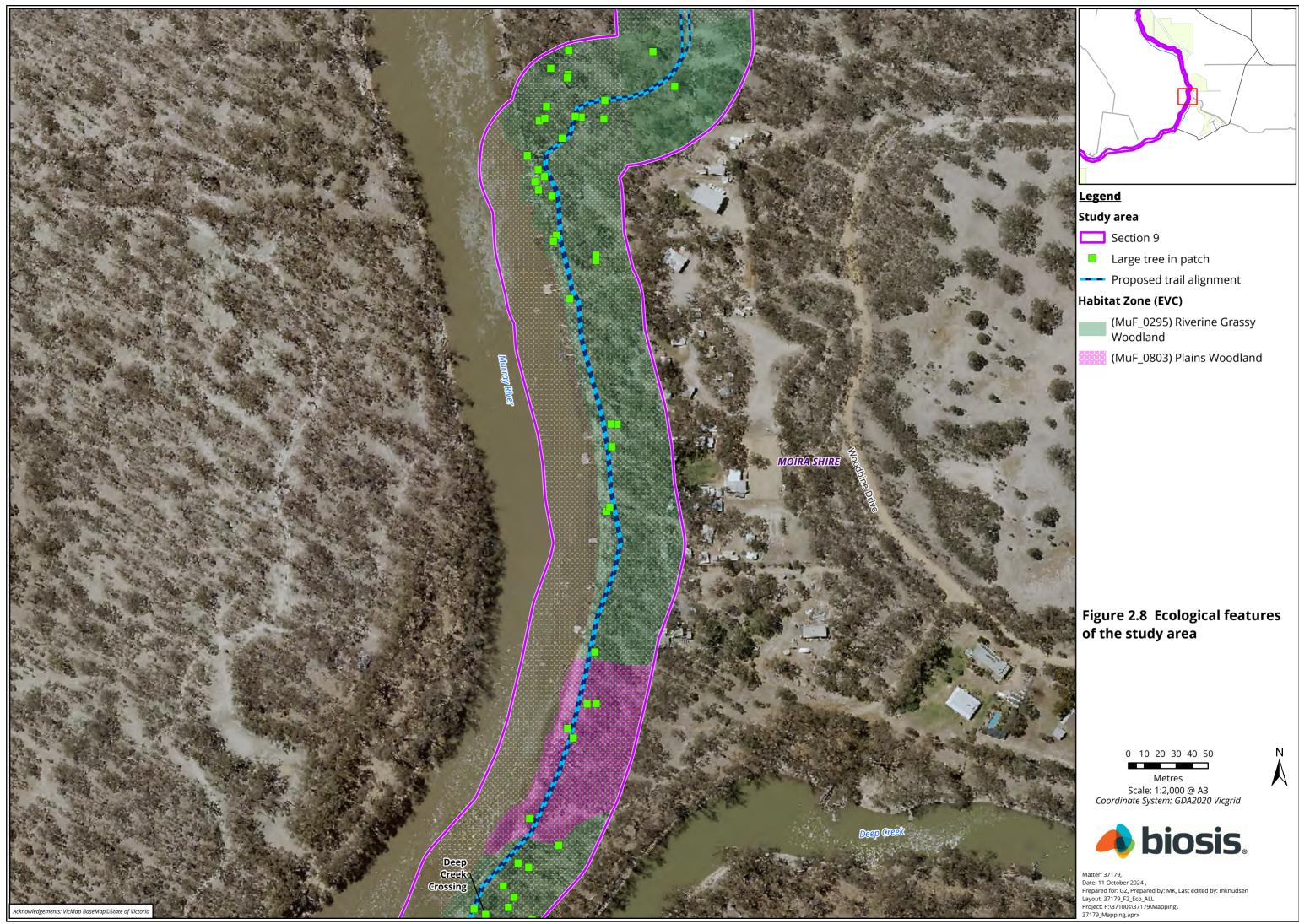




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid











Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

Figure 2.9 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland

Figure 2.10 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0803) Plains Woodland

Figure 2.11 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland

Figure 2.12 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

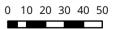
- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0295) Riverine Grassy Woodland

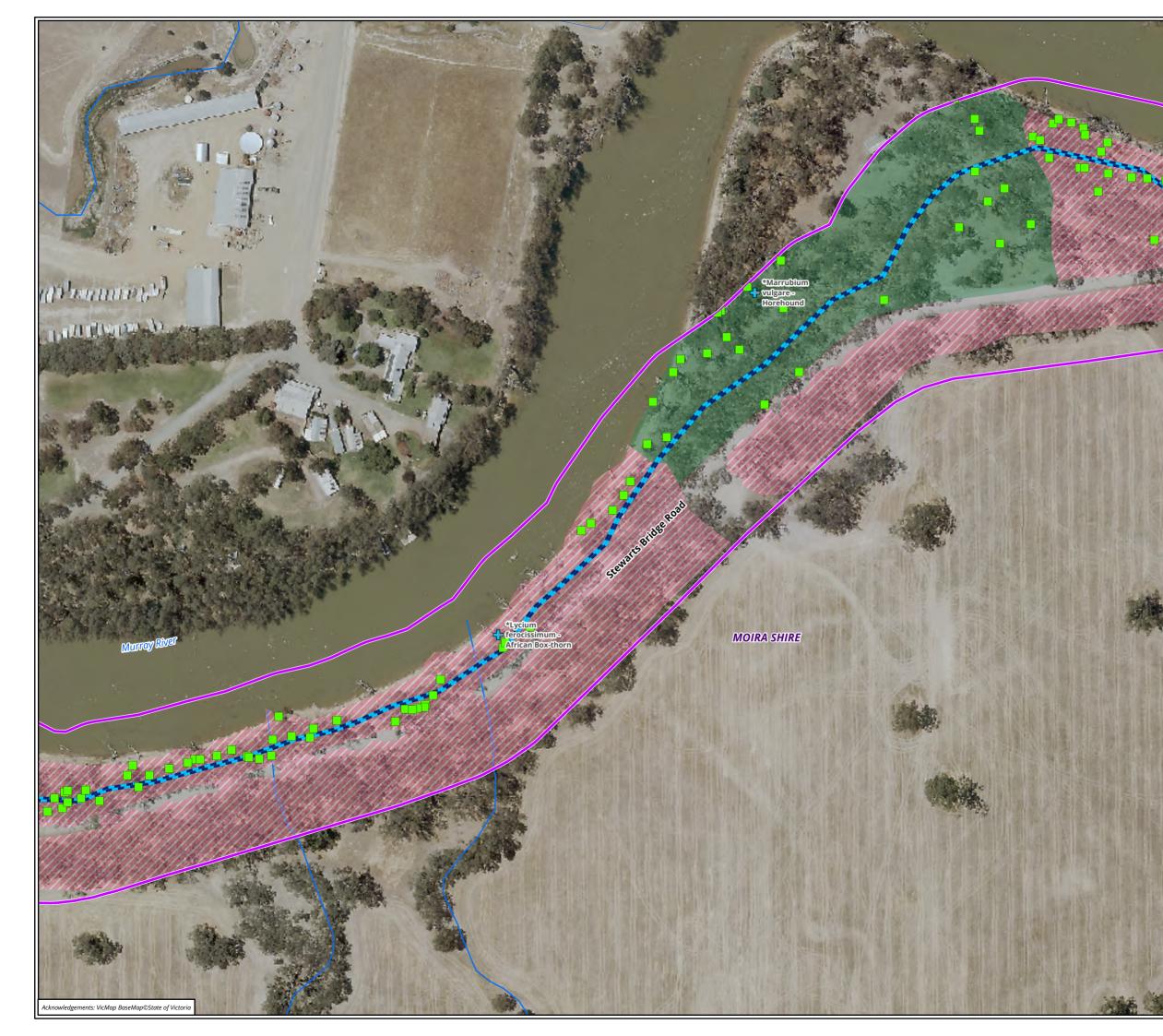
Figure 2.13 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0295) Riverine Grassy Woodland

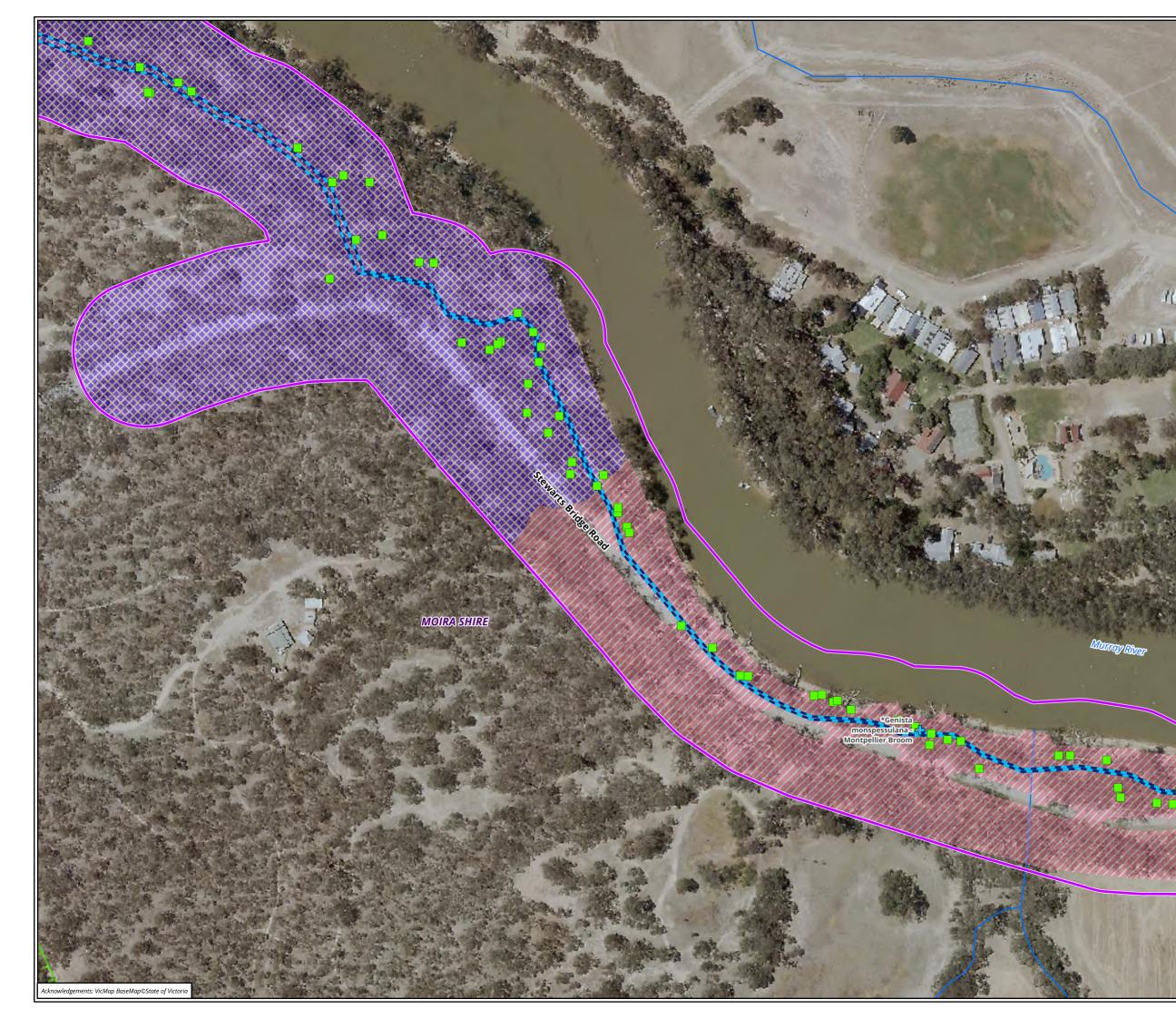
Figure 2.14 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Study area

- Section 9
- National Park
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)



(MuF_0056) Floodplain Riparian Woodland

(MuF_0103) Riverine Chenopod Woodland

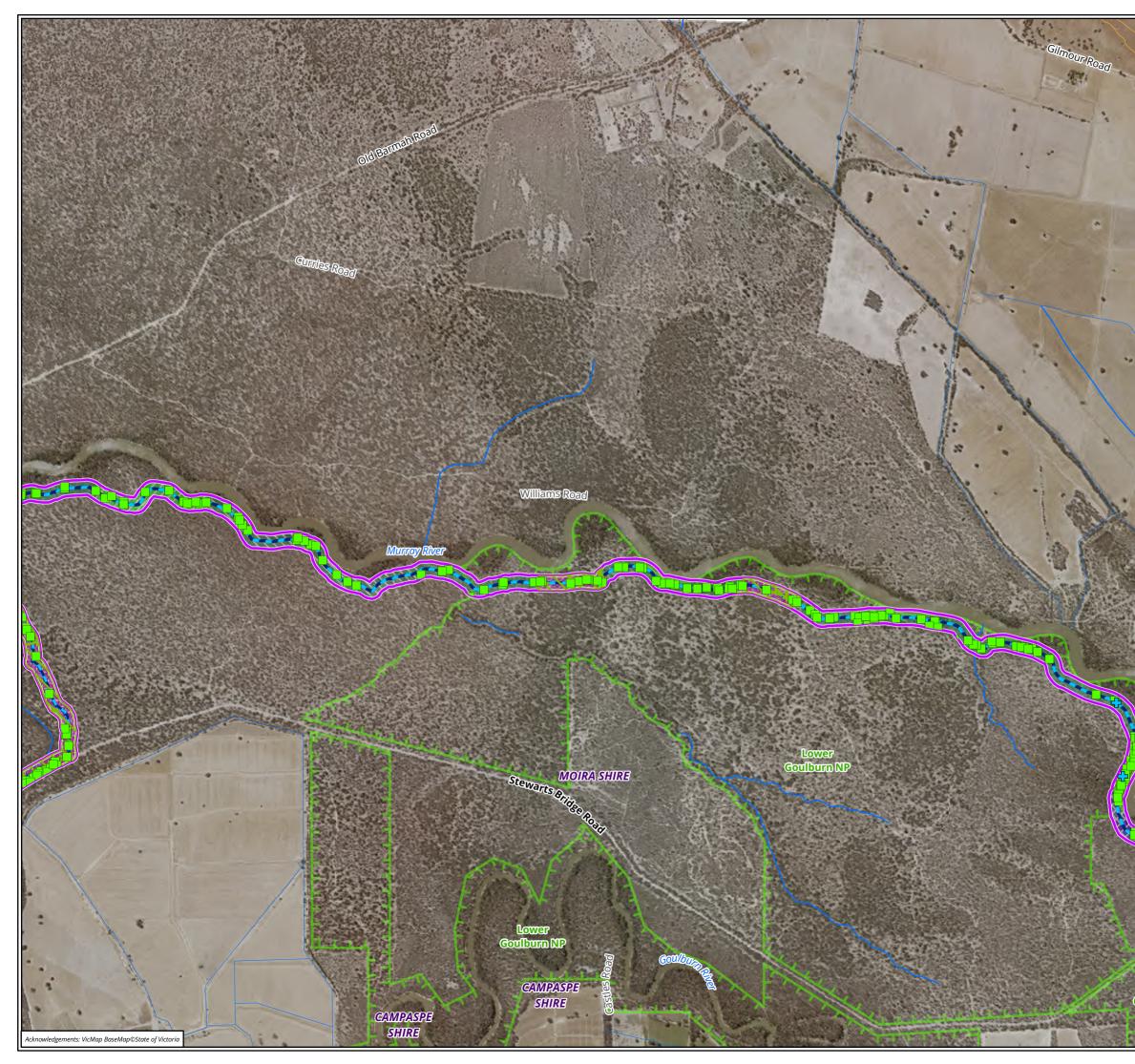
Figure 2.15 Ecological features of the study area

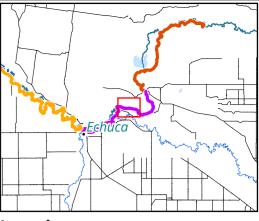




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

Section 9

National Park

- ✤ Weed species observation
- Large tree in patch
- ---- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0106) Grassy Riverine Forest

(MuF_0295) Riverine Grassy Woodland

- (MuF_0803) Plains Woodland
- (MuF_0814) Riverine Swamp Forest
- Threatened ecological community

Figure 2.16 Ecological features of the study area



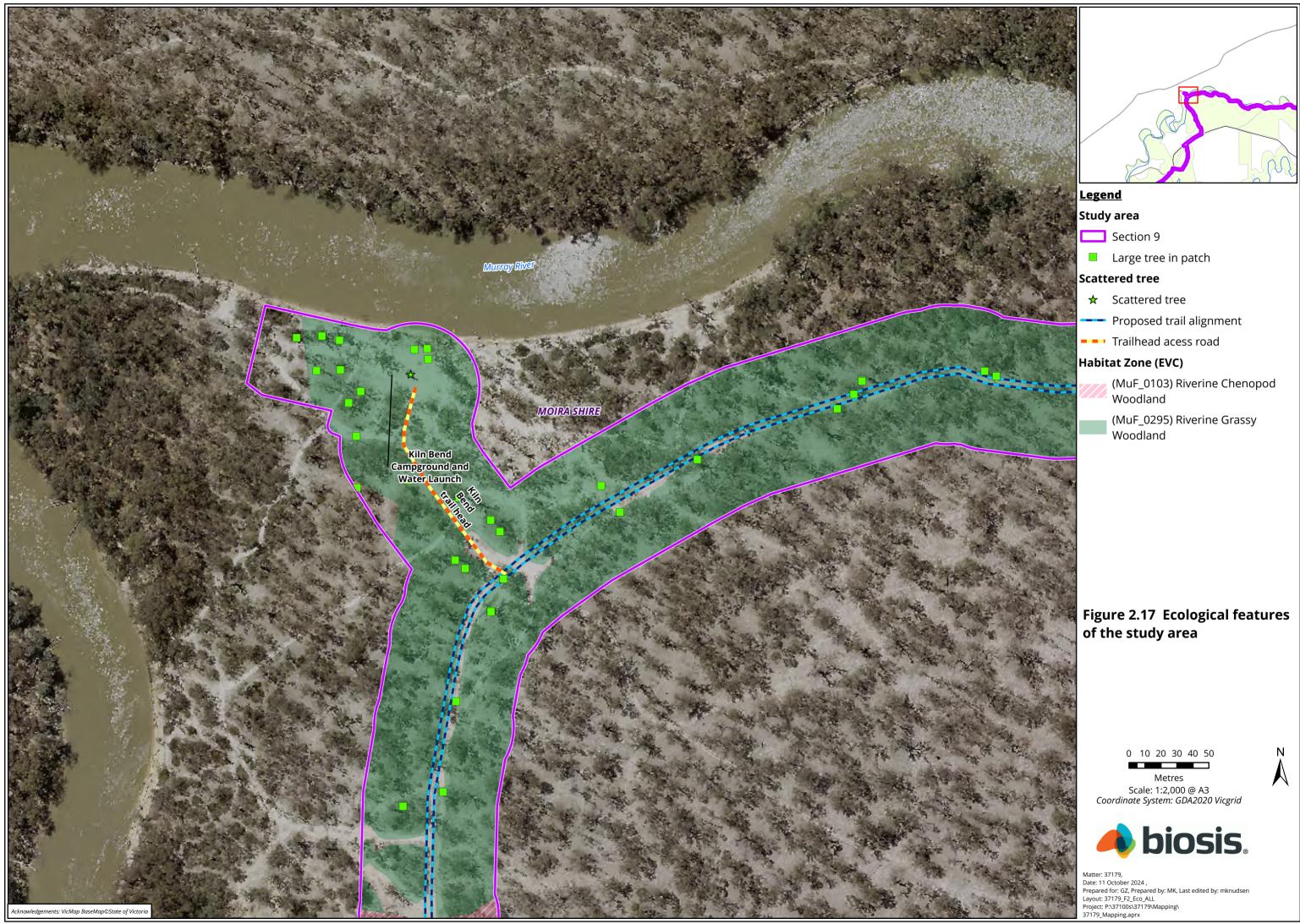


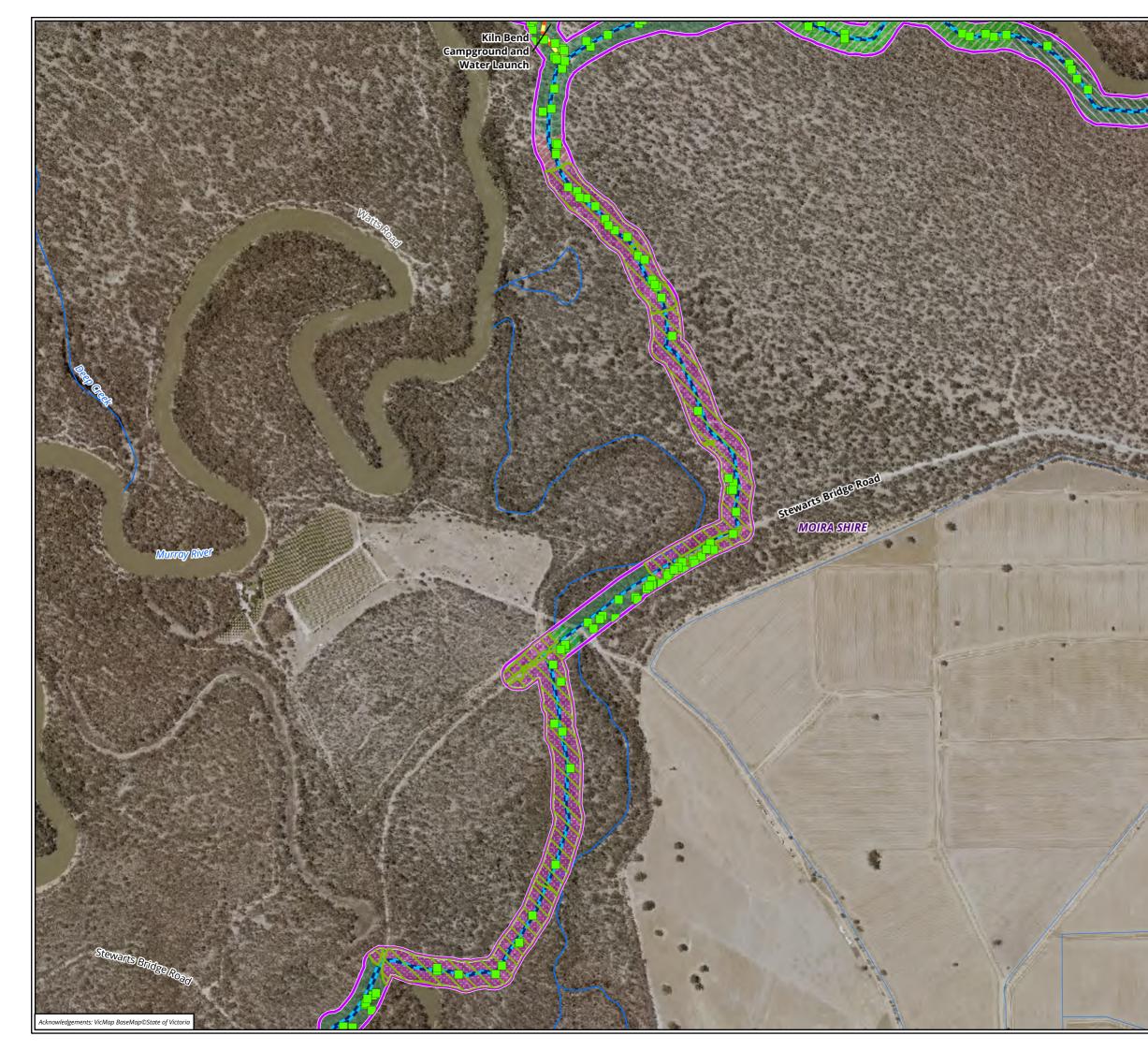
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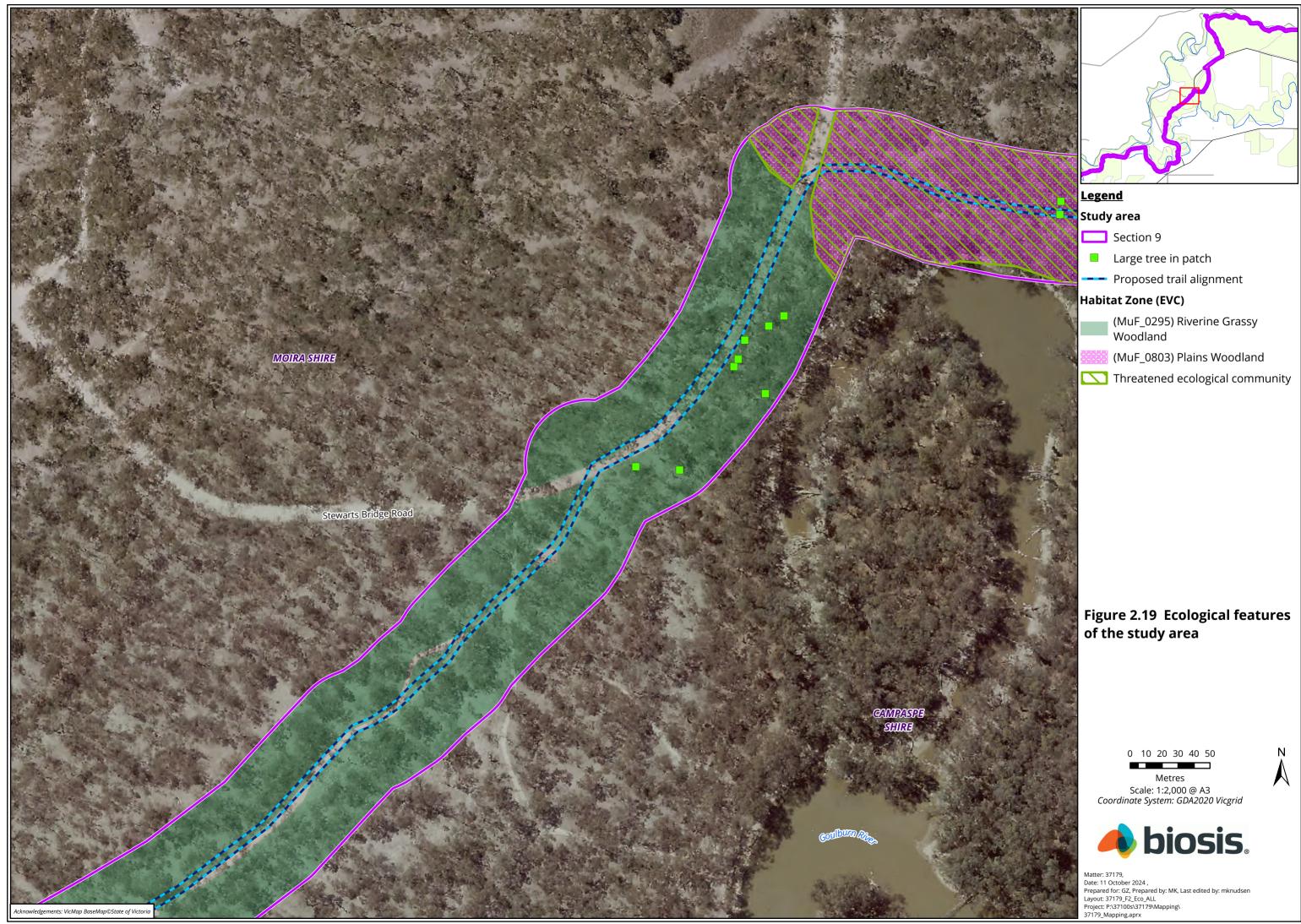
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Lower Coulburn NP

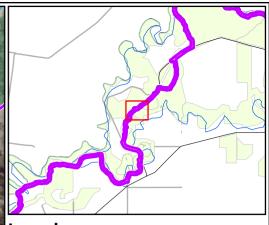












Study area

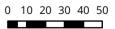
- Section 9
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

> (MuF_0295) Riverine Grassy Woodland

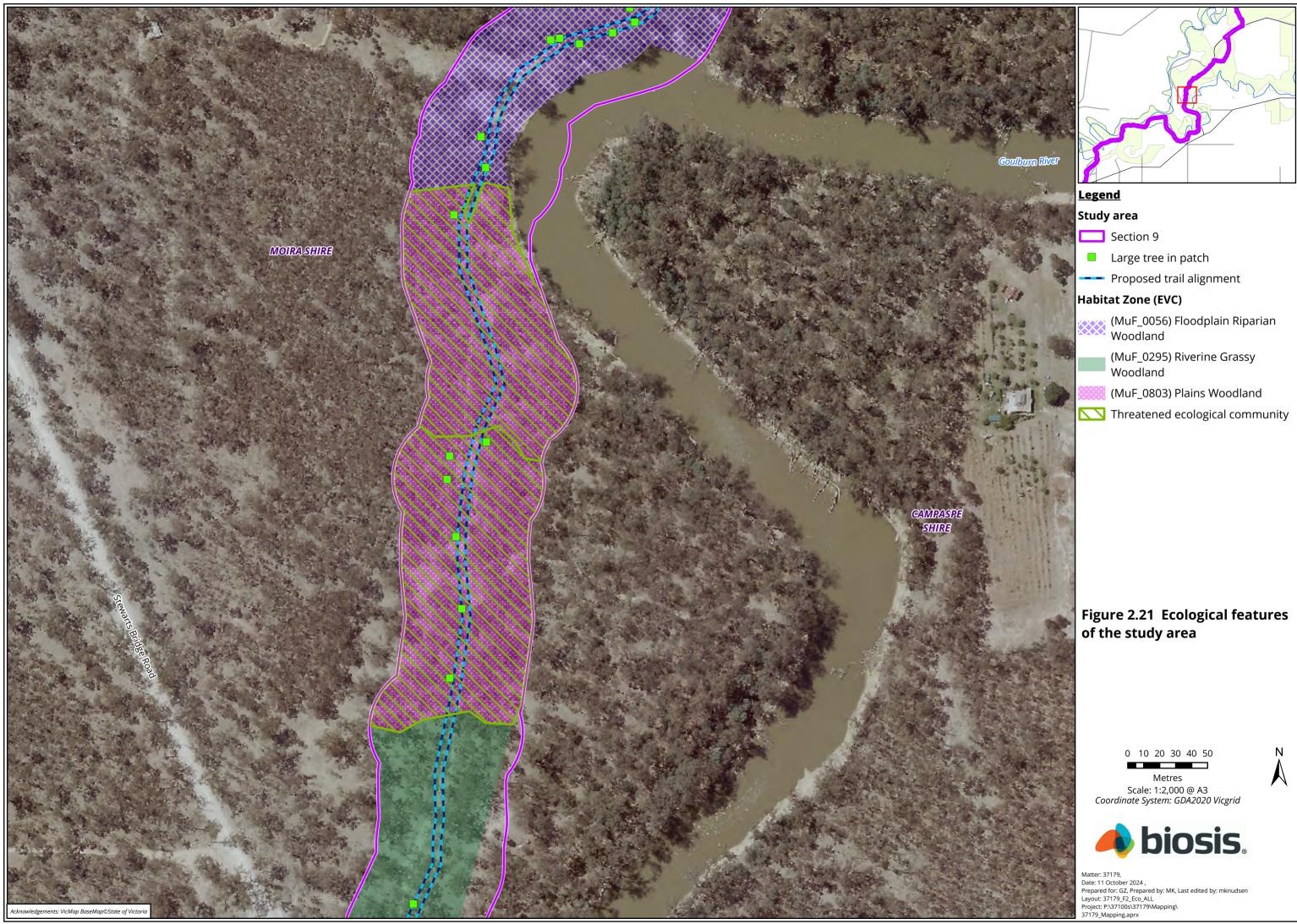
Figure 2.20 Ecological features of the study area

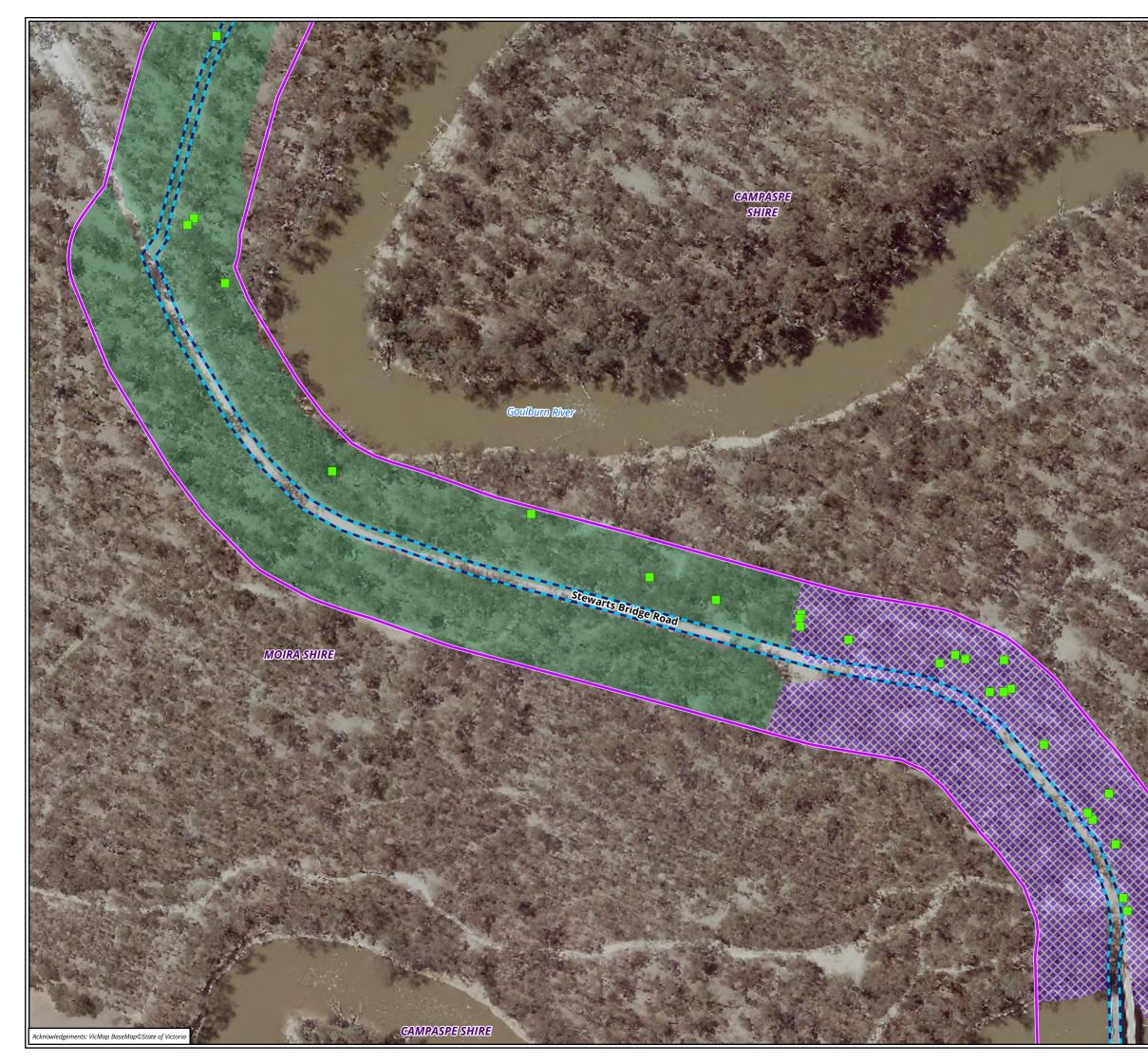




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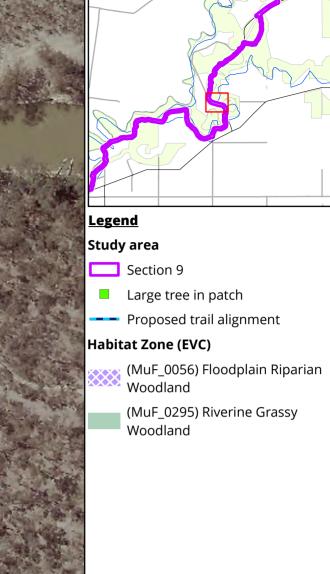
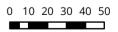


Figure 2.22 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid



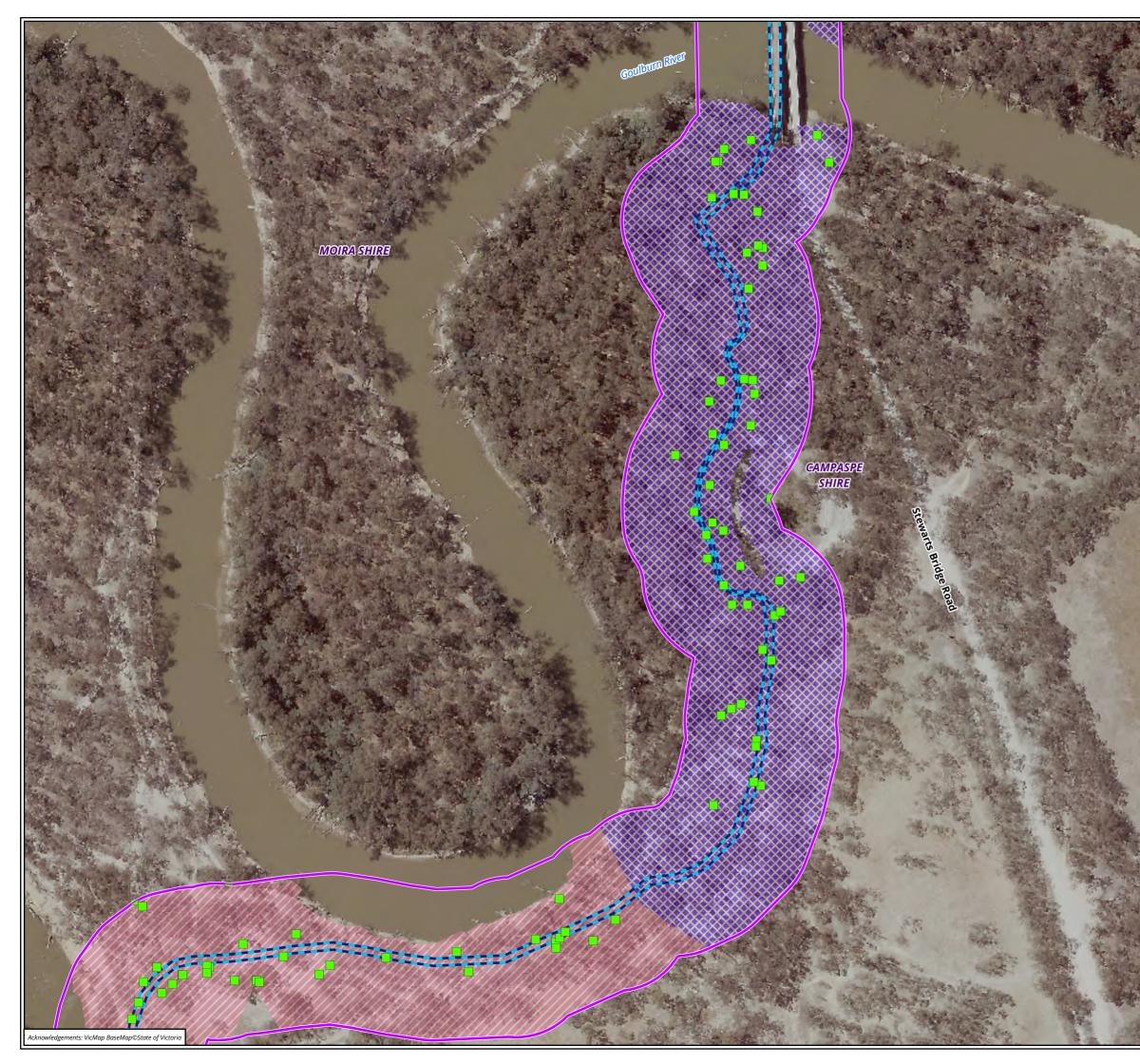
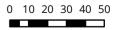




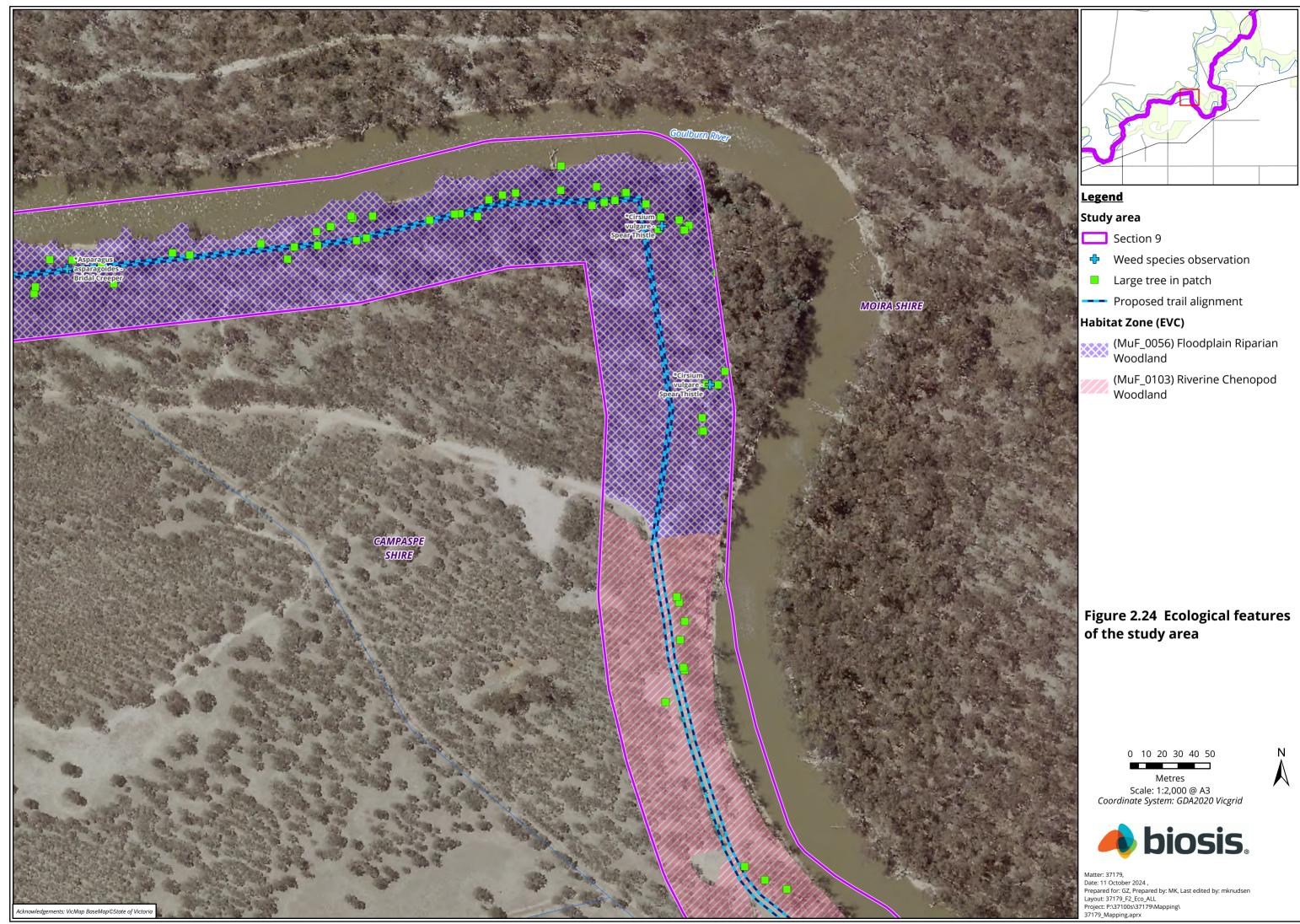
Figure 2.23 Ecological features of the study area

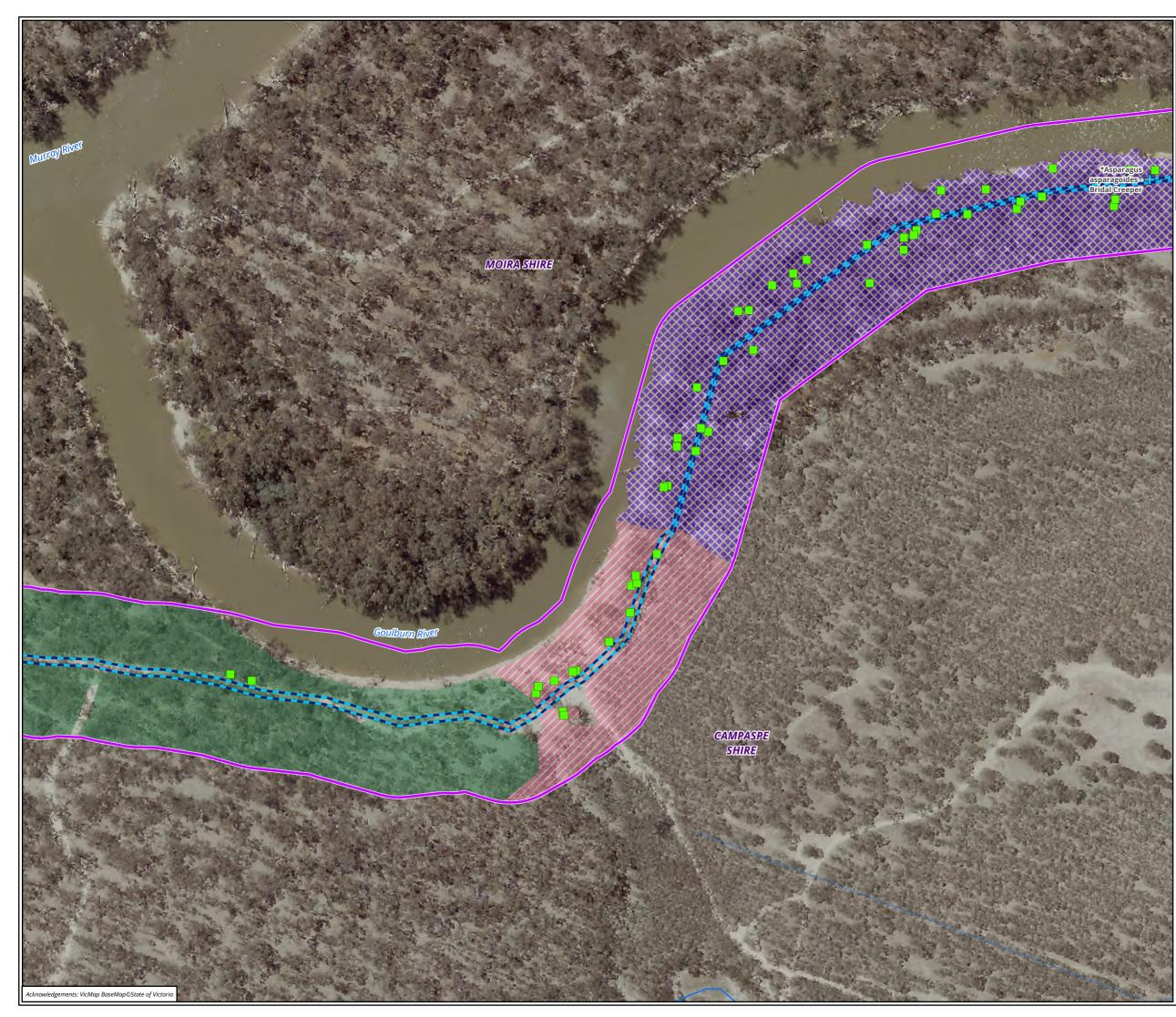


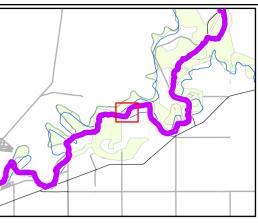


Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid









Study area

- Section 9
- ✤ Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0295) Riverine Grassy Woodland

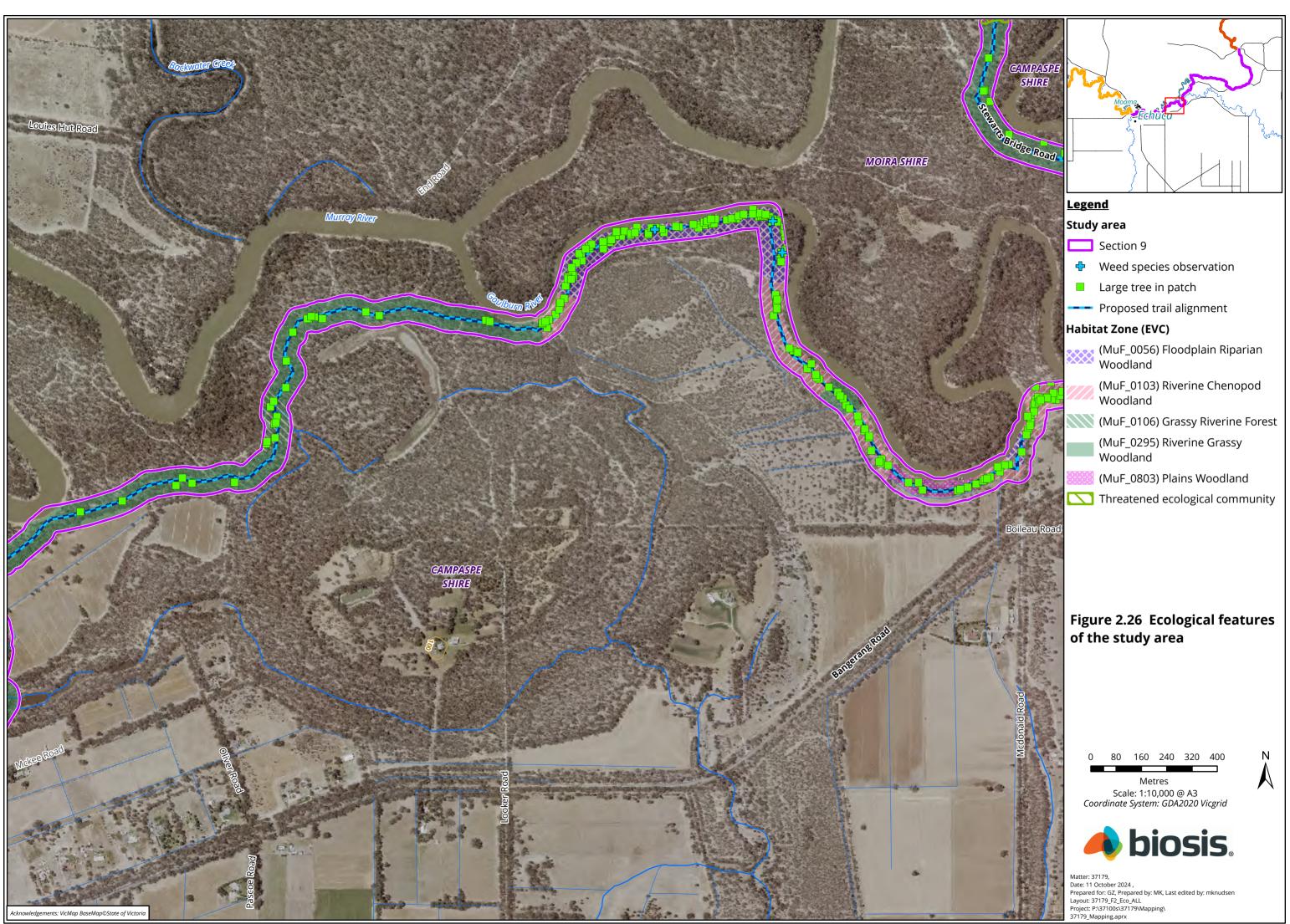
Figure 2.25 Ecological features of the study area

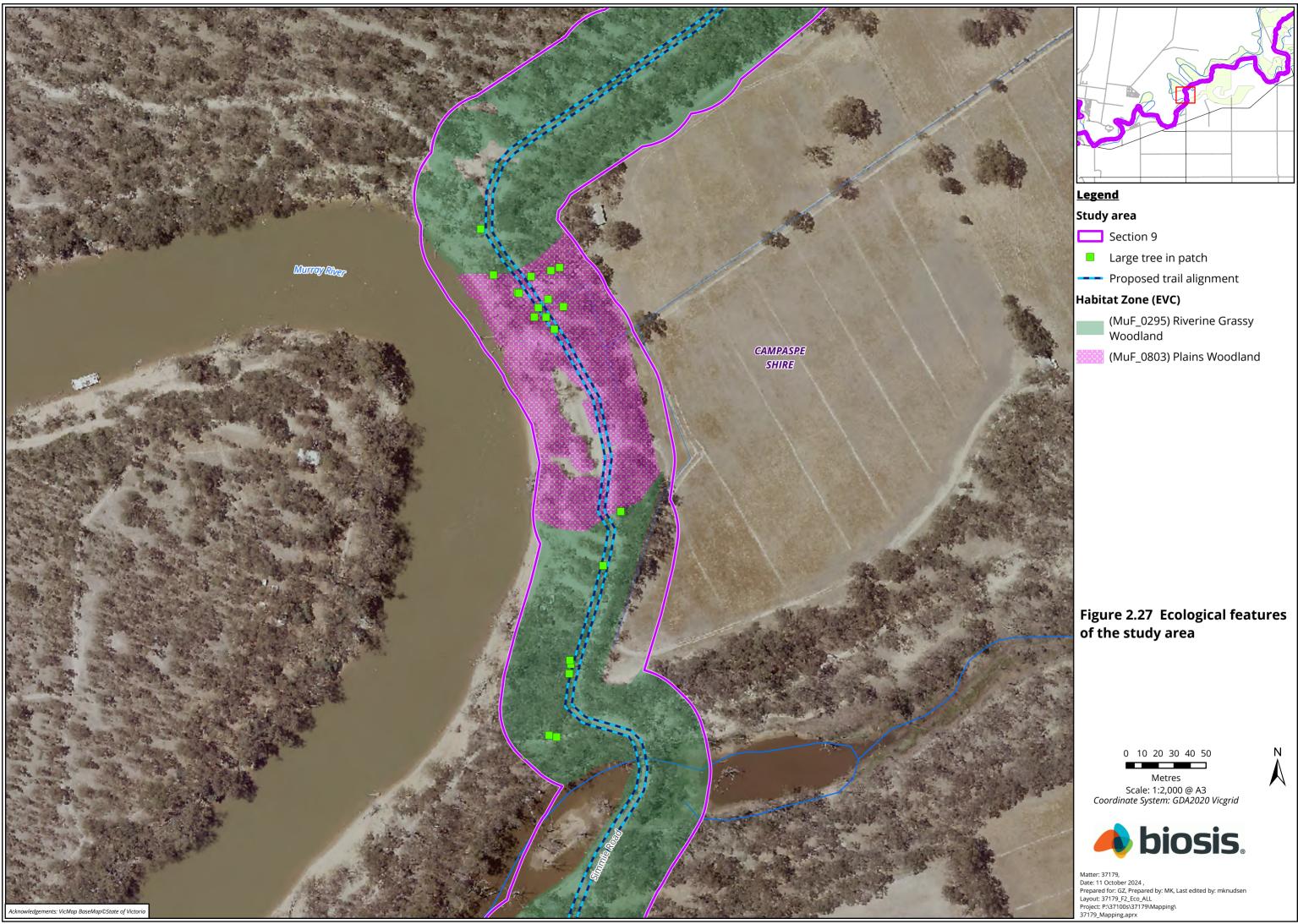


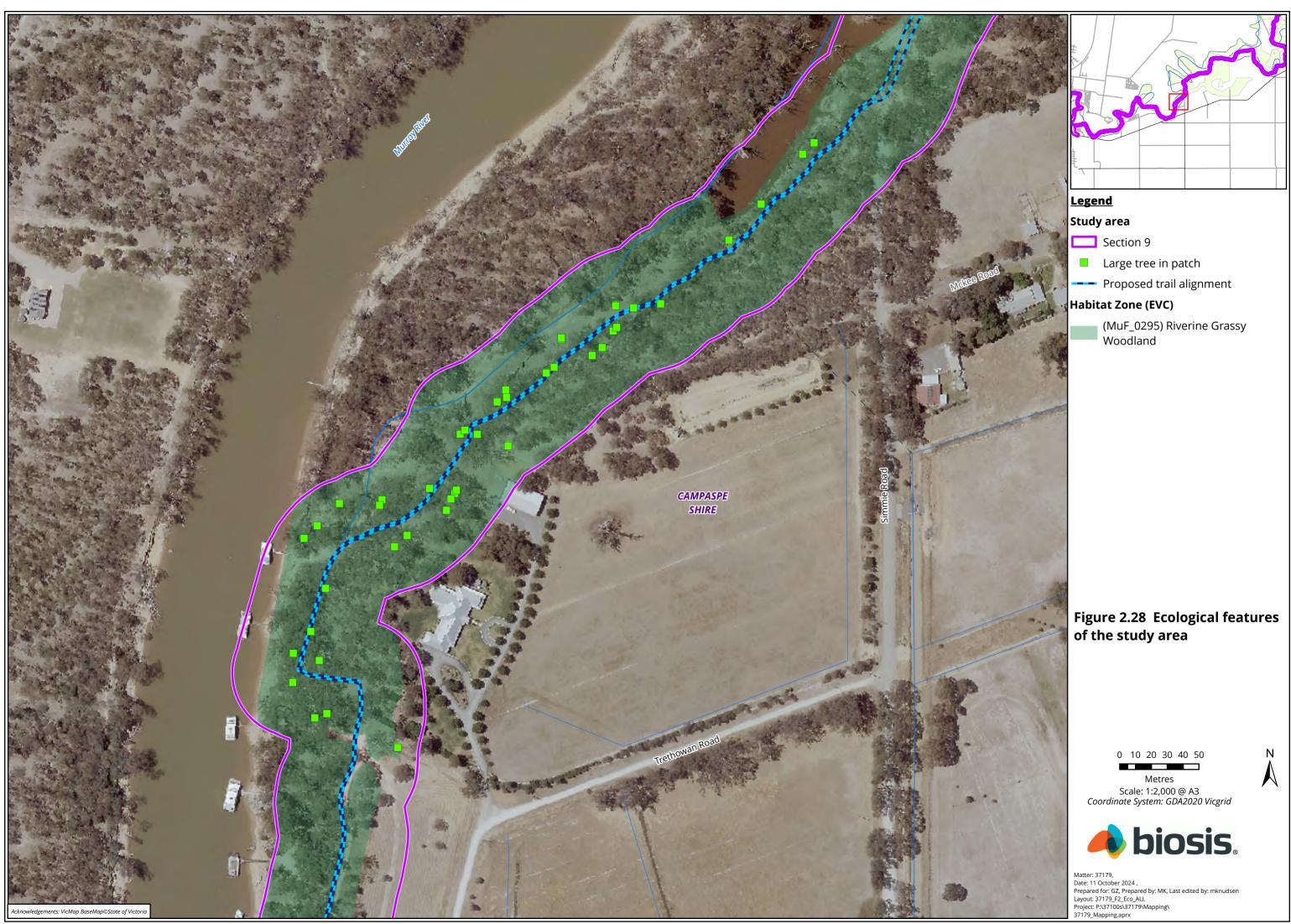


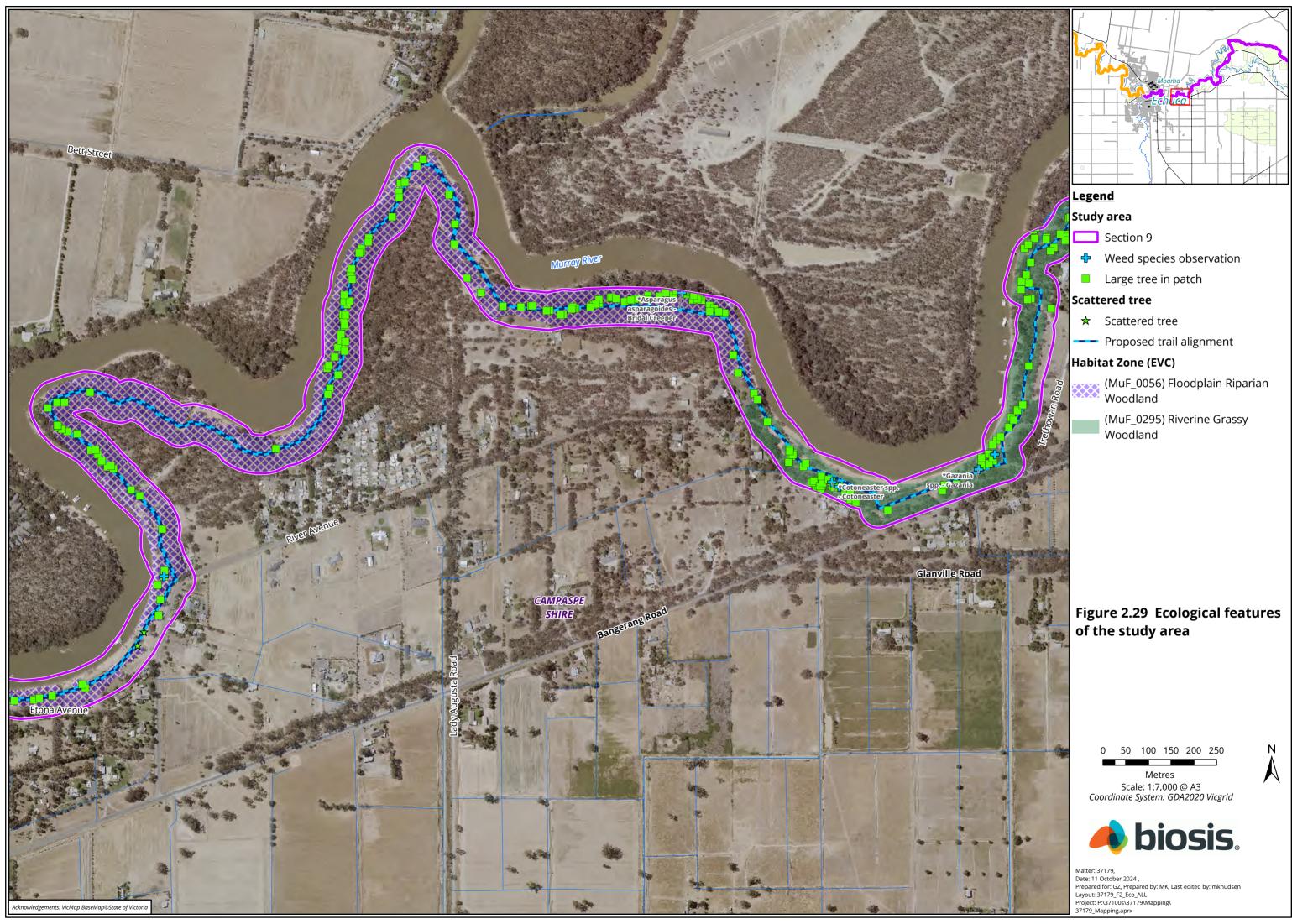
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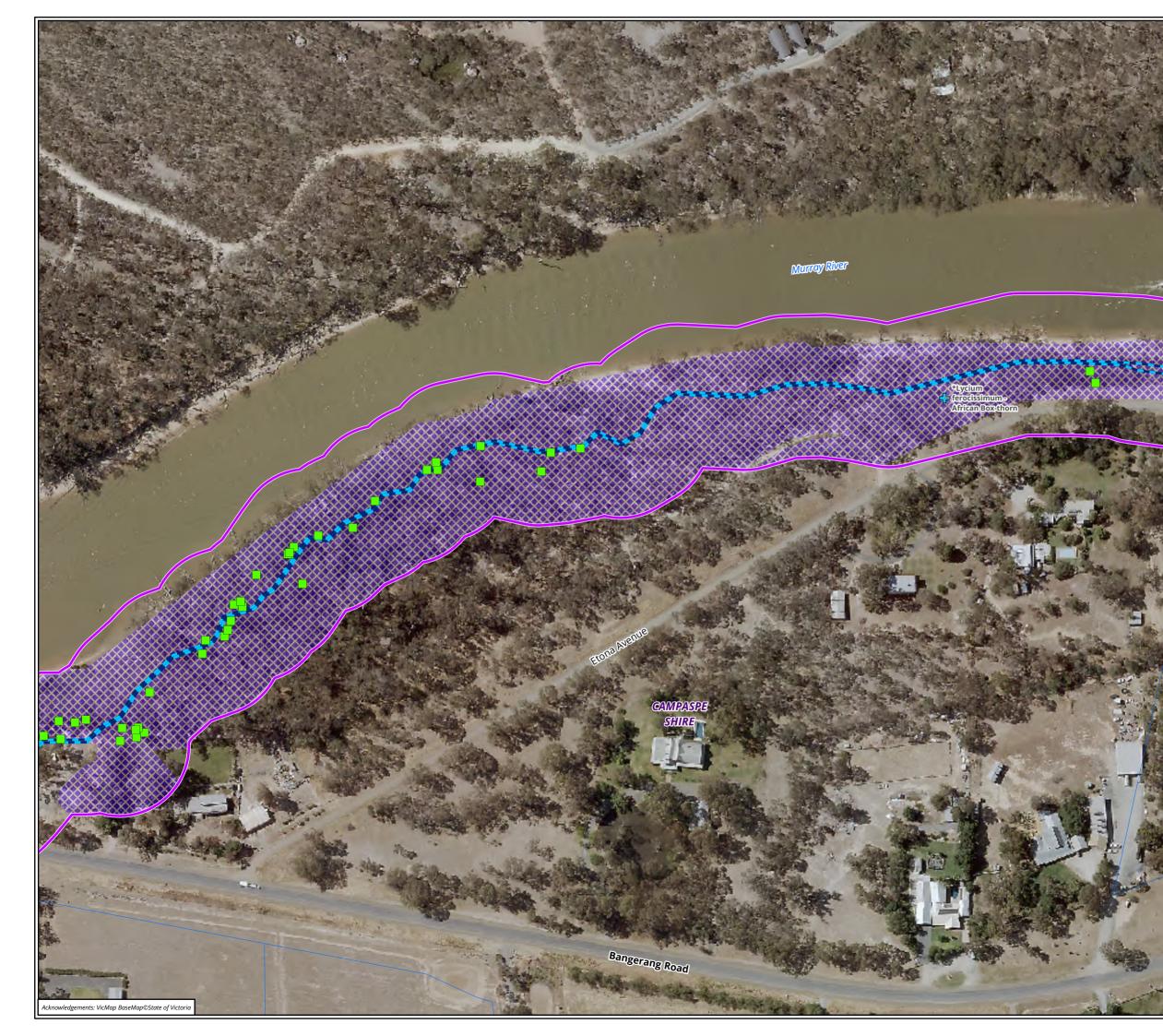


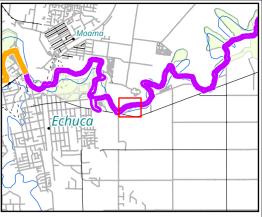












Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)



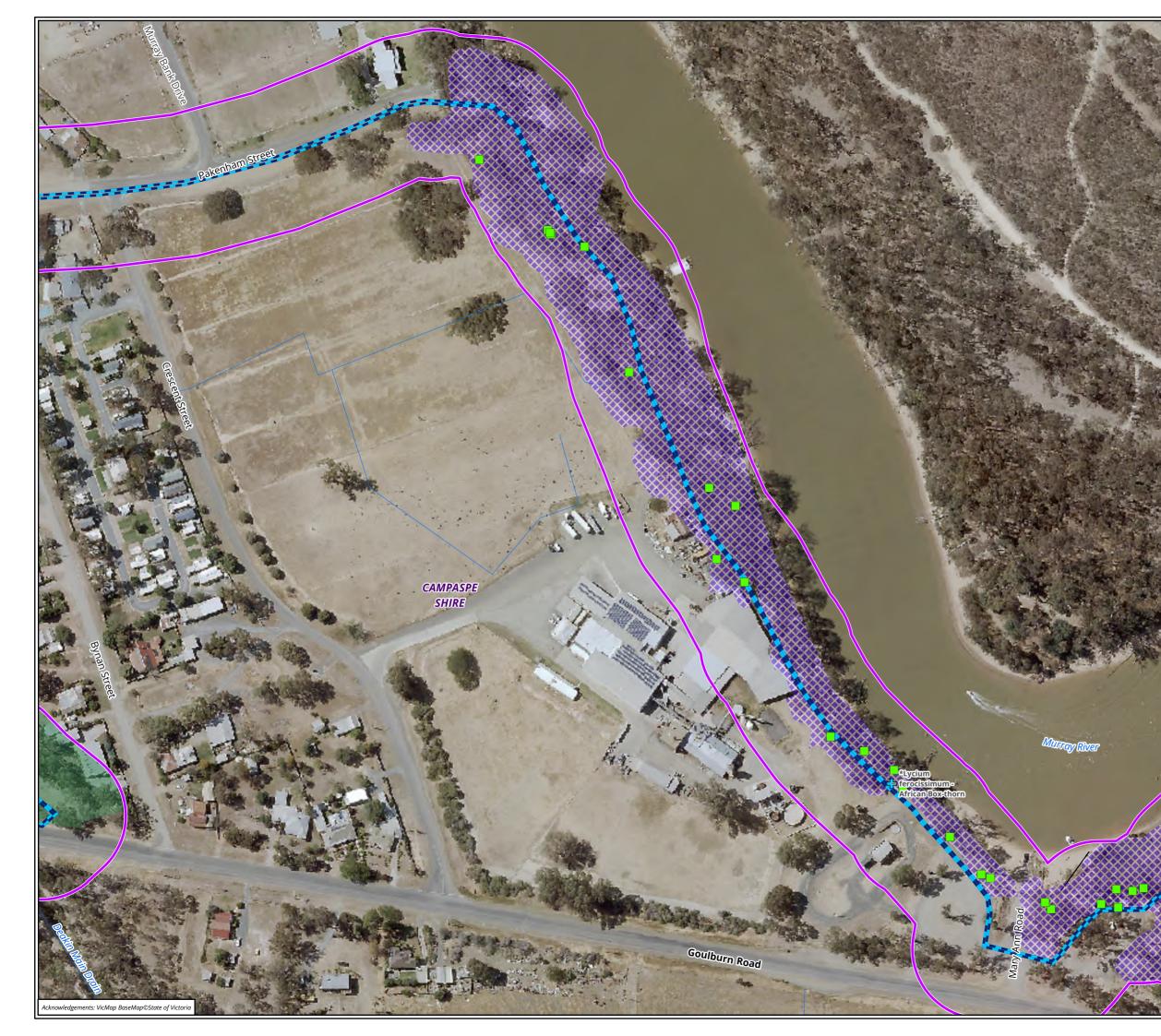
Figure 2.30 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0295) Riverine Grassy Woodland

Figure 2.31 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





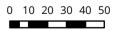
Study area

- Section 9
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

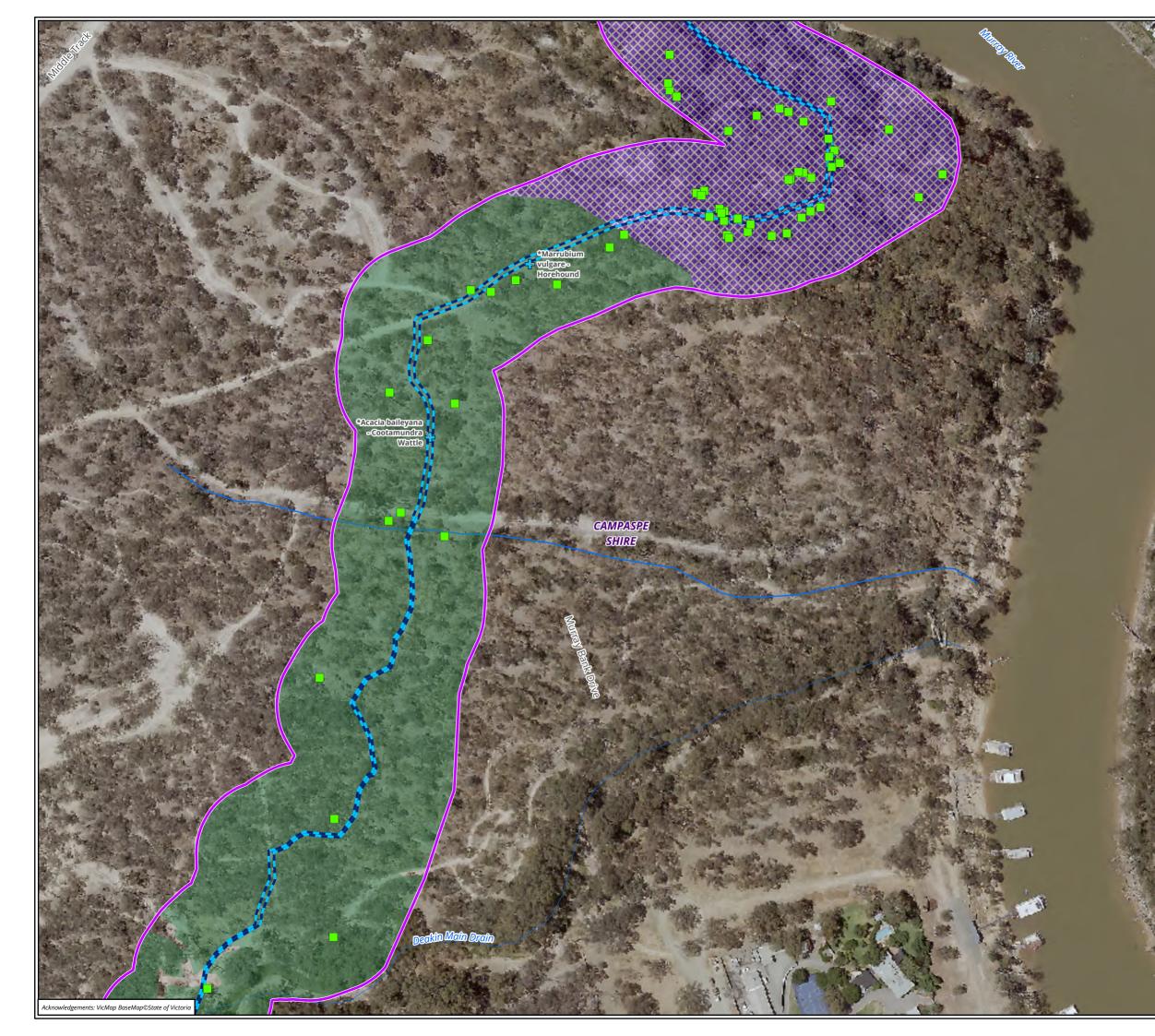
Figure 2.32 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Study area

- Section 9
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

> (MuF_0295) Riverine Grassy Woodland

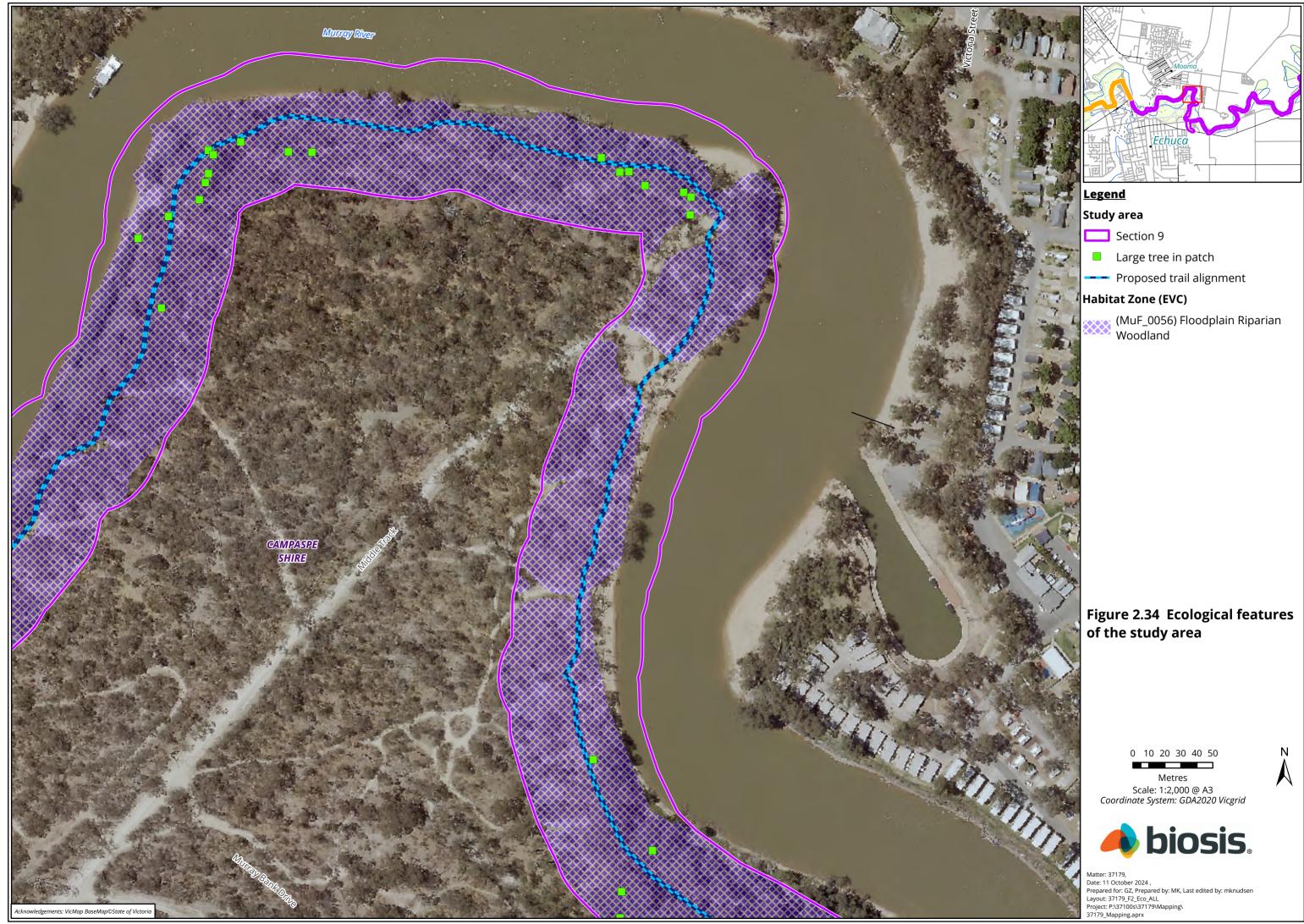
Figure 2.33 Ecological features of the study area

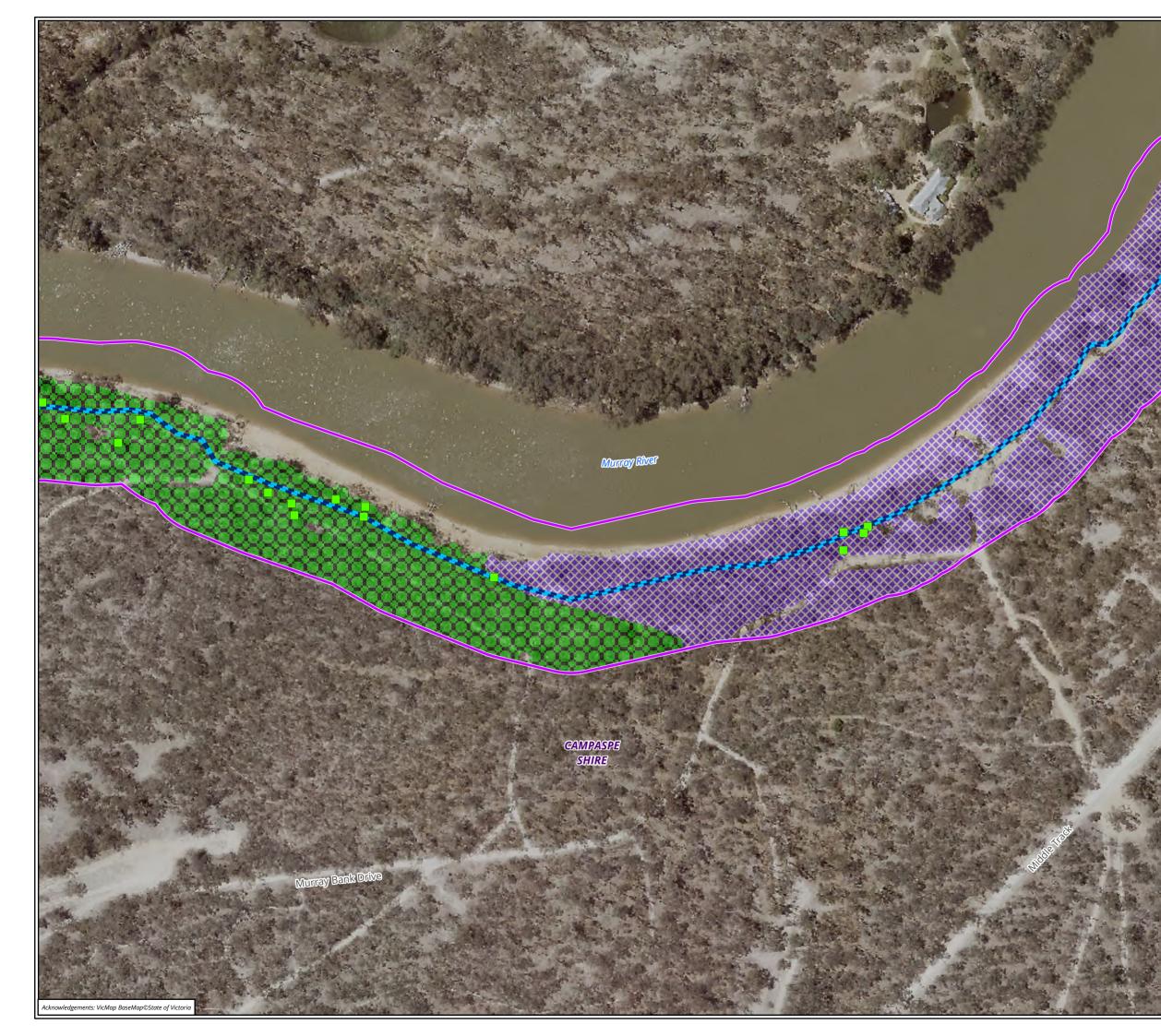




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

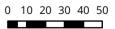
- Section 9
- Large tree in patch
- ---- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0815) Riverine Swampy Woodland

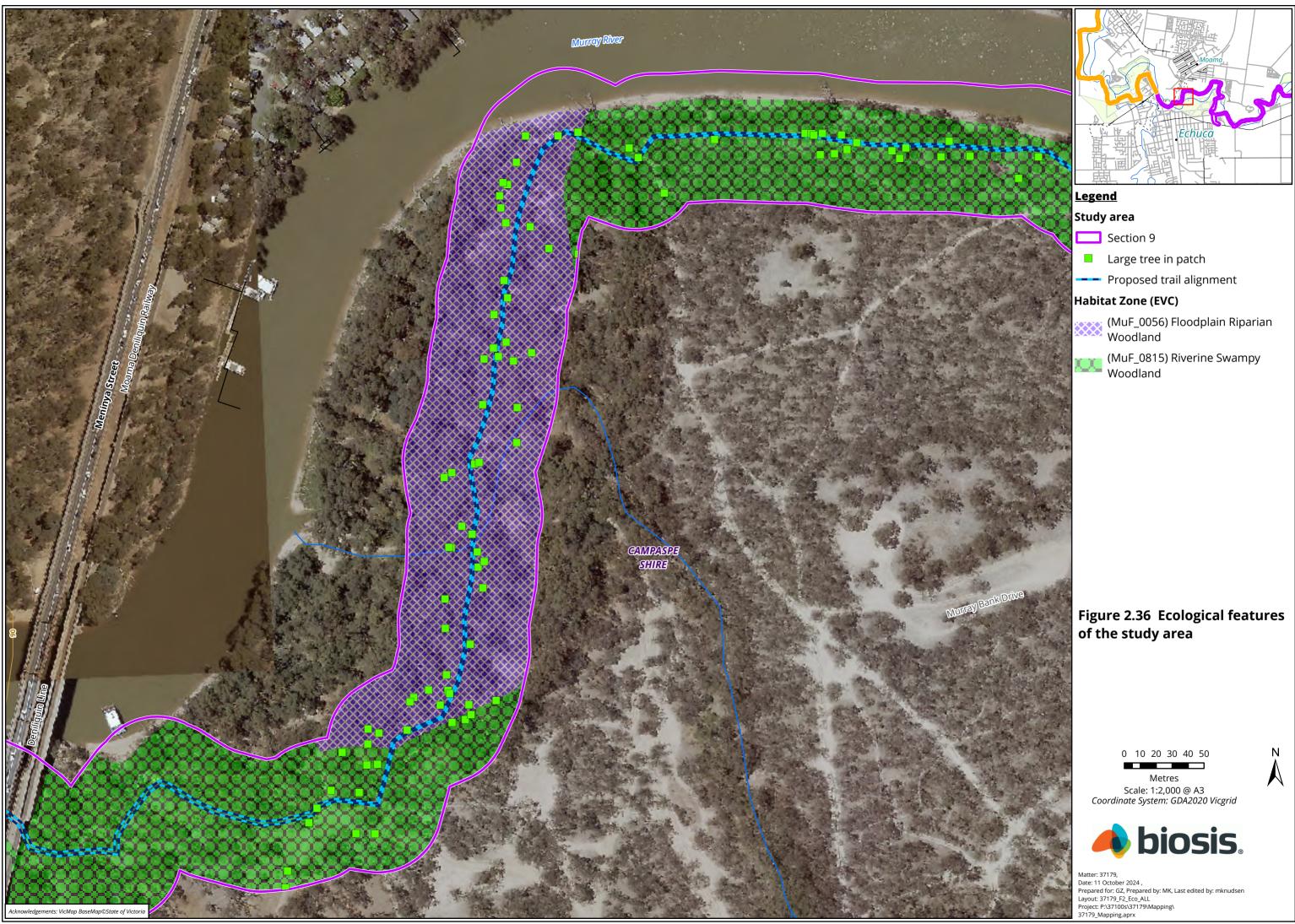
Figure 2.35 Ecological features of the study area

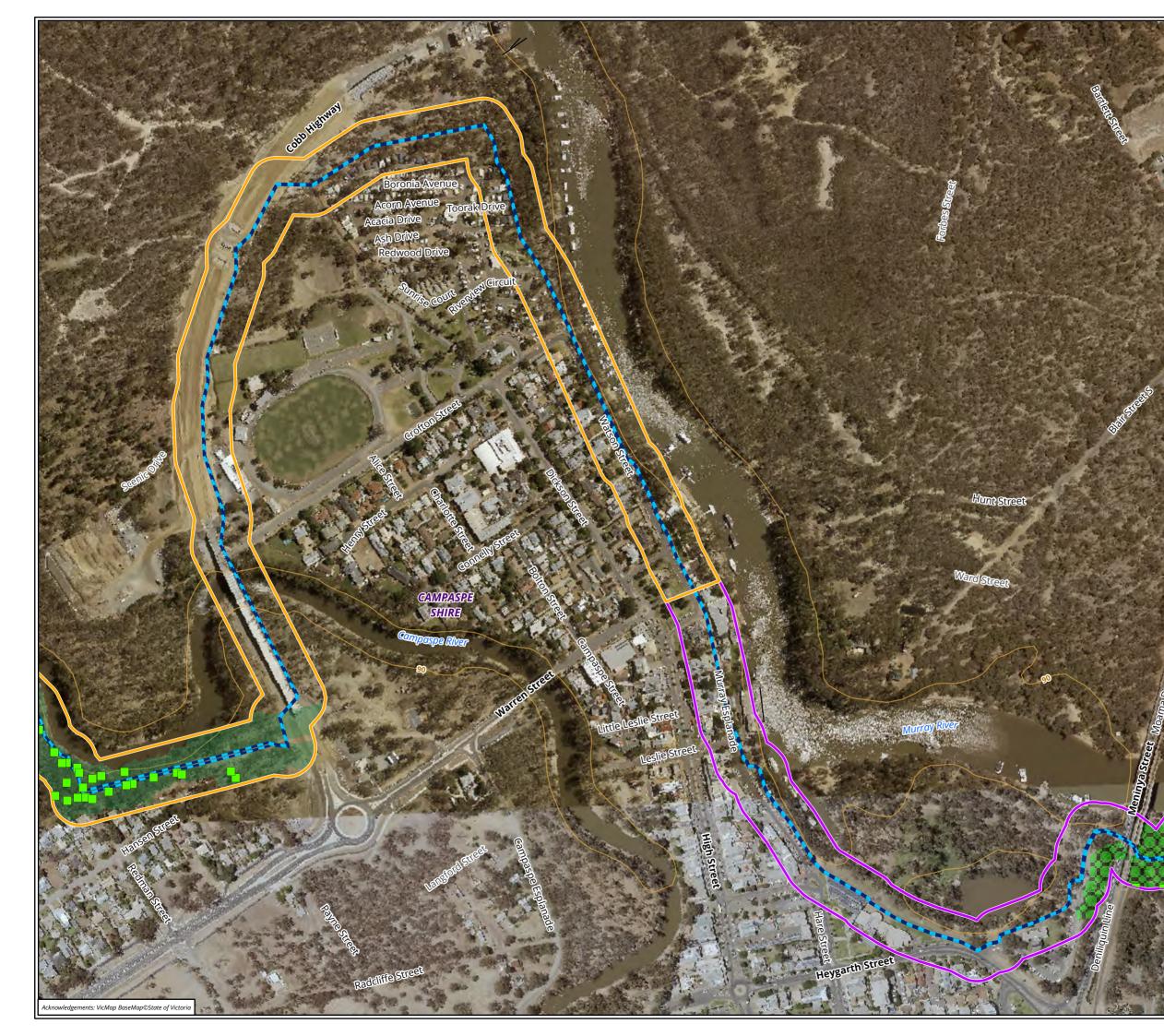


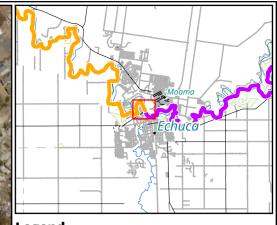


Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid









Study area

- Section 9
- Section 10
- Large tree in patch
- --- Proposed trail alignment

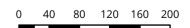
Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

(MuF_0815) Riverine Swampy Woodland

(VRiv0295) Riverine Grassy Woodland

Figure 2.37 Ecological features of the study area

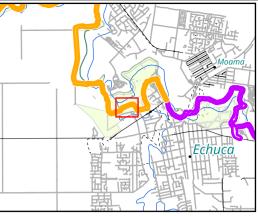




Metres Scale: 1:5,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest

- (MuF_0295) Riverine Grassy Woodland
- (VRiv0106) Grassy Riverine Forest
 - (VRiv0295) Riverine Grassy Woodland

Figure 2.38 Ecological features of the study area

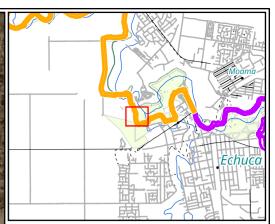




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0106) Grassy Riverine Forest
- (VRiv0106) Grassy Riverine Forest

(VRiv0295) Riverine Grassy Woodland

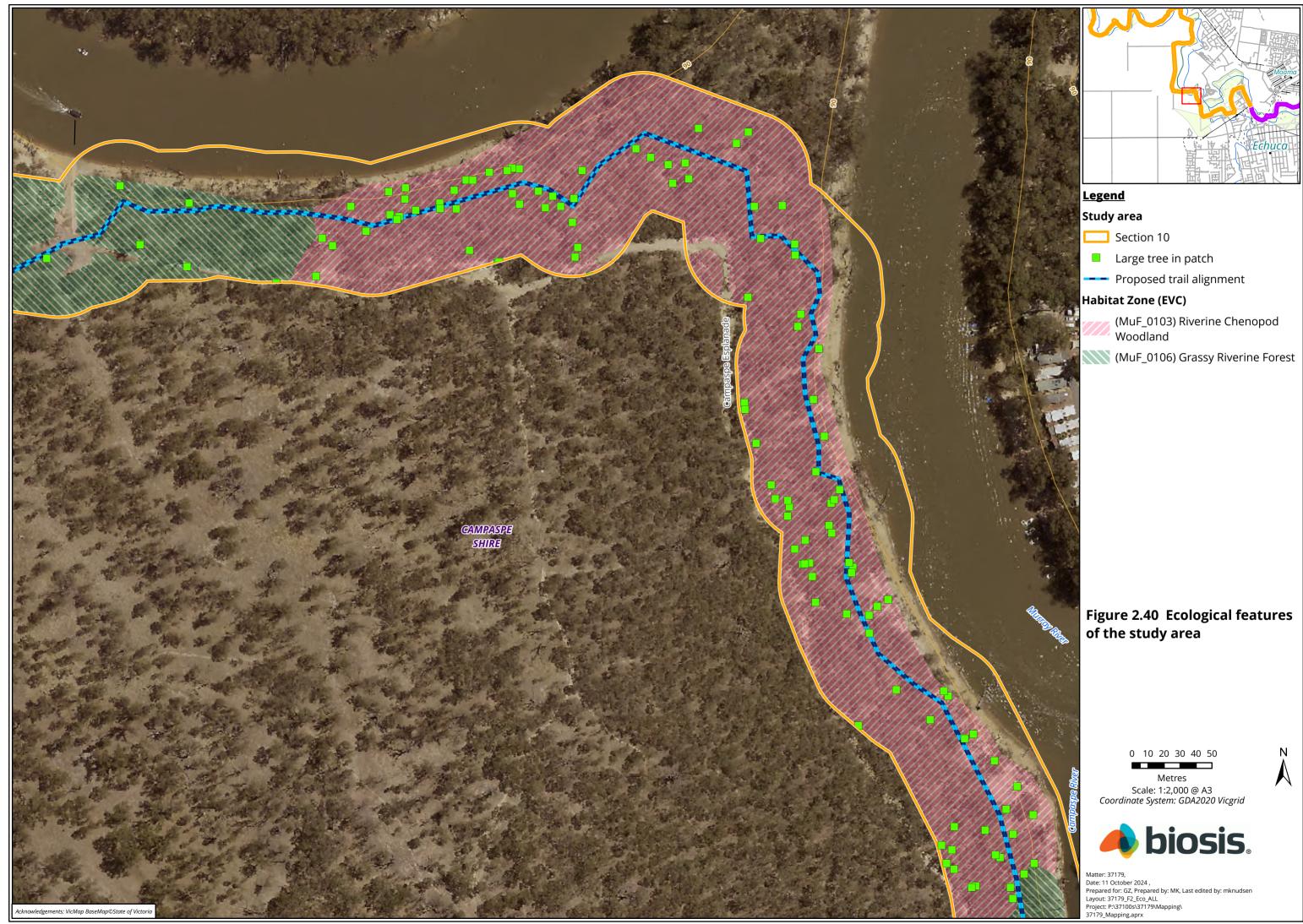
Figure 2.39 Ecological features of the study area

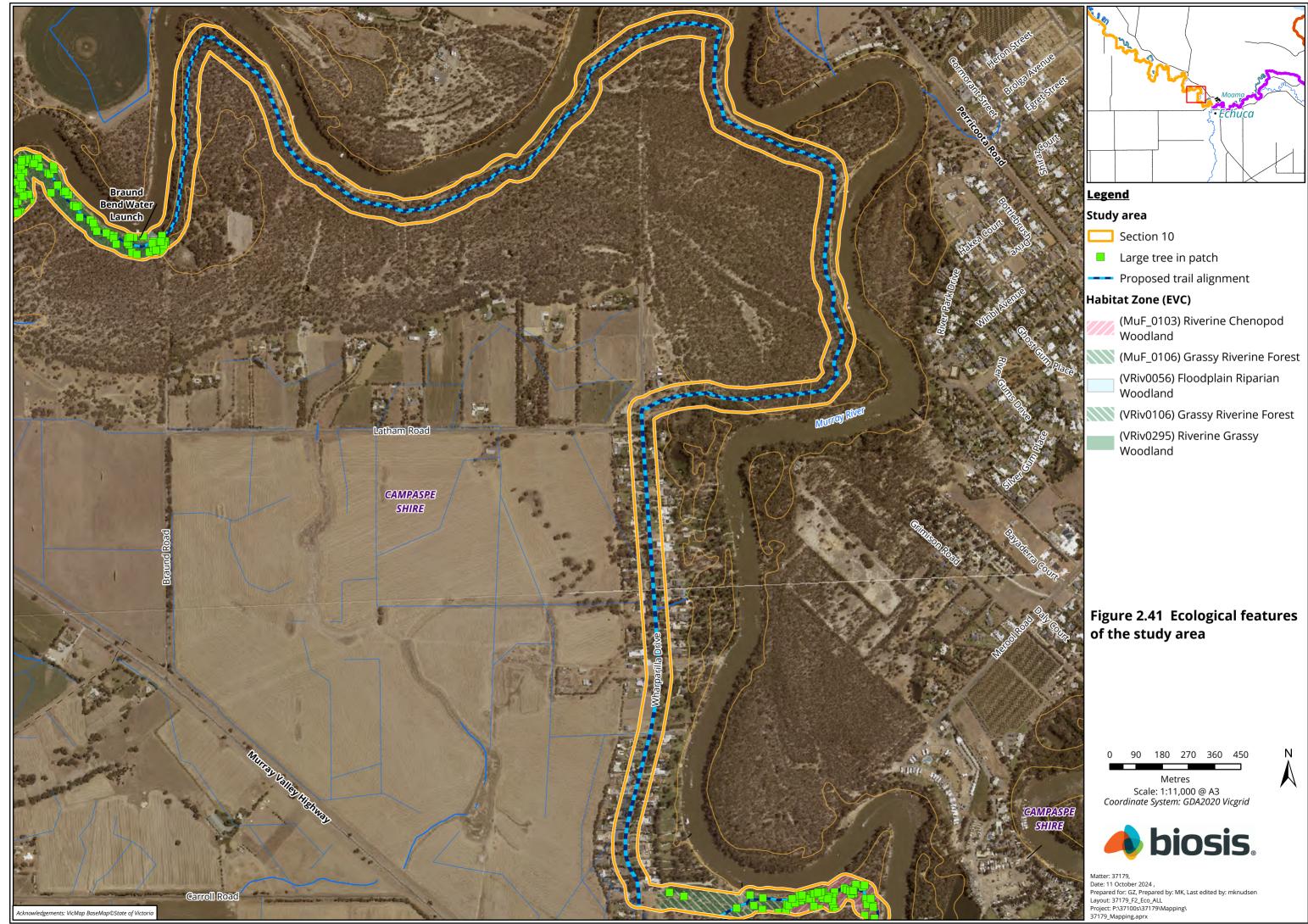
0 10 20 30 40 50

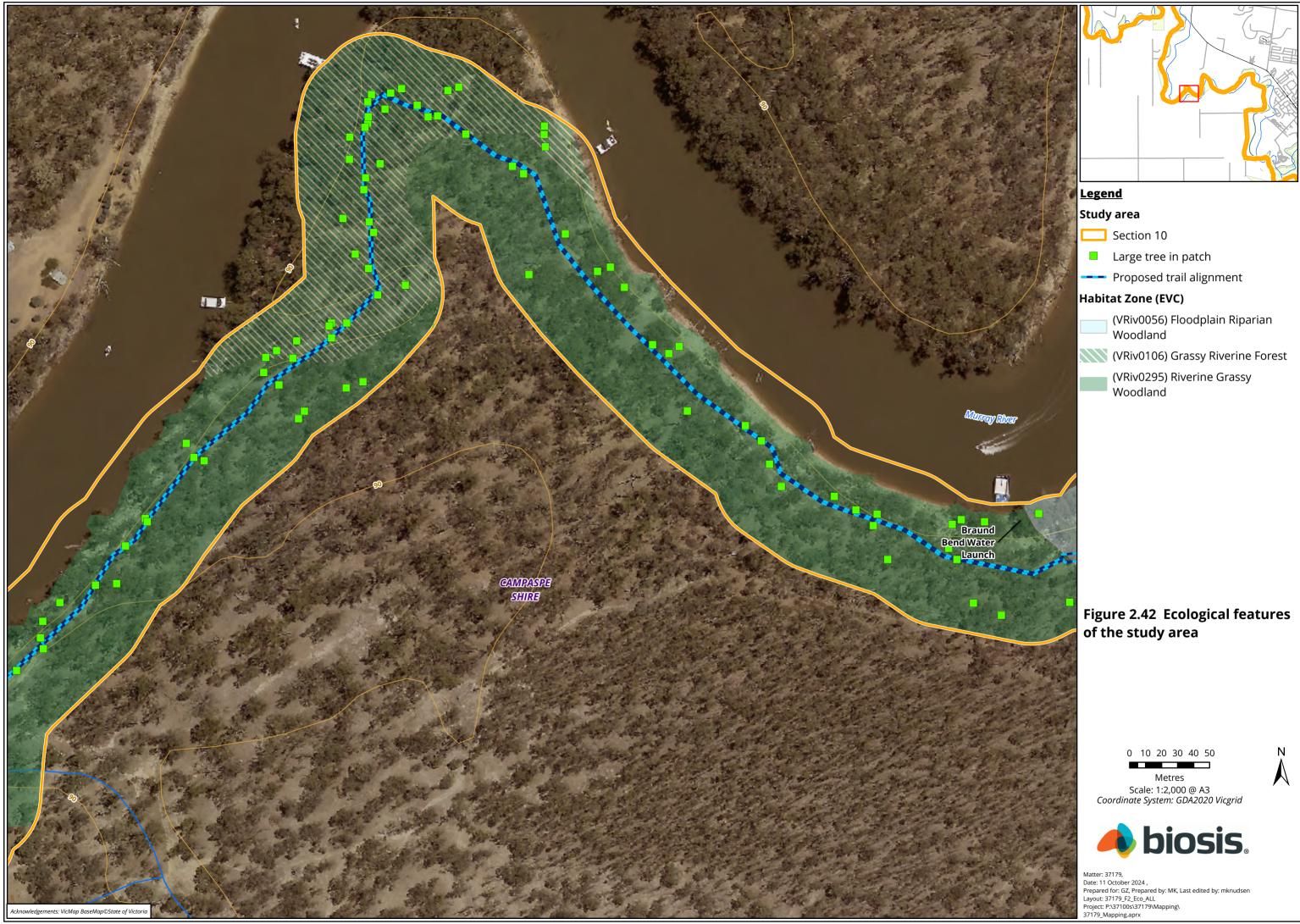


Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid

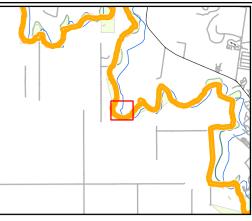












Study area

- Section 10
- Large tree in patch

Scattered tree

- ★ Scattered tree
- ---- Proposed trail alignment

Habitat Zone (EVC)

(VRiv0106) Grassy Riverine Forest (VRiv0295) Riverine Grassy Woodland

Figure 2.43 Ecological features of the study area

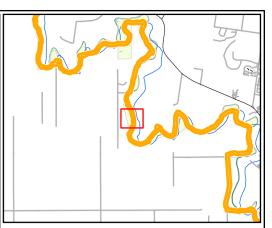




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

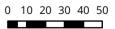
- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(VRiv0106) Grassy Riverine Forest

(VRiv0295) Riverine Grassy Woodland

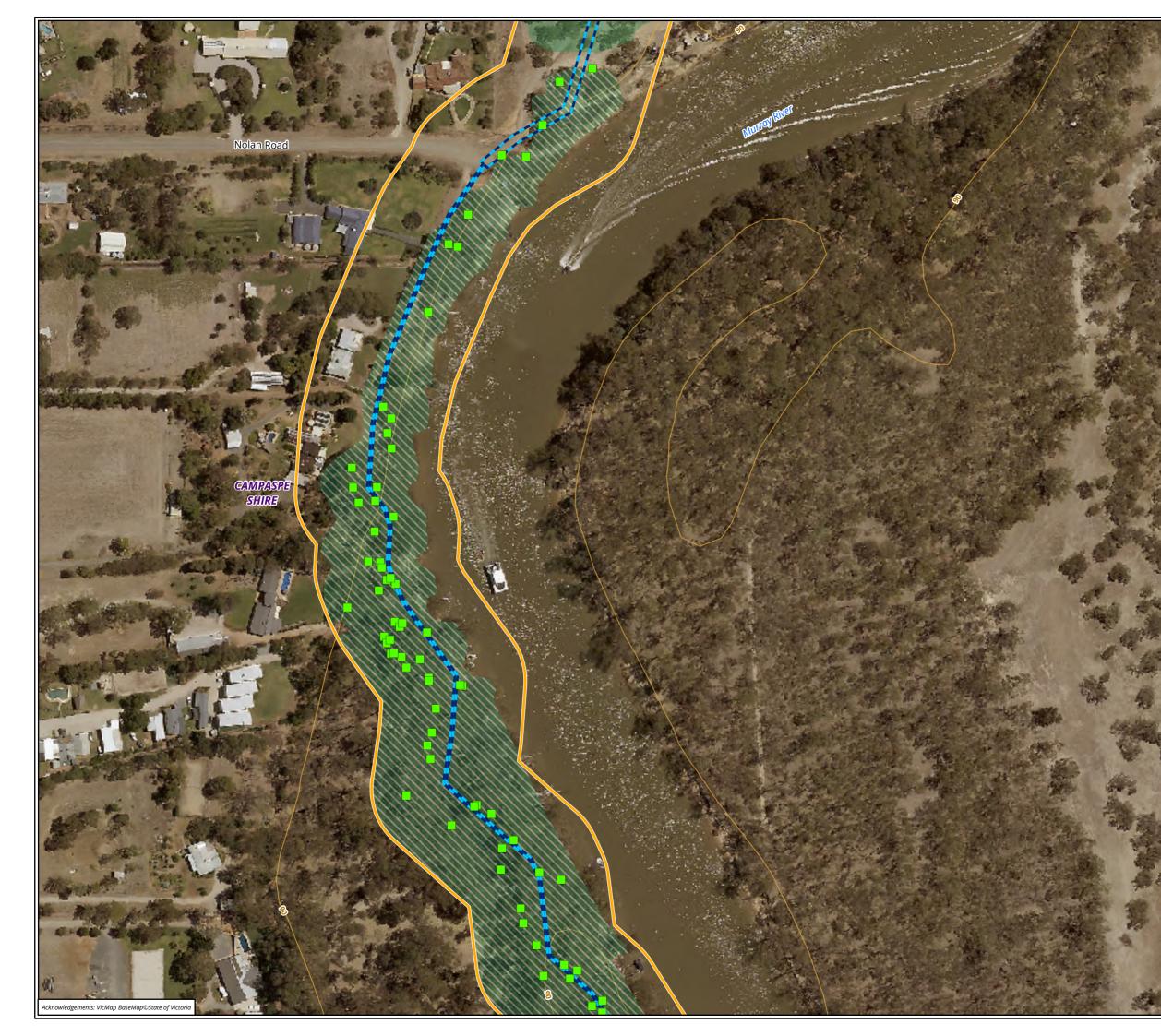
Figure 2.44 Ecological features of the study area

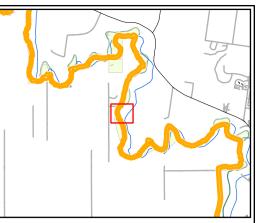




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

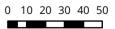
- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

(VRiv0106) Grassy Riverine Forest

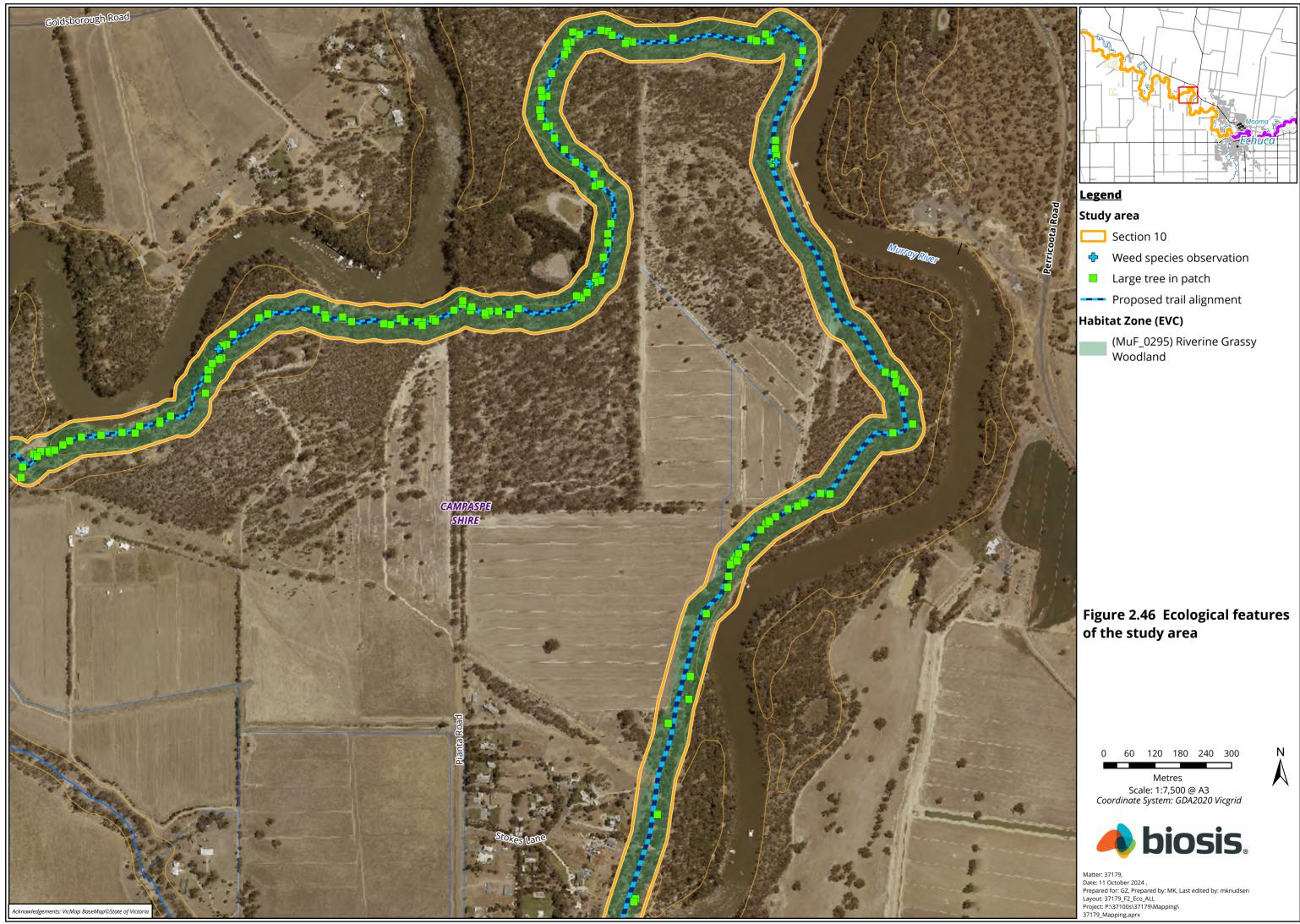
Figure 2.45 Ecological features of the study area

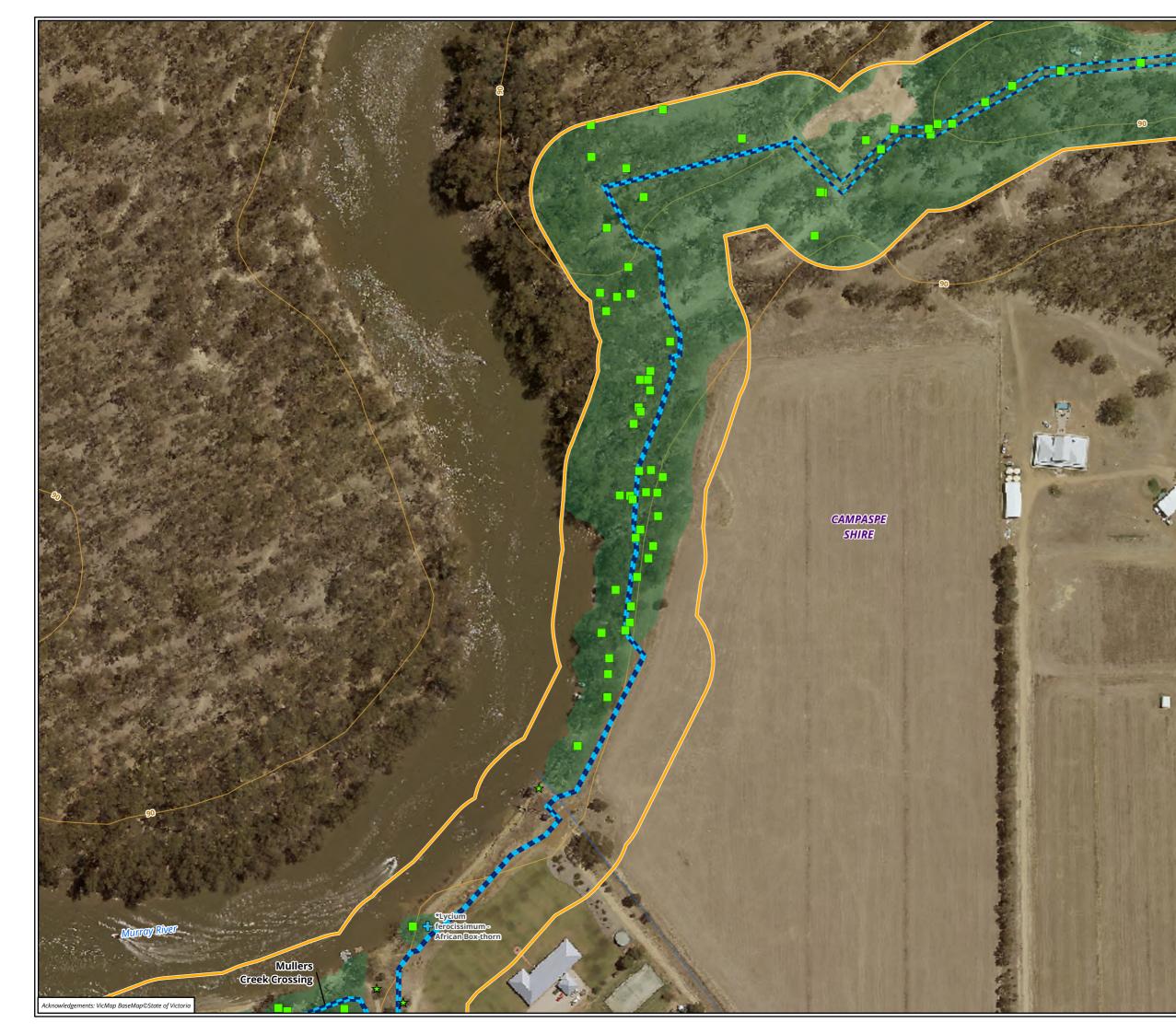




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- Weed species observation
- Large tree in patch

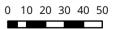
Scattered tree

- ★ Scattered tree
- ---- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (VRiv0295) Riverine Grassy Woodland

Figure 2.47 Ecological features of the study area

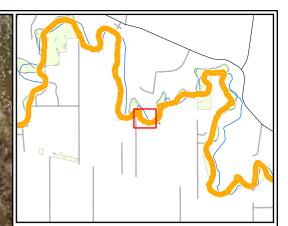




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- Weed species observation
- Large tree in patch

Scattered tree

- ★ Scattered tree
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (VRiv0295) Riverine Grassy Woodland

Figure 2.48 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid

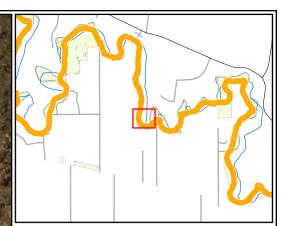


Matter: 37179, Date: 11 October 2024, Prepared for: GZ, Prepared by: MK, Last edited by: mknudsen Layout: 37179_F2_Eco_ALL Project: P:\37100s\37179\Mapping\ 37179_Mapping.aprx

feroelssimum-AfricenBoxethorn

Mullers Creek Crossing





Study area

- Section 10
- Weed species observation
- Large tree in patch

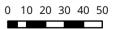
Scattered tree

- ★ Scattered tree
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland

Figure 2.49 Ecological features of the study area

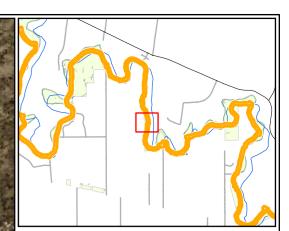




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







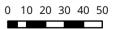
Study area

- Section 10
- ✤ Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest (MuF_0295) Riverine Grassy
 - Woodland
 - 🔢 (MuF_0803) Plains Woodland

Figure 2.50 Ecological features of the study area





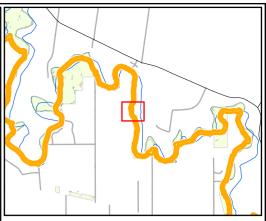
Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid



Matter: 37179, Date: 11 October 2024, Prepared for: GZ, Prepared by: MK, Last edited by: mknudsen Layout: 37179_F2_Eco_ALL Project: P:\37100s\37179\Mapping\ 37179_Mapping.aprx

20





Study area

- Section 10
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

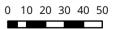
Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0106) Grassy Riverine Forest



Figure 2.51 Ecological features of the study area

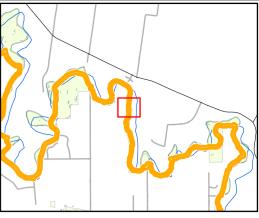




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

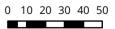
- Section 10
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

(MuF_0803) Plains Woodland

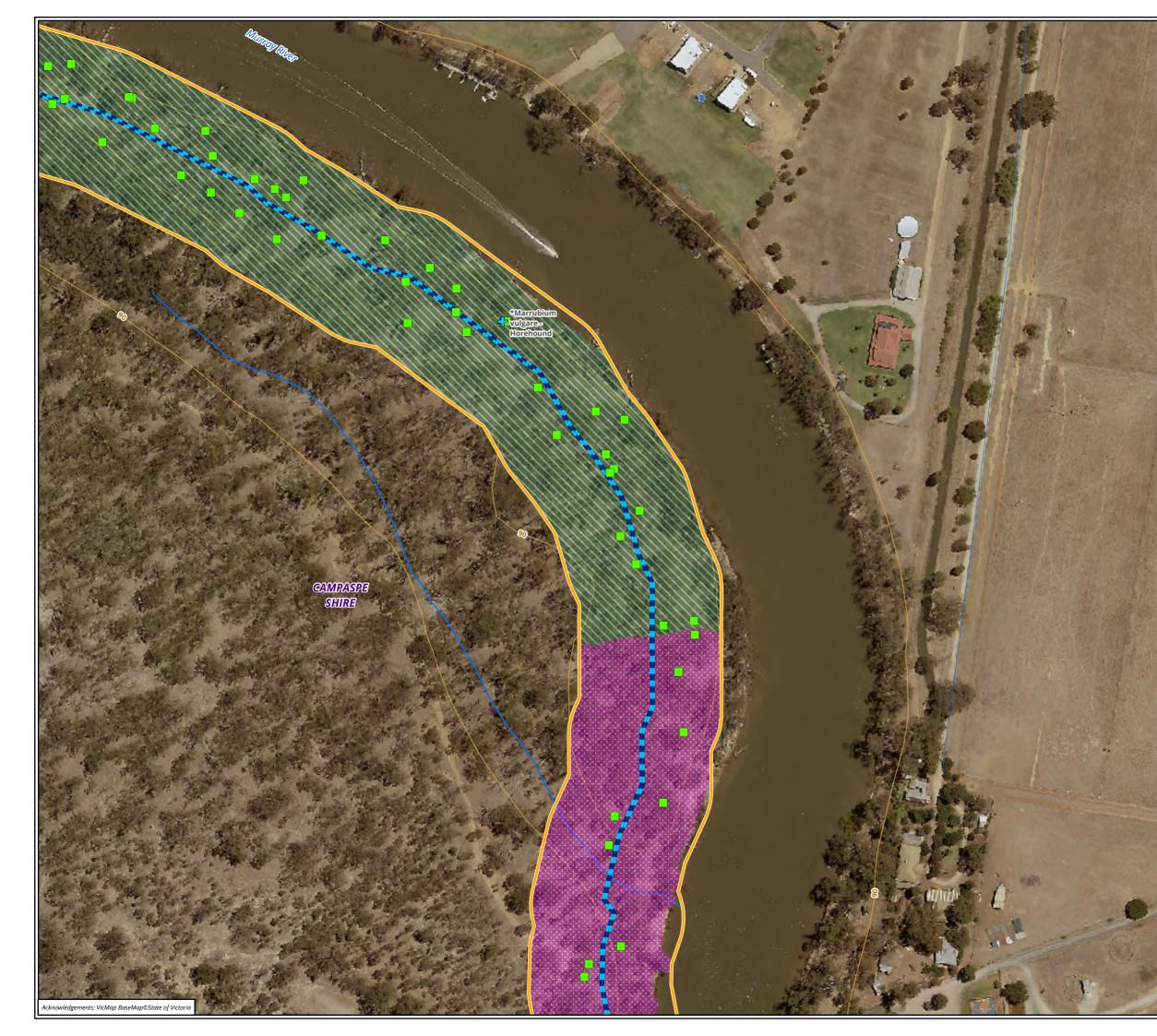
Figure 2.52 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





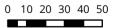
Study area

- Section 10
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest (MuF_0803) Plains Woodland

Figure 2.53 Ecological features of the study area

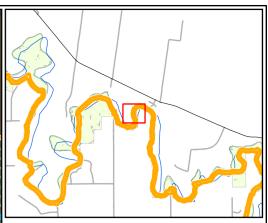




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

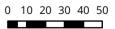
- Section 10
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest

(MuF_0295) Riverine Grassy Woodland

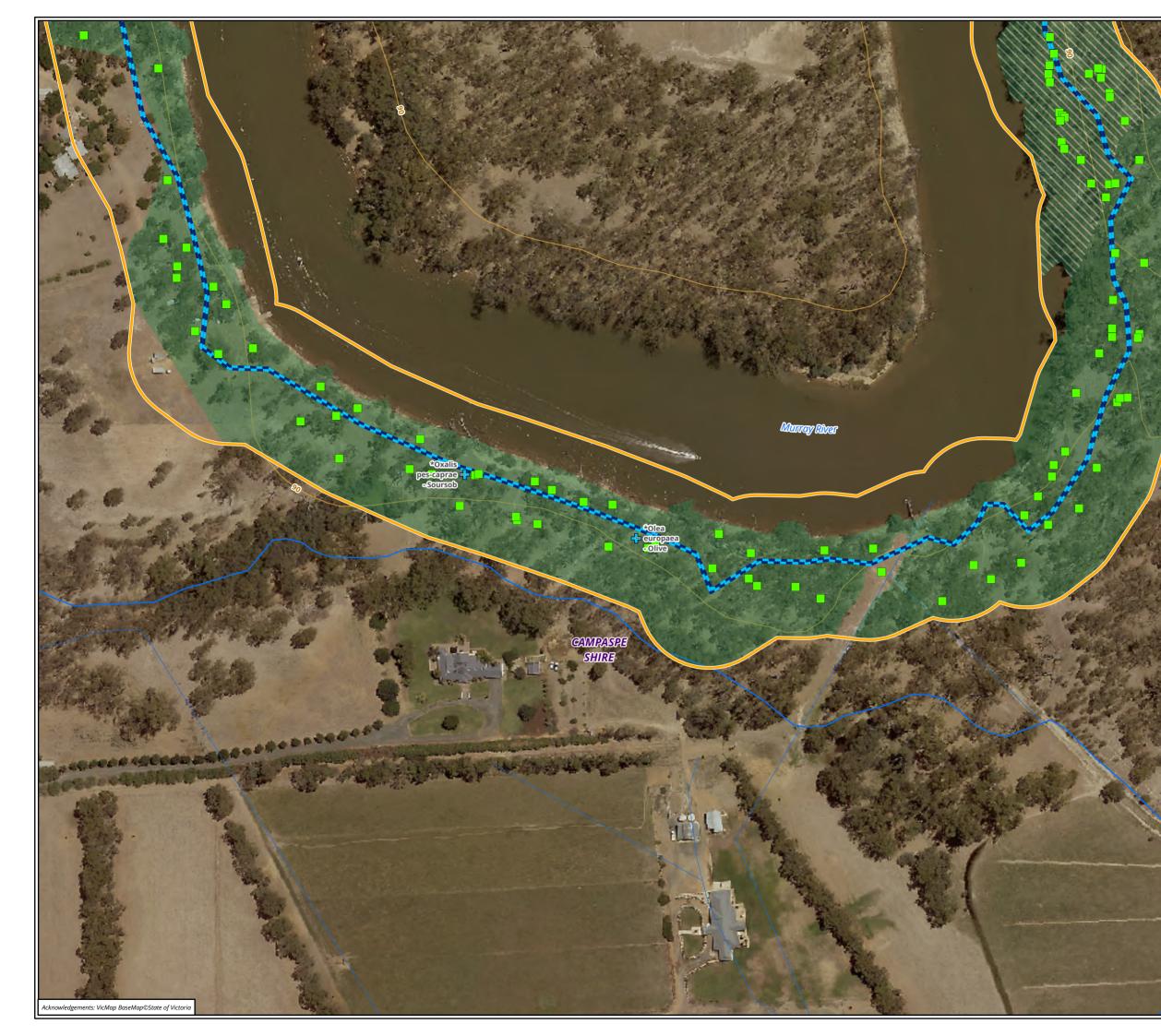
Figure 2.54 Ecological features of the study area

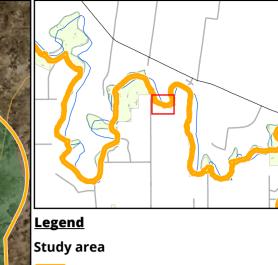




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





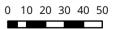


- Section 10
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest (MuF_0295) Riverine Grassy Woodland

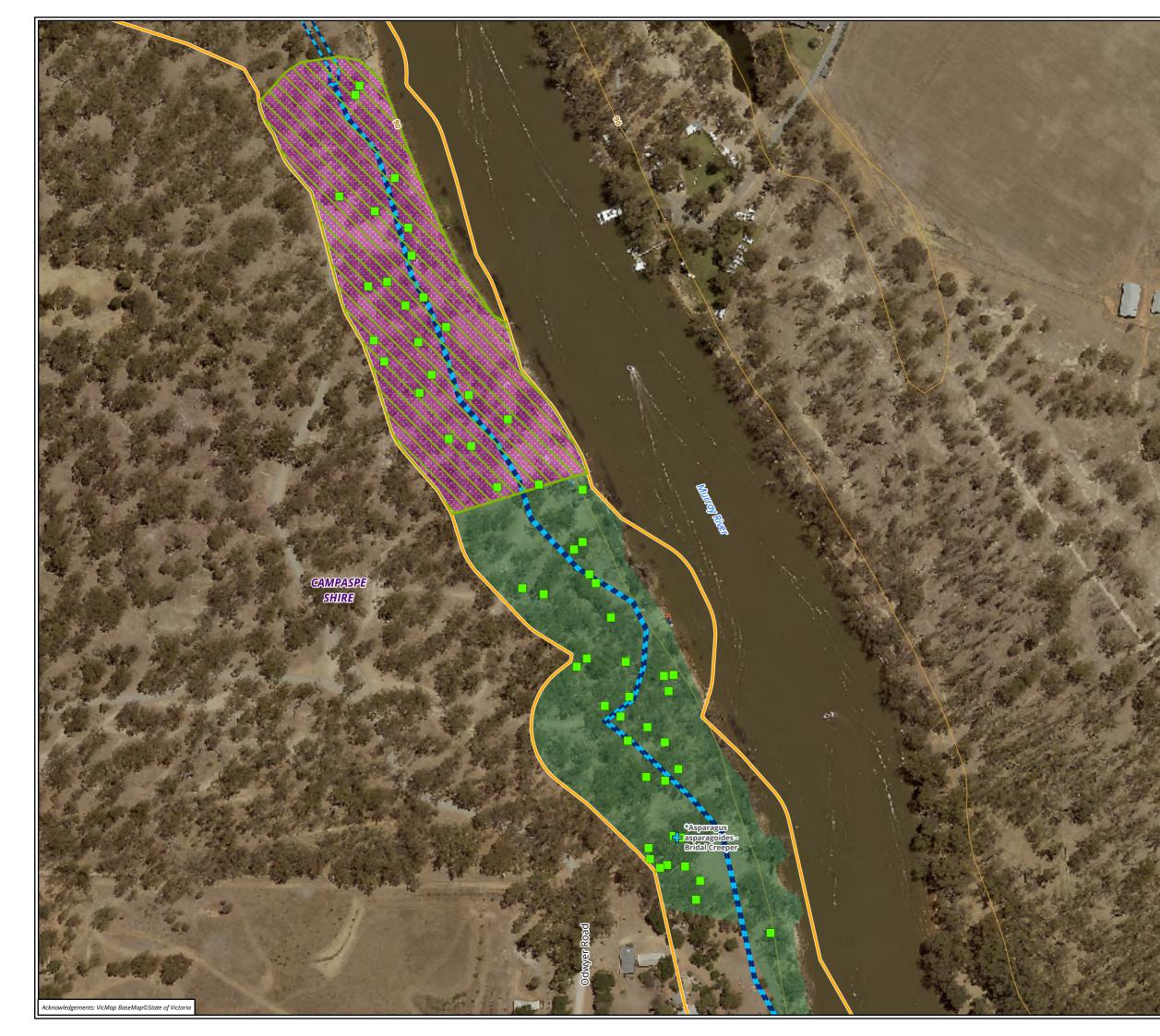
Figure 2.55 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





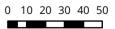
Study area

- Section 10
- ✤ Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- 🔋 (MuF_0803) Plains Woodland
- N Threatened ecological community

Figure 2.56 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid



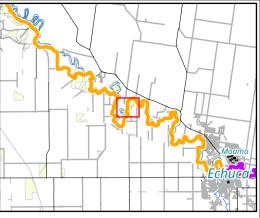
Brown Treegreeper - Climageris pigumnus

> CAMPASPE SHIRE

CAMPASP

SHIRE

AMPASPE SHIRE



<u>Legend</u>

Study area

- Section 10
- Threatened fauna observation
- Threatened flora observation
- Weed species observation
- Large tree in patch
- ---- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- 🚪 (MuF_0803) Plains Woodland
- (VRiv0803) Plains Woodland
- Threatened ecological community

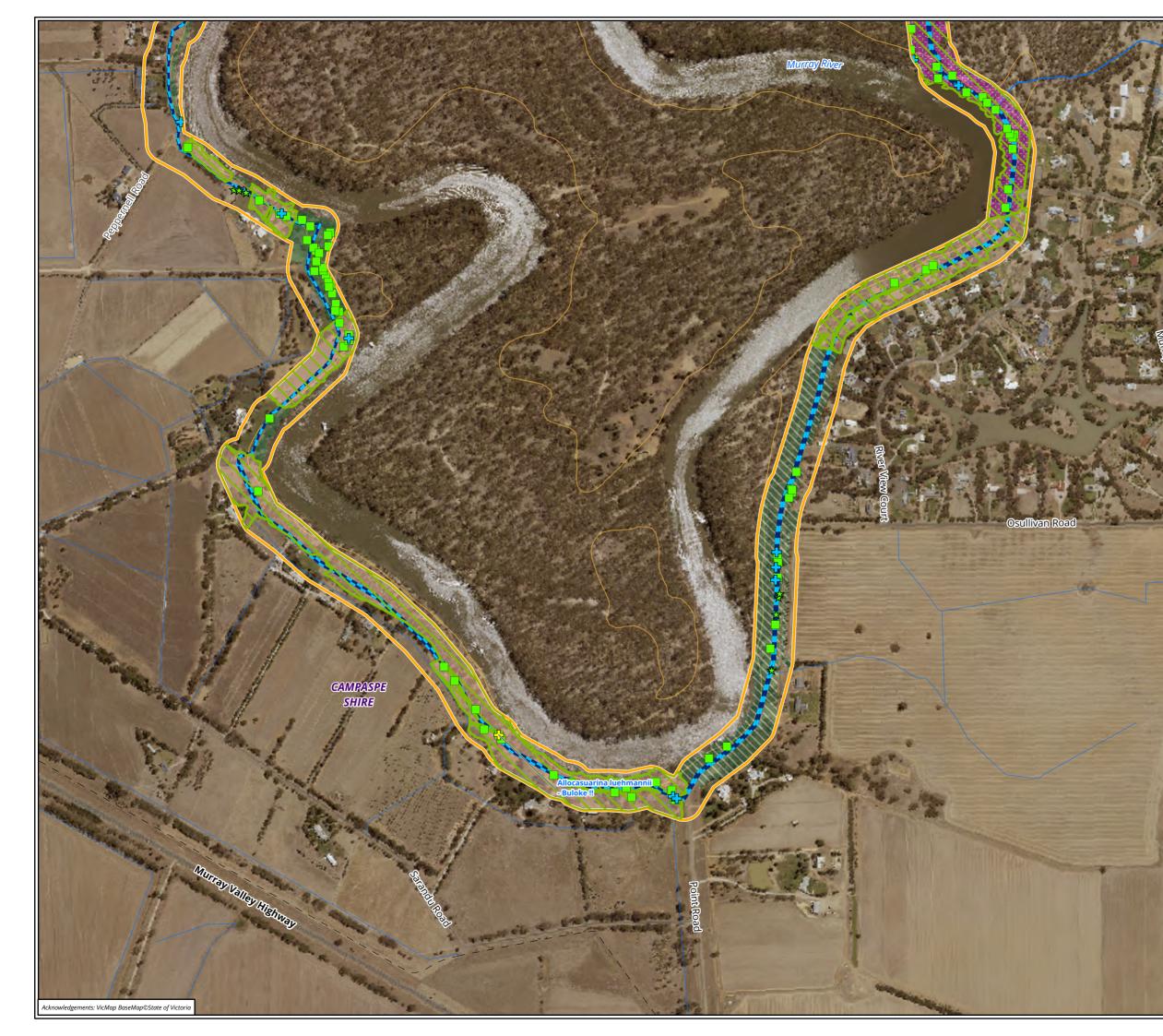
Figure 2.57 Ecological features of the study area

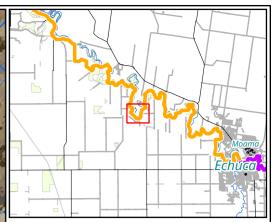




Metres Scale: 1:7,500 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- ✤ Threatened flora observation
- Weed species observation
- Large tree in patch

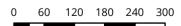
Scattered tree

- ★ Scattered tree
- --- Proposed trail alignment

Habitat Zone (EVC)

- 📱 (MuF_0803) Plains Woodland
- (VRiv0106) Grassy Riverine Forest
 - (VRiv0295) Riverine Grassy Woodland
 - (VRiv0803) Plains Woodland
- Threatened ecological community

Figure 2.58 Ecological features of the study area

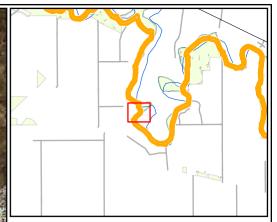




Metres Scale: 1:7,500 @ A3 Coordinate System: GDA2020 Vicgrid







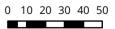
Study area

- Section 10
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (VRiv0295) Riverine Grassy Woodland
- (VRiv0803) Plains Woodland
- N Threatened ecological community

Figure 2.59 Ecological features of the study area

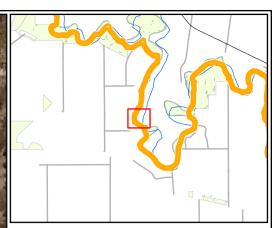




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- Weed species observation
- Large tree in patch

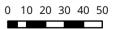
Scattered tree

- ★ Scattered tree
- --- Proposed trail alignment

Habitat Zone (EVC)

- (VRiv0295) Riverine Grassy Woodland
- (VRiv0803) Plains Woodland
- Threatened ecological community

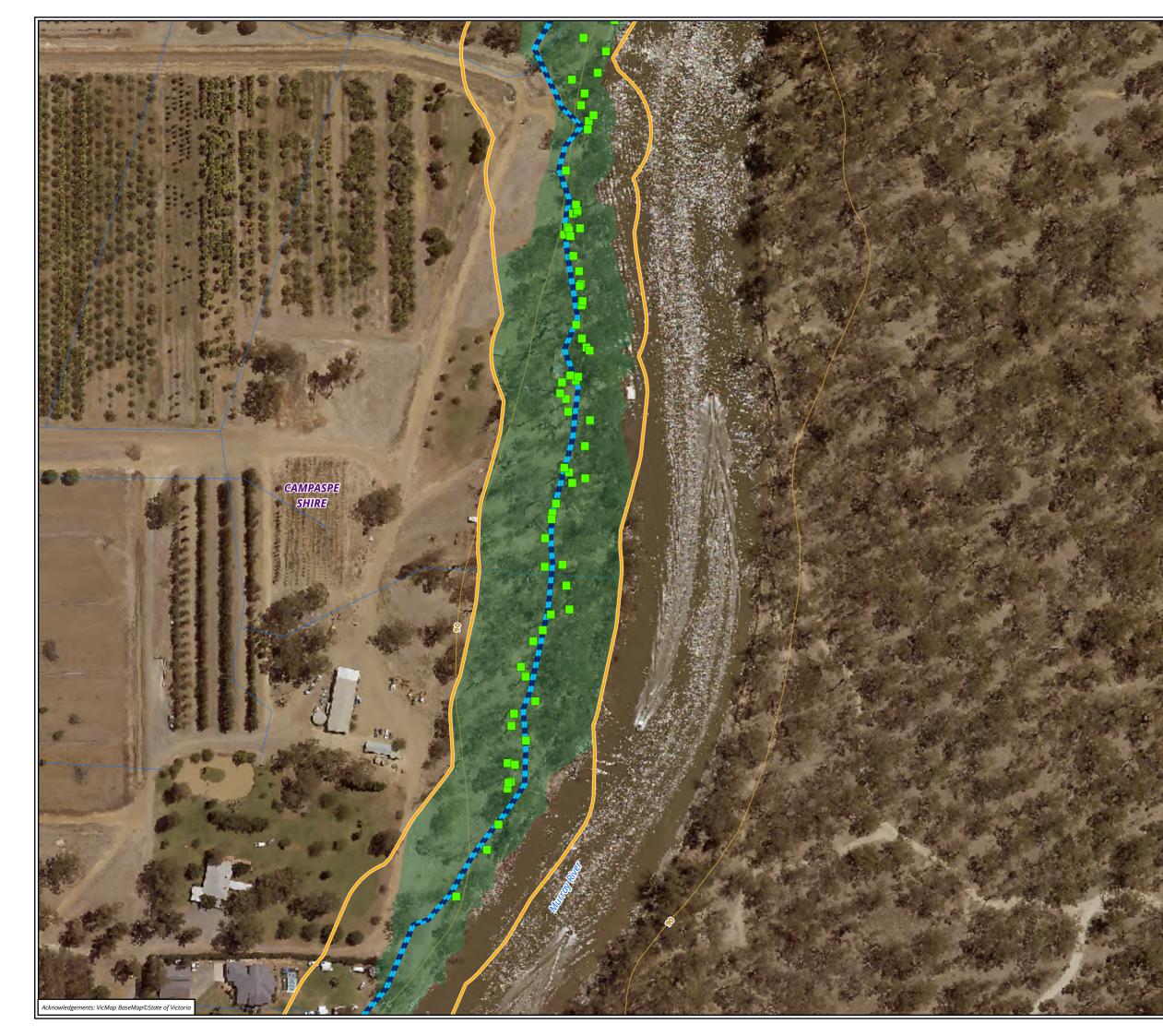
Figure 2.60 Ecological features of the study area

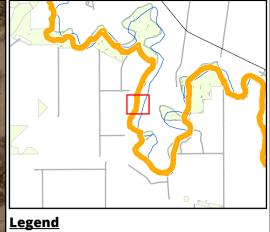




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







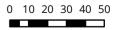
Study area

- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(VRiv0295) Riverine Grassy Woodland

Figure 2.61 Ecological features of the study area

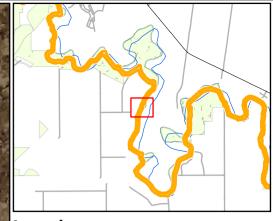




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

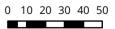
- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

- (MuF_0803) Plains Woodland
- (VRiv0295) Riverine Grassy Woodland
- **Threatened ecological community**

Figure 2.62 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid





Study area

- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

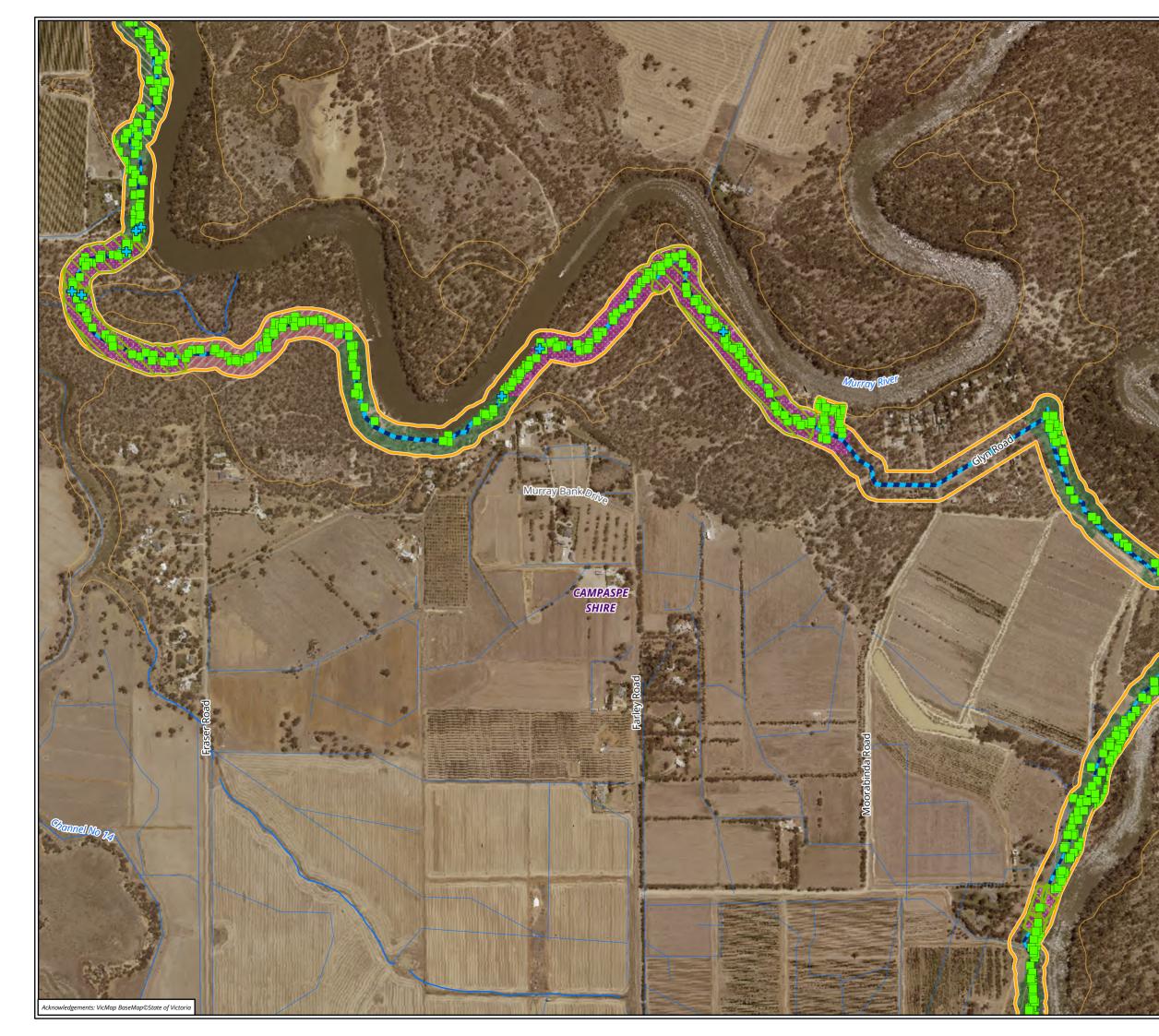
Figure 2.63 Ecological features of the study area

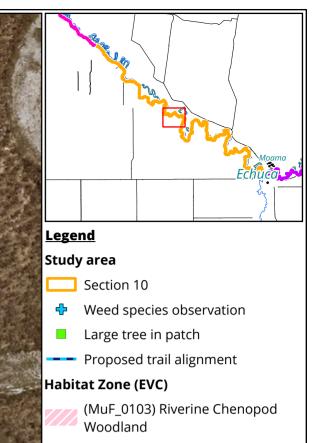




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid

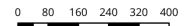






- (MuF_0106) Grassy Riverine Forest
 - (MuF_0295) Riverine Grassy Woodland
 - 🔢 (MuF_0803) Plains Woodland
 - (VRiv0295) Riverine Grassy Woodland
- Threatened ecological community

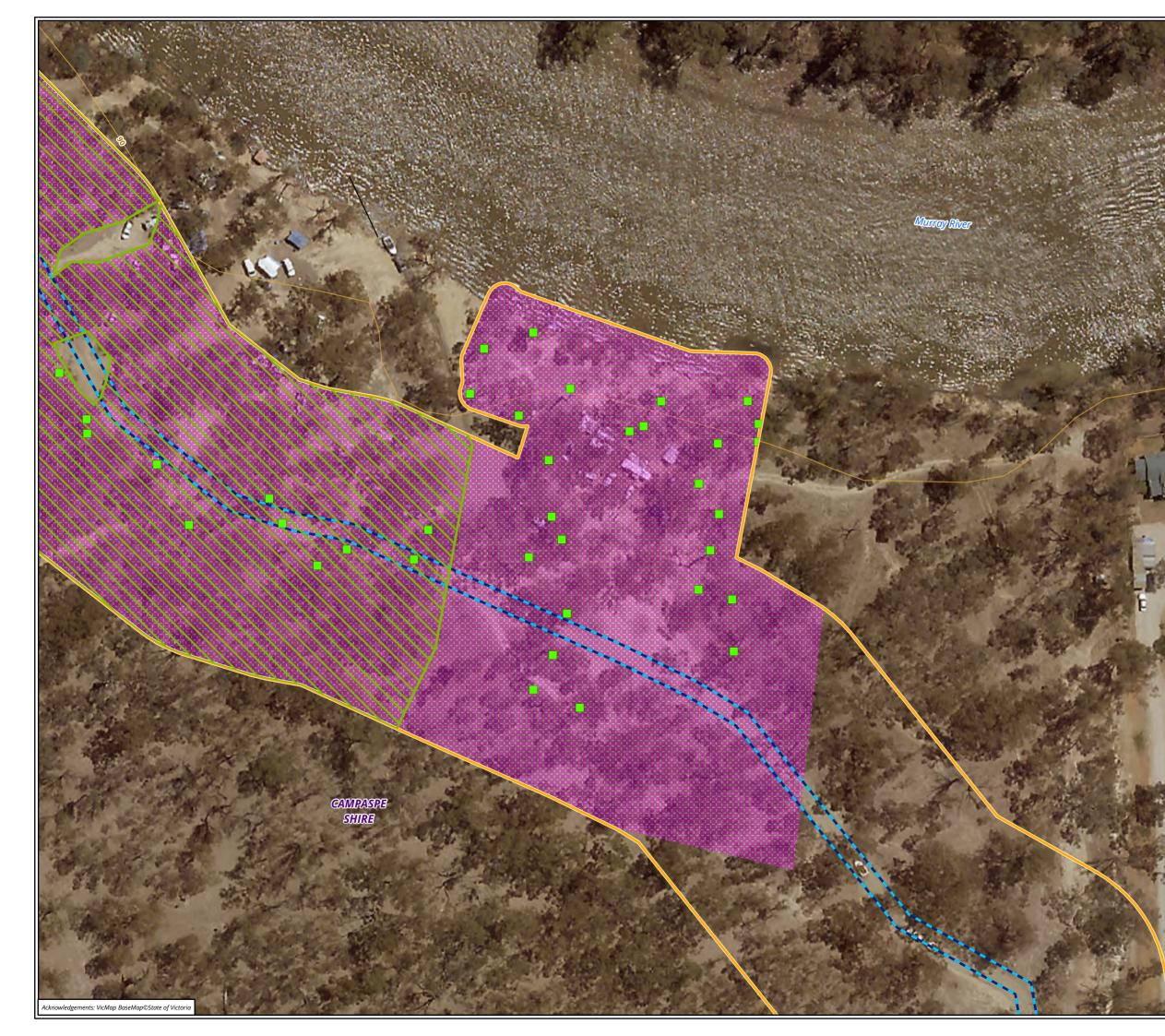
Figure 2.64 Ecological features of the study area





Metres Scale: 1:10,000 @ A3 Coordinate System: GDA2020 Vicgrid





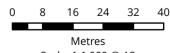
Study area

- Section 10
- Large tree in patch
- ---- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0803) Plains Woodland
- Threatened ecological community

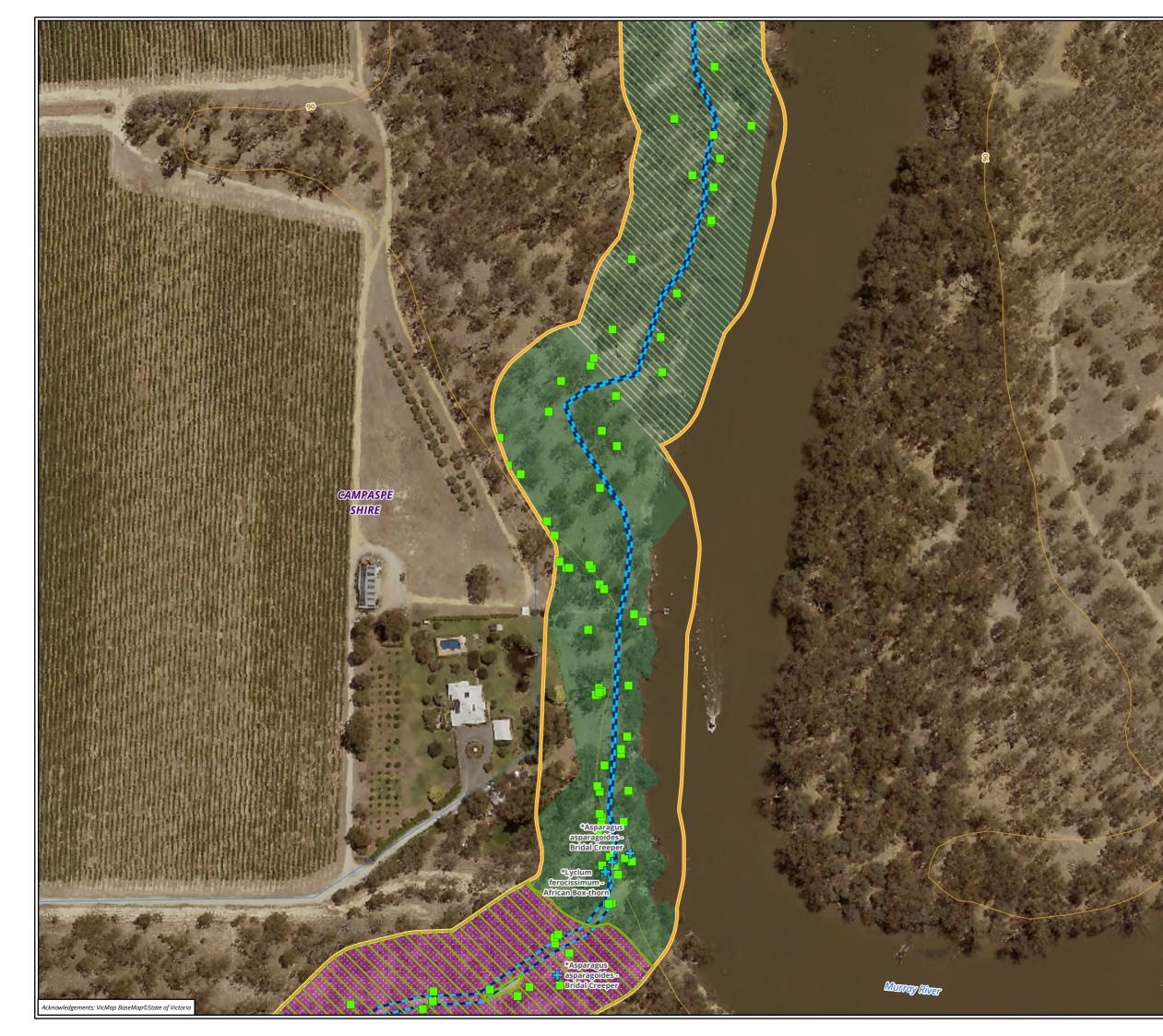
Figure 2.65 Ecological features of the study area

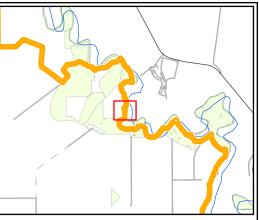




Metres Scale: 1:1,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)



- (MuF_0803) Plains Woodland
- Threatened ecological community

Figure 2.66 Ecological features of the study area

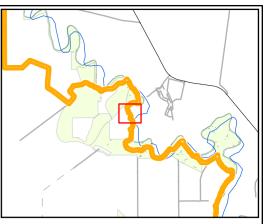




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







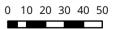
Study area

- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest (MuF_0295) Riverine Grassy Woodland
 - (MuF_0803) Plains Woodland
- **Threatened ecological community**

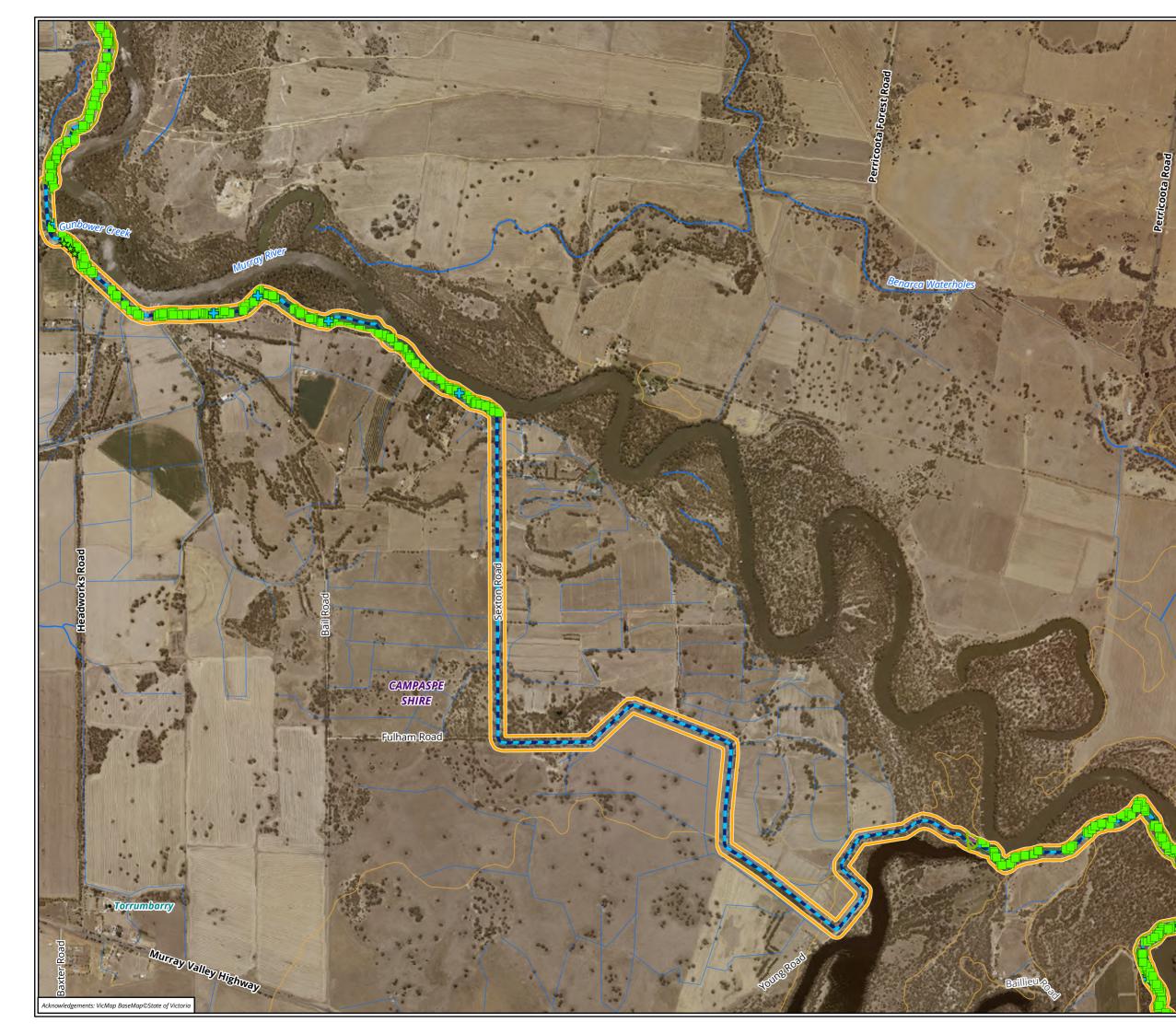
Figure 2.67 Ecological features of the study area

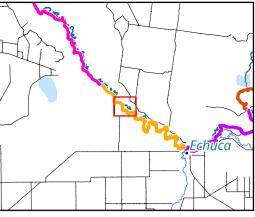




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- Weed species observation
- Large tree in patch

Scattered tree

- ★ Scattered tree
- ---- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest (MuF_0295) Riverine Grassy Woodland
 - (MuF_0803) Plains Woodland
- (VRiv0106) Grassy Riverine Forest
 - (VRiv0803) Plains Woodland
- Threatened ecological community

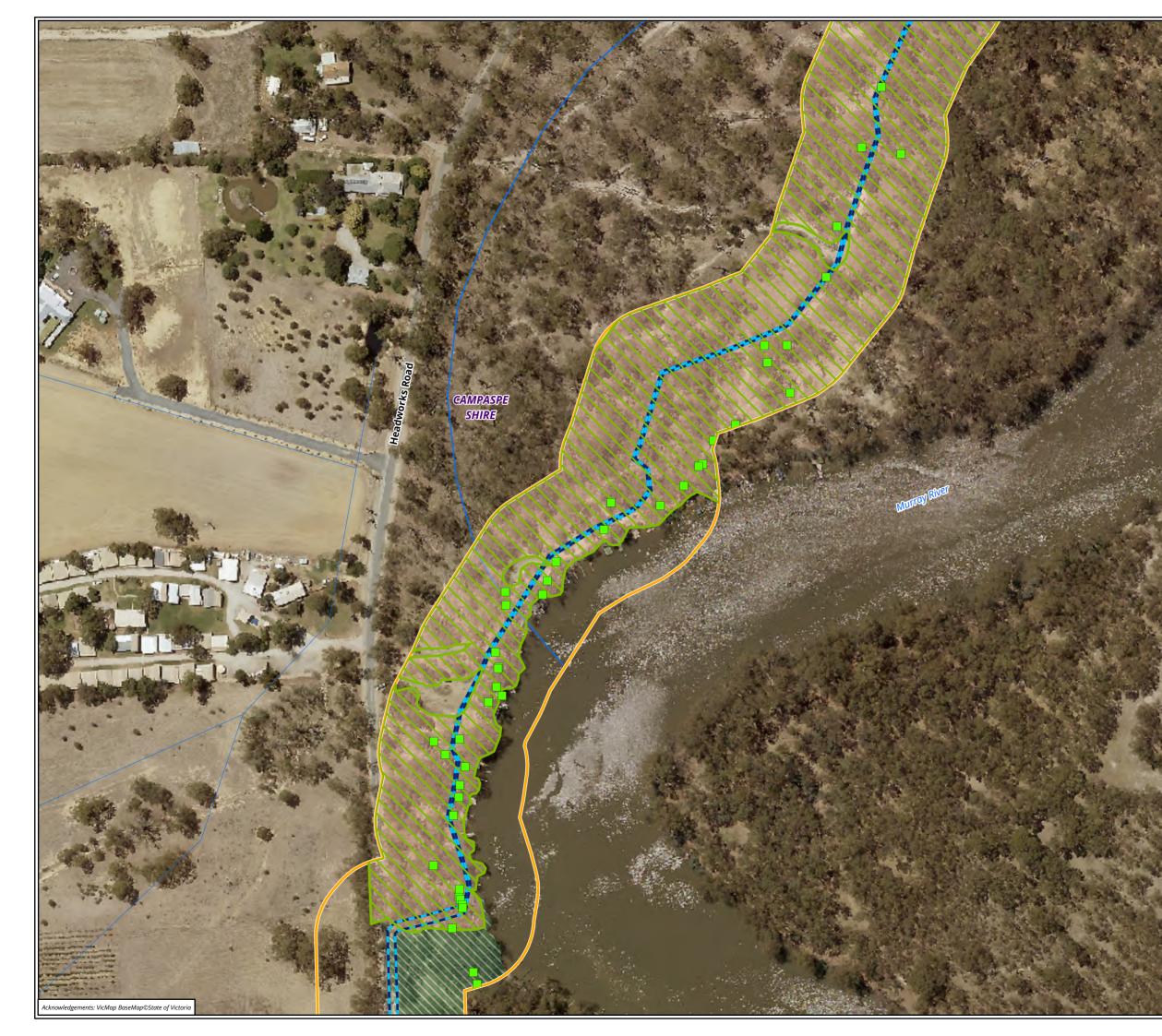
Figure 2.68 Ecological features of the study area

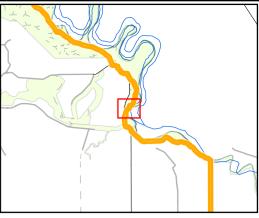




Metres Scale: 1:20,000 @ A3 Coordinate System: GDA2020 Vicgrid







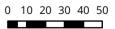
Study area

- Section 10
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (VRiv0106) Grassy Riverine Forest
 - (VRiv0803) Plains Woodland
- Threatened ecological community

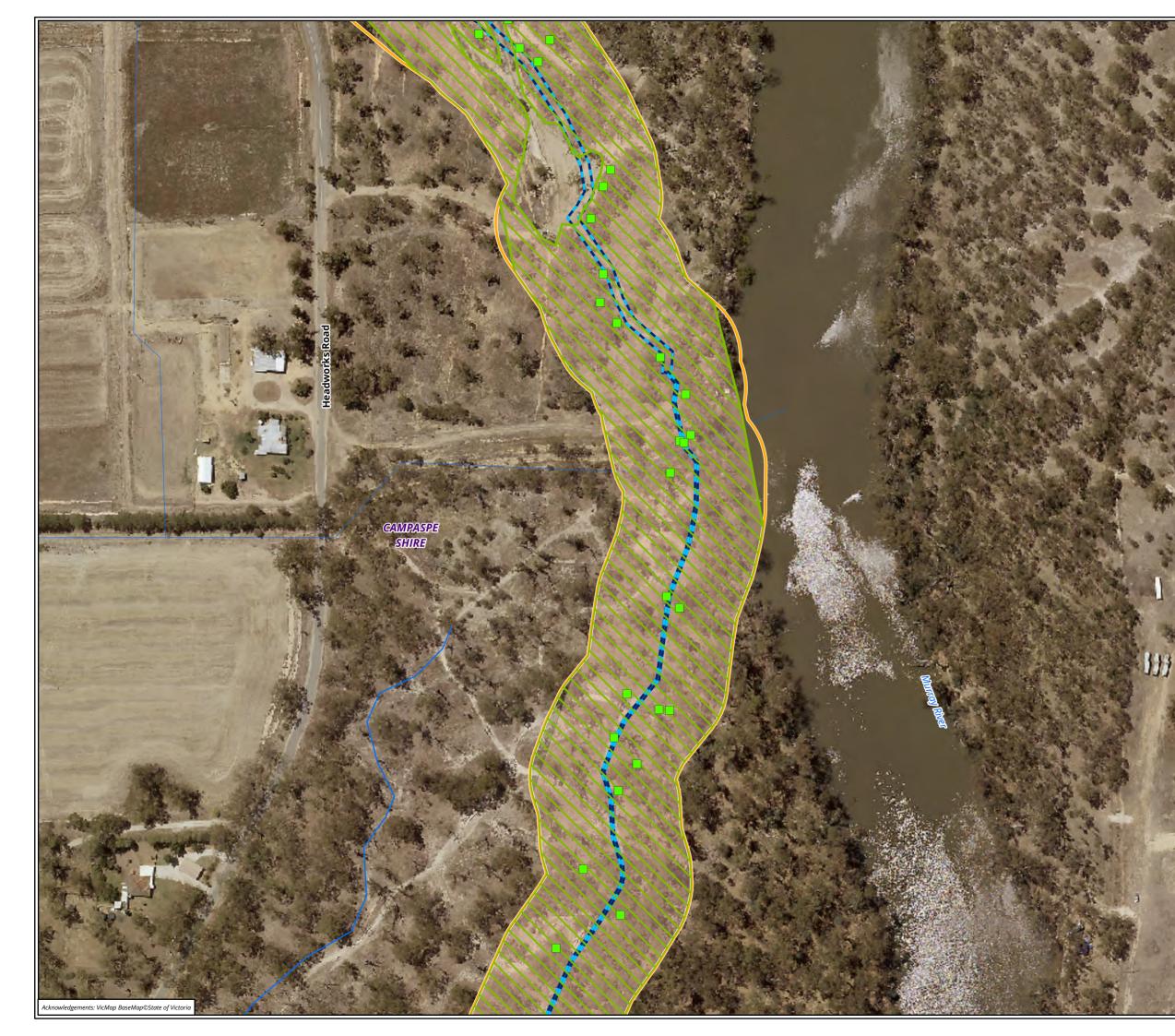
Figure 2.69 Ecological features of the study area

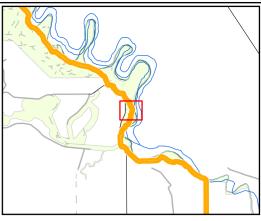




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







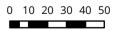
Study area

- Section 10
- Large tree in patch
- ---- Proposed trail alignment

Habitat Zone (EVC)

- (VRiv0803) Plains Woodland
- Nreatened ecological community

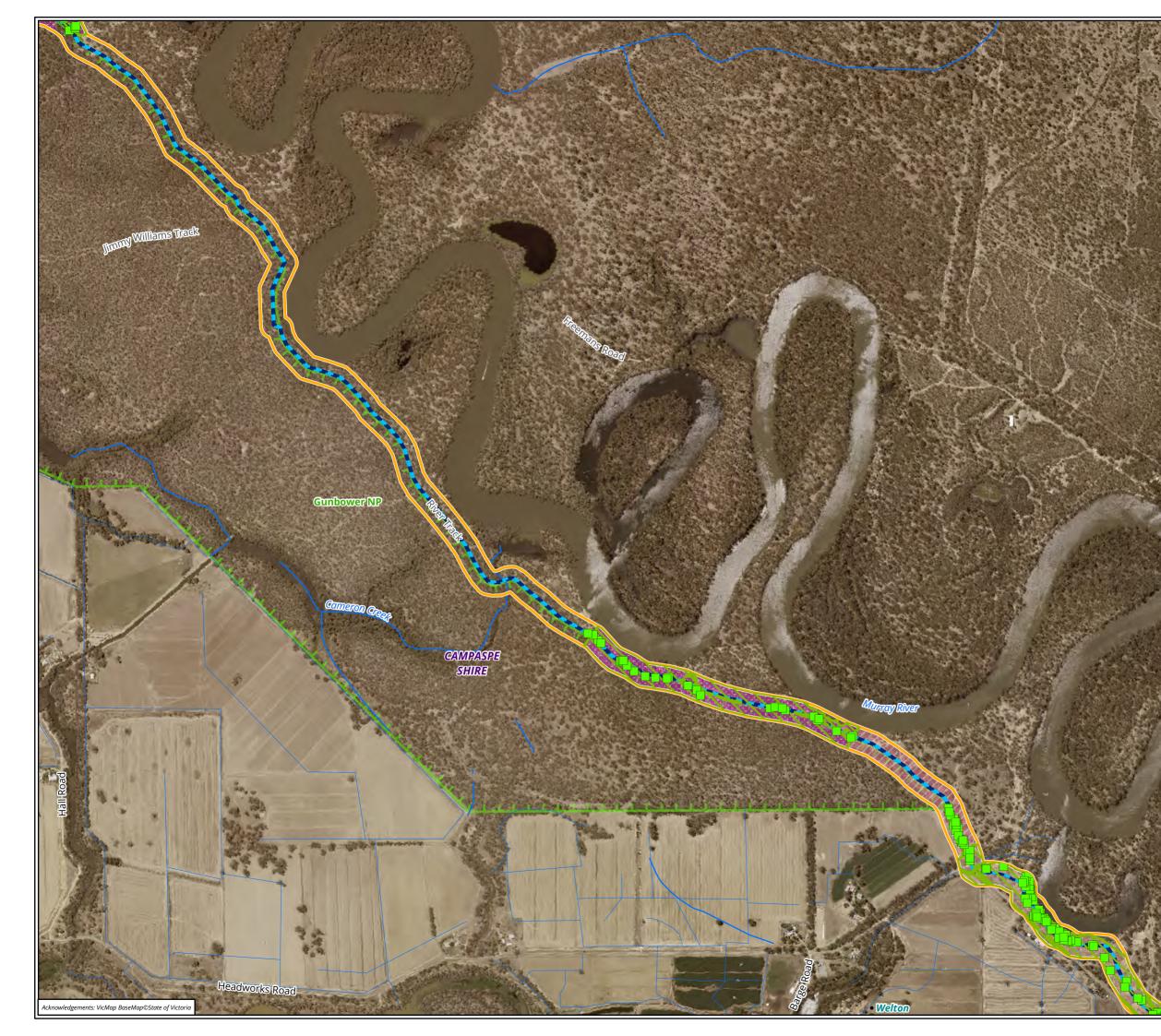
Figure 2.70 Ecological features of the study area

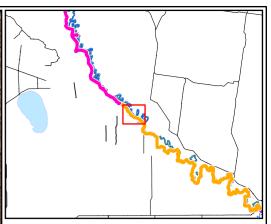




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- National Park
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0803) Plains Woodland
- (VRiv0803) Plains Woodland
- Threatened ecological community

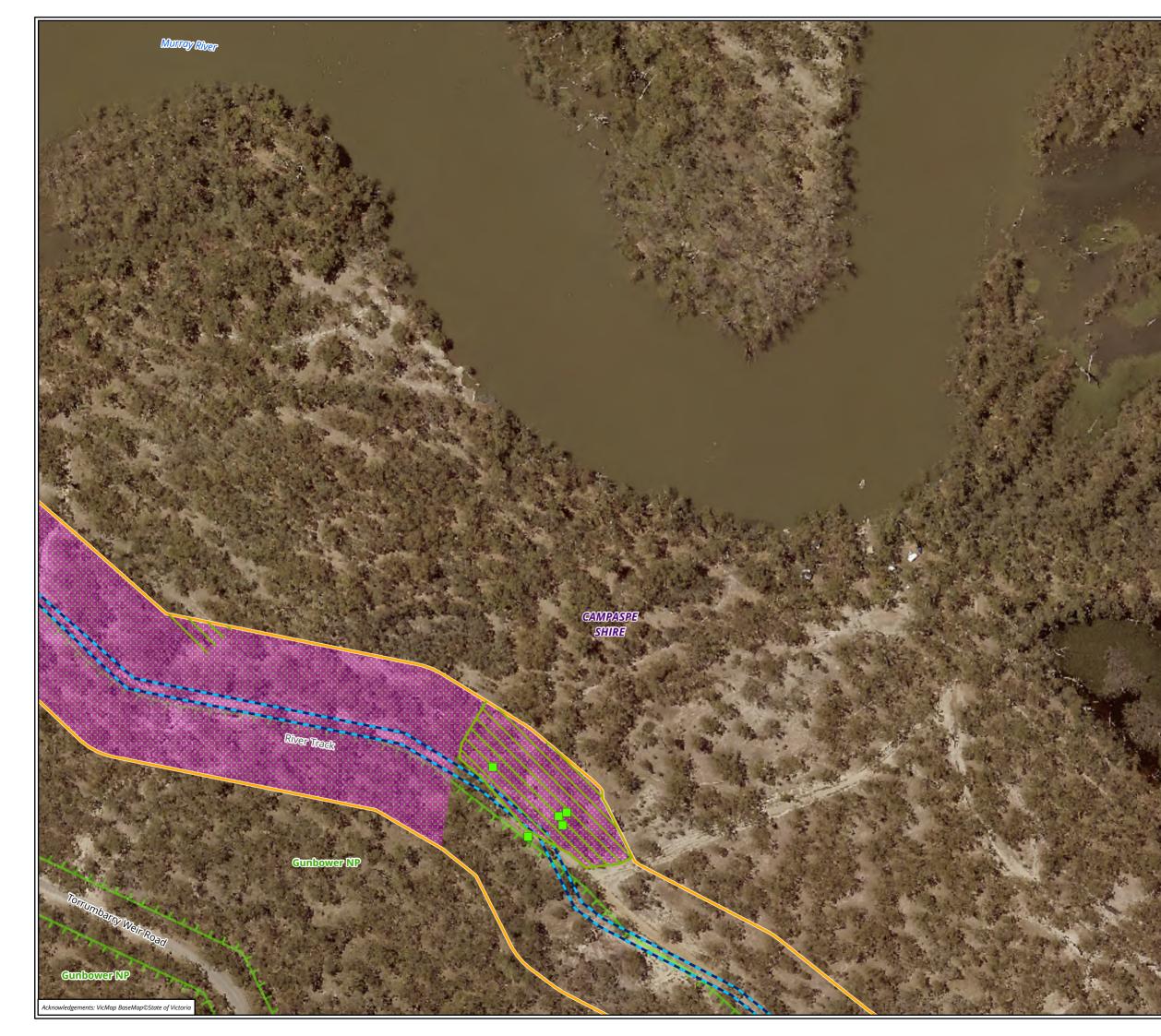
Figure 2.71 Ecological features of the study area

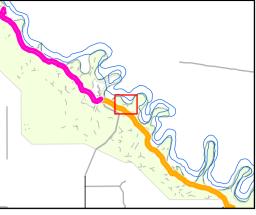




Metres Scale: 1:12,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

- Section 10
- **D** National Park
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- 🔋 (MuF_0803) Plains Woodland
- Threatened ecological community

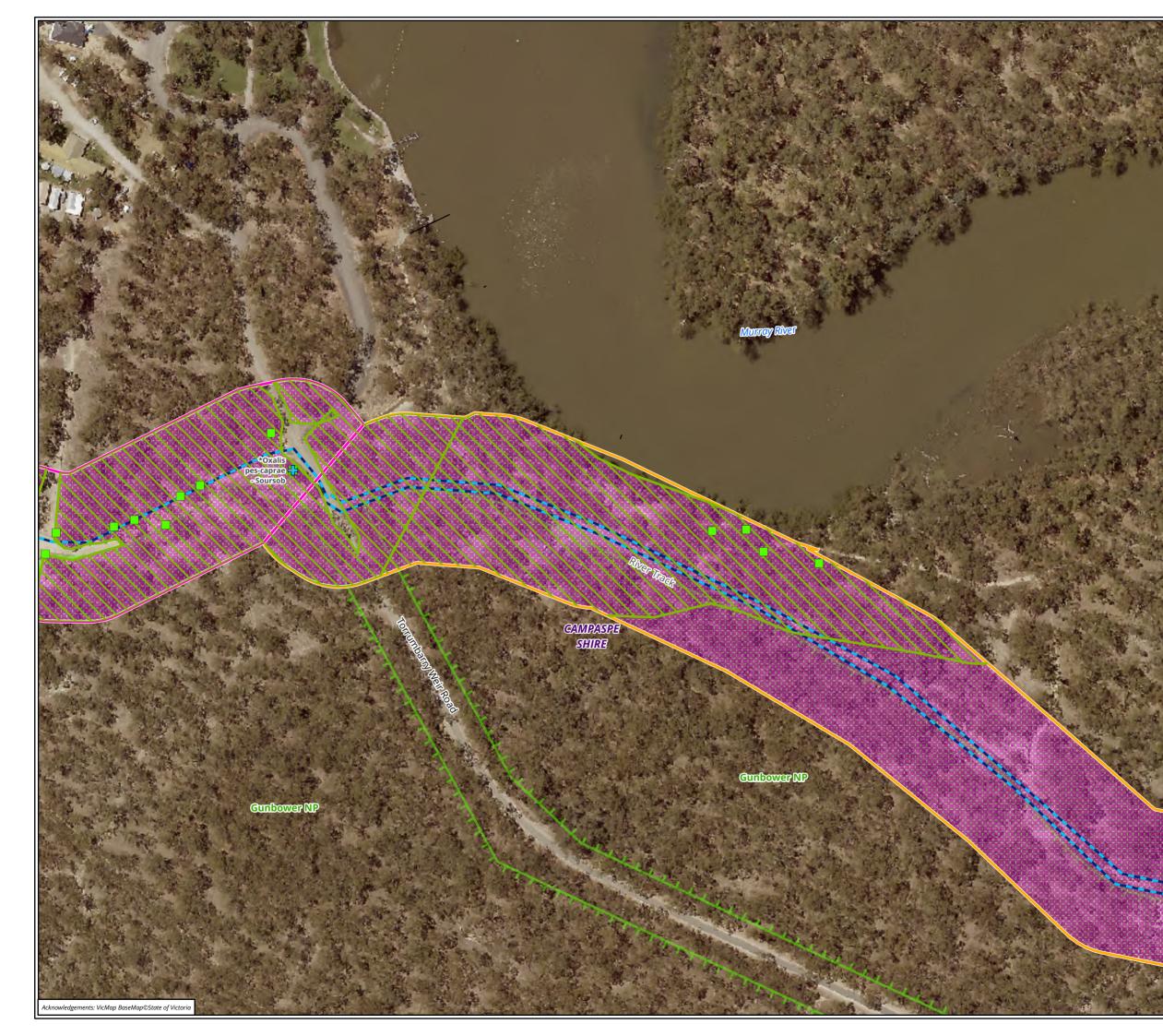
Figure 2.72 Ecological features of the study area

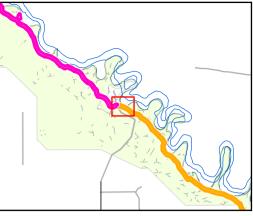




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

Section	10

- Section 11
- National Park
- Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

- 👯 (MuF_0803) Plains Woodland
- Threatened ecological community

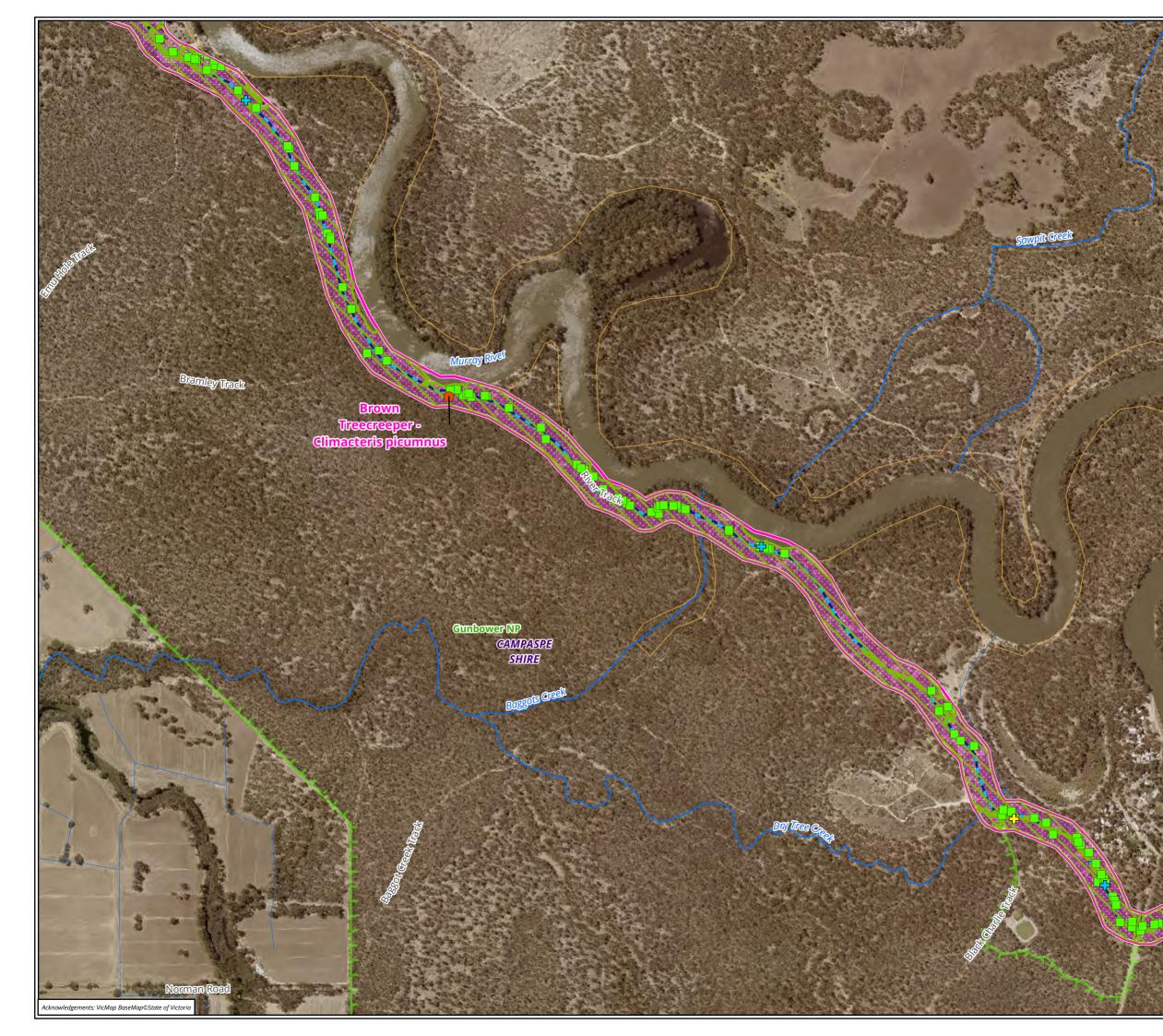
Figure 2.73 Ecological features of the study area

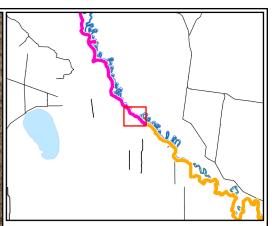




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area	
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- Section 10
- Section 11
- National Park
- Threatened fauna observation
- ✤ Threatened flora observation
- ✤ Weed species observation
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0803) Plains Woodland Threatened ecological community

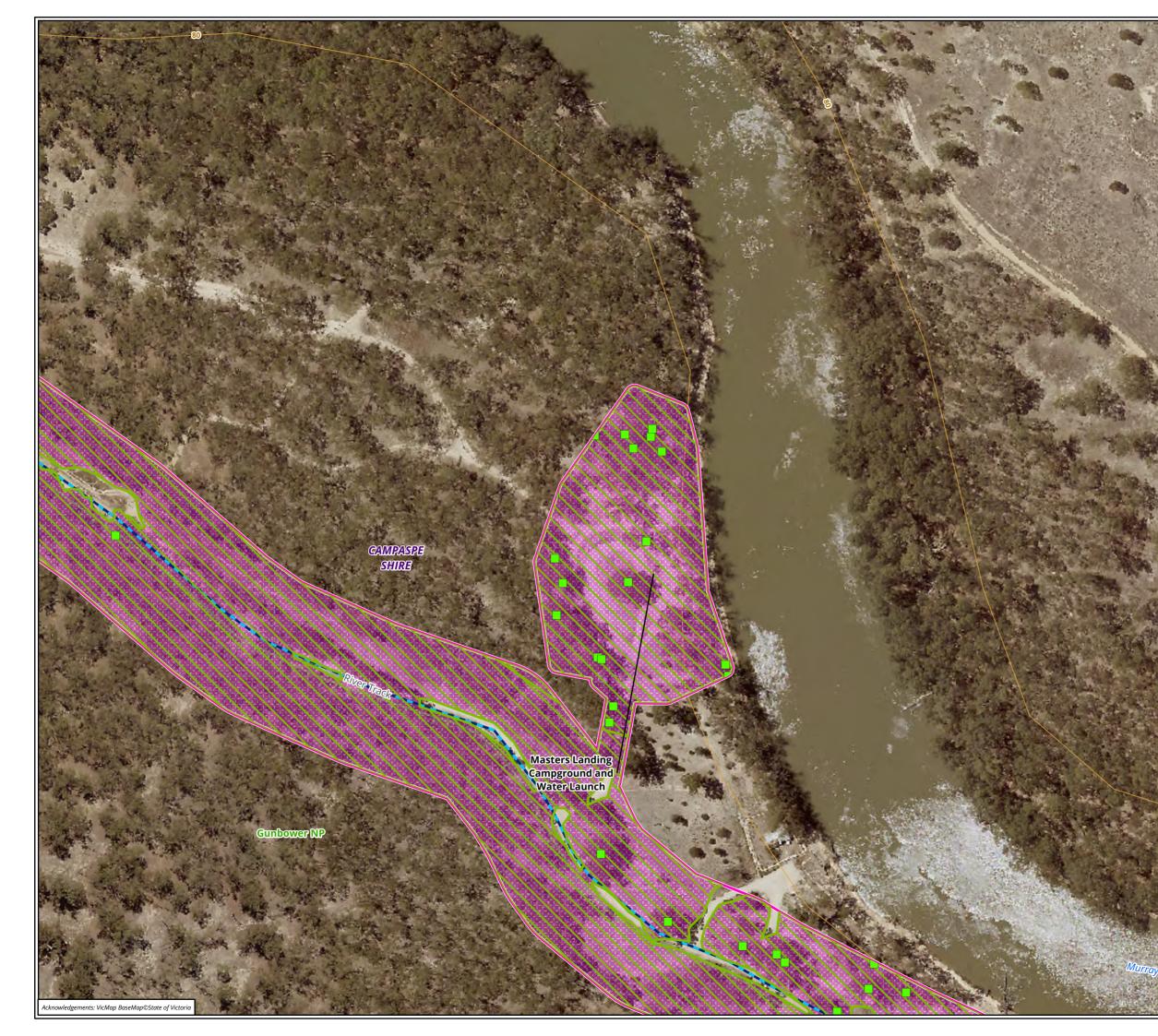
Figure 2.74 Ecological features of the study area





Metres Scale: 1:10,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

Section 11

D National Park

Large tree in patch

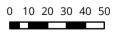
--- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0803) Plains Woodland

Threatened ecological community

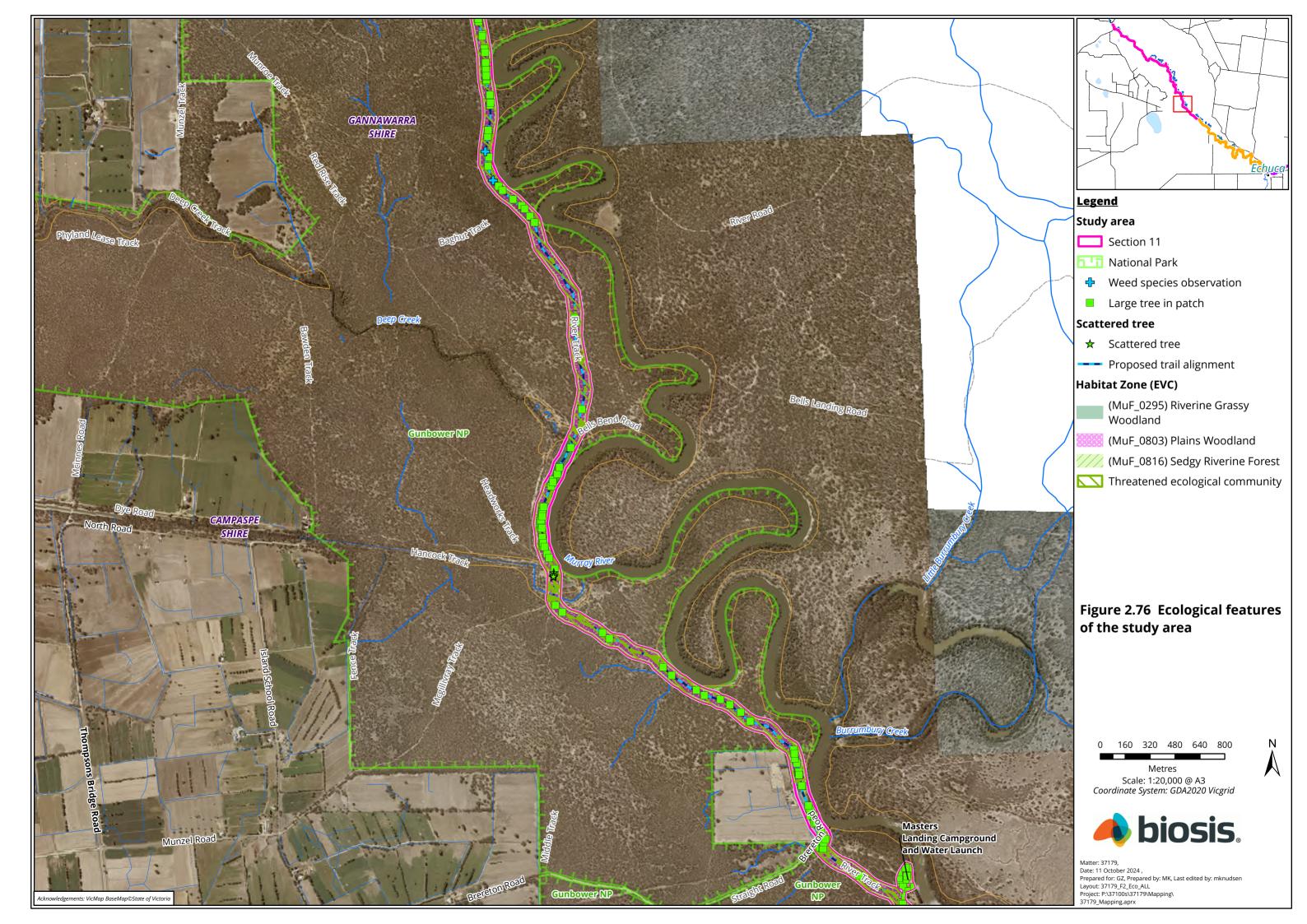
Figure 2.75 Ecological features of the study area





Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid









Study area

- Section 11
- **11** National Park
- Large tree in patch
- --- Proposed trail alignment
- Trailhead acess road

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest
 (MuF_0803) Plains Woodland
 (MuF_0816) Sedgy Riverine Forest
 Threatened ecological community

Figure 2.77 Ecological features of the study area

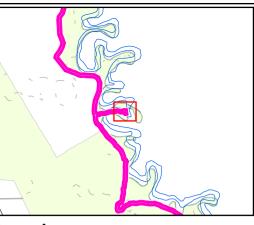




Metres Scale: 1:20,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

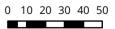
- Section 11
- **National Park**
- Large tree in patch
- --- Proposed trail alignment
- Trailhead acess road

Habitat Zone (EVC)

2 N P

// (MuF_0816) Sedgy Riverine Forest

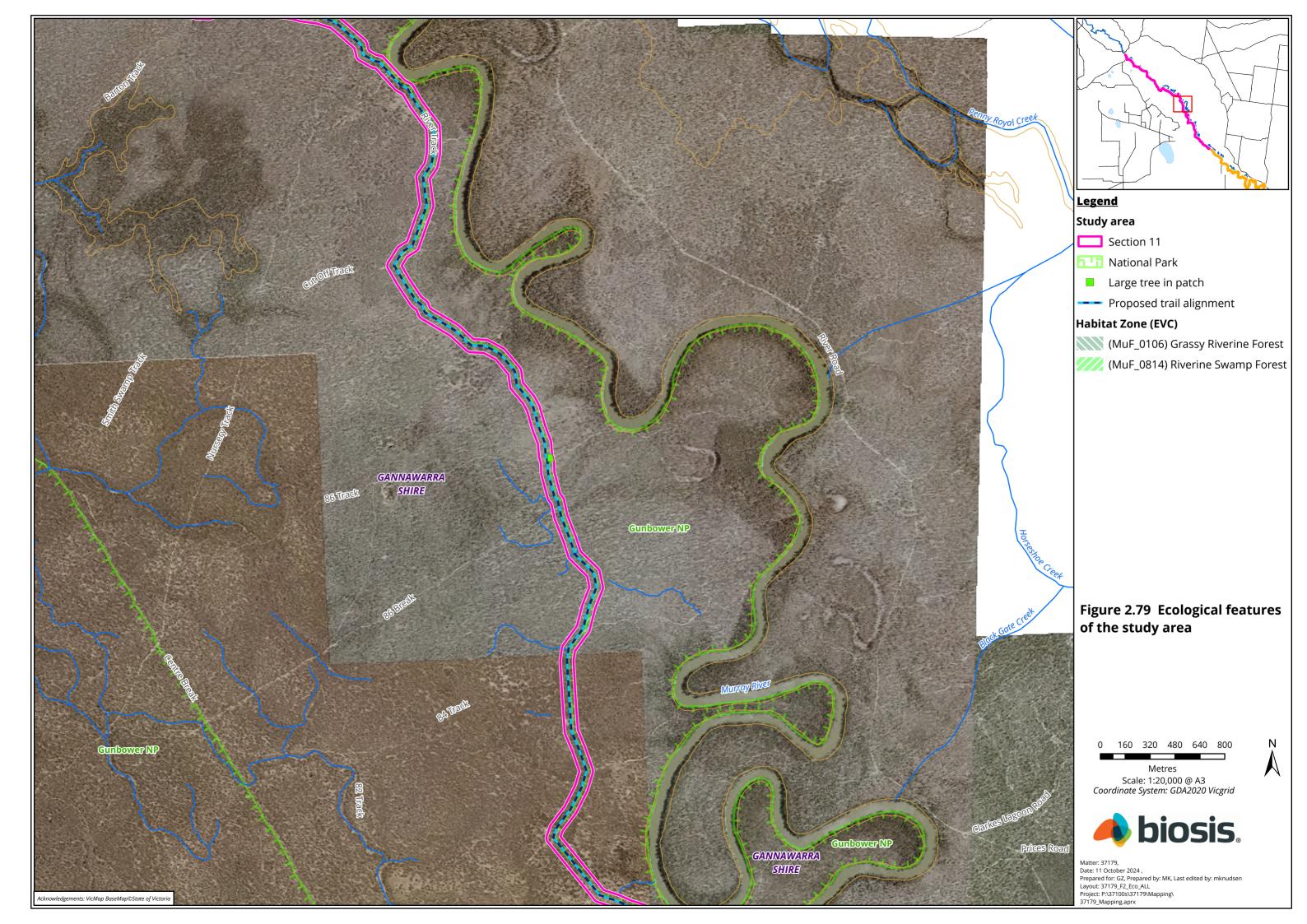
Figure 2.78 Ecological features of the study area

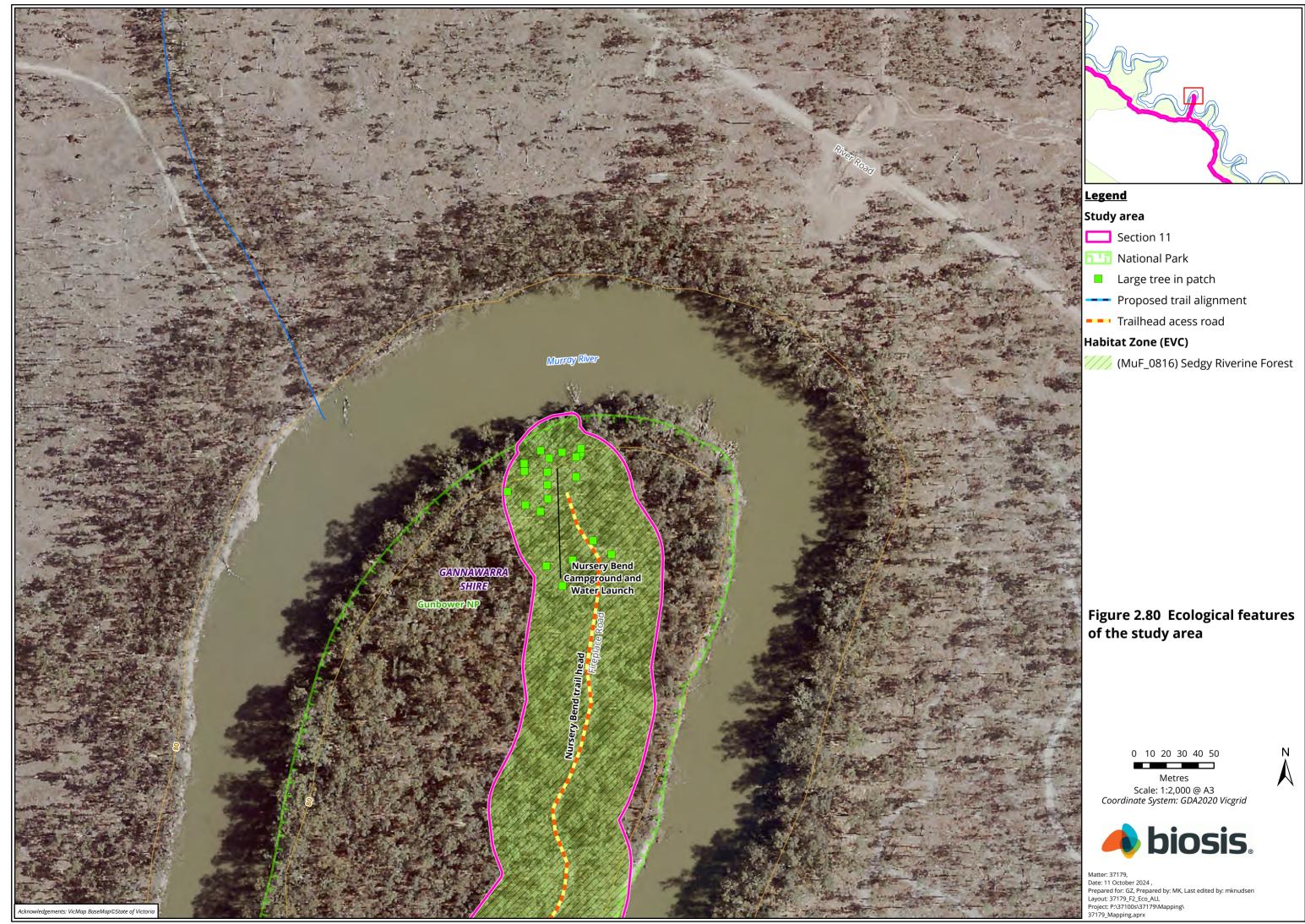


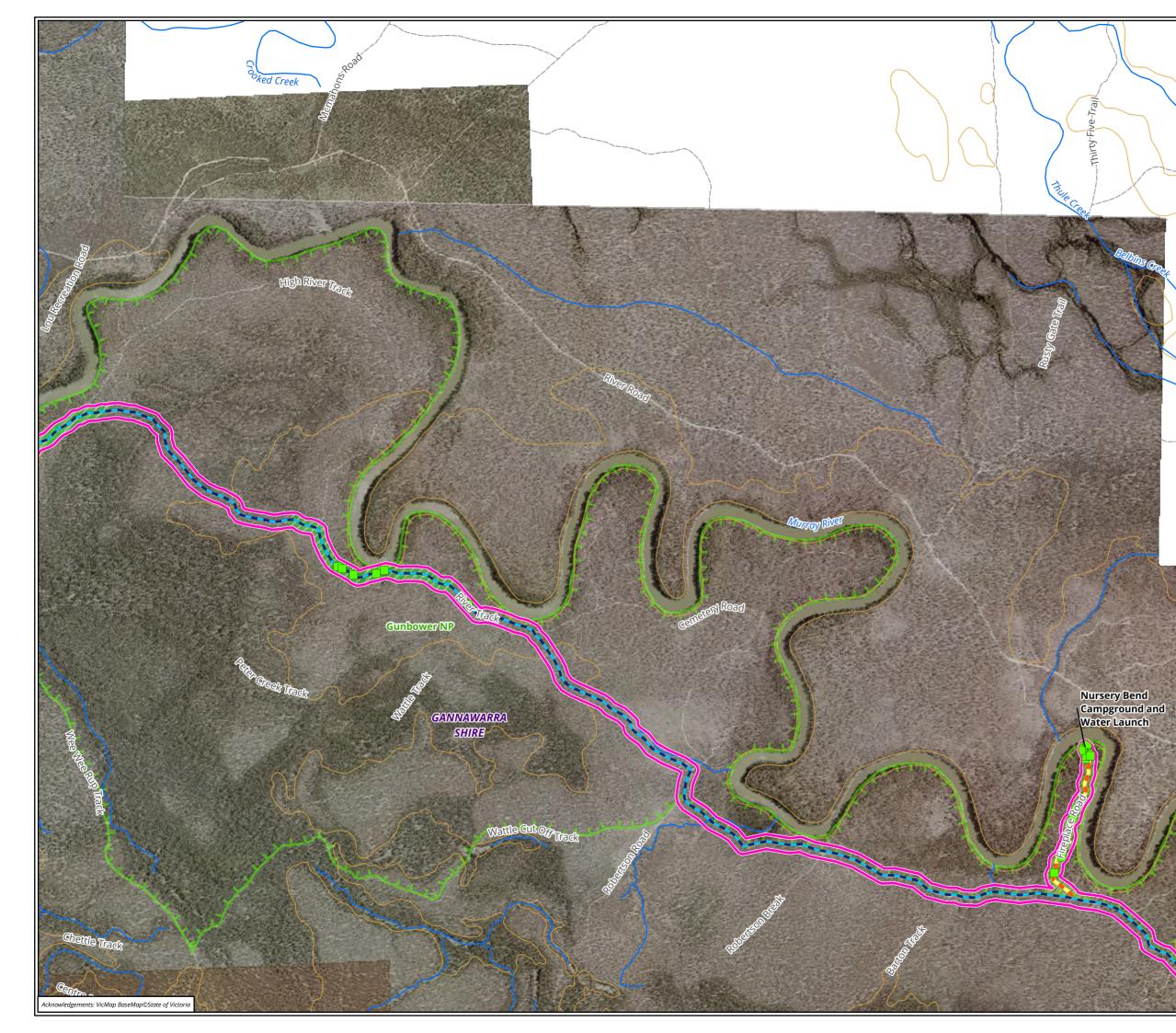


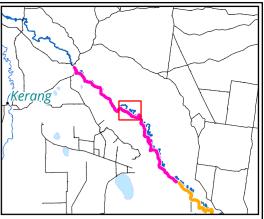
Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid











Study area

- Section 11
- National Park
- Large tree in patch
- --- Proposed trail alignment
- Trailhead acess road

Habitat Zone (EVC)

- (MuF_0814) Riverine Swamp Forest
 - / (MuF_0816) Sedgy Riverine Forest

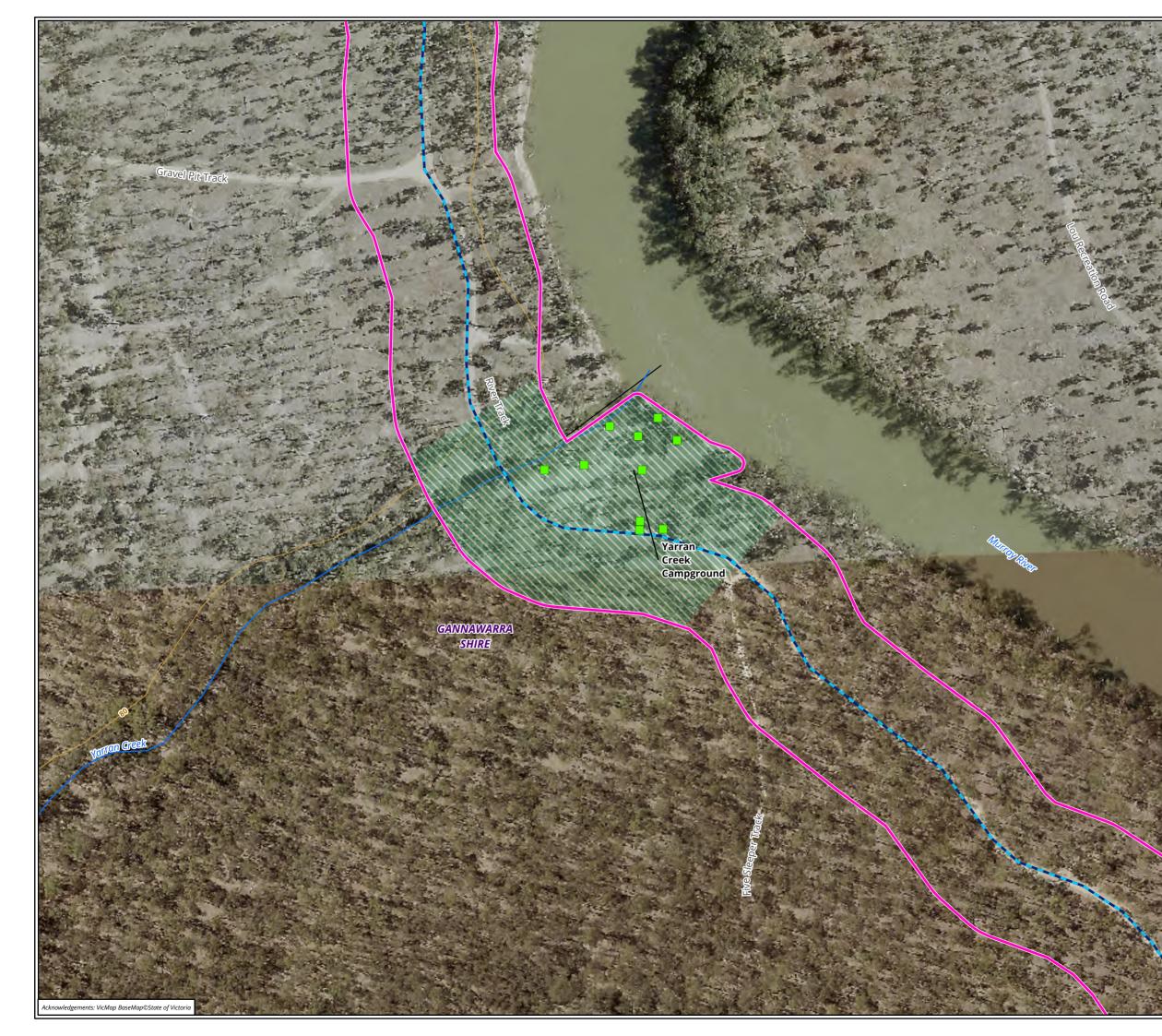
Figure 2.81 Ecological features of the study area

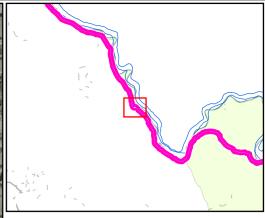




Metres Scale: 1:20,000 @ A3 Coordinate System: GDA2020 Vicgrid







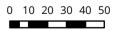
Study area

- Section 11
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest

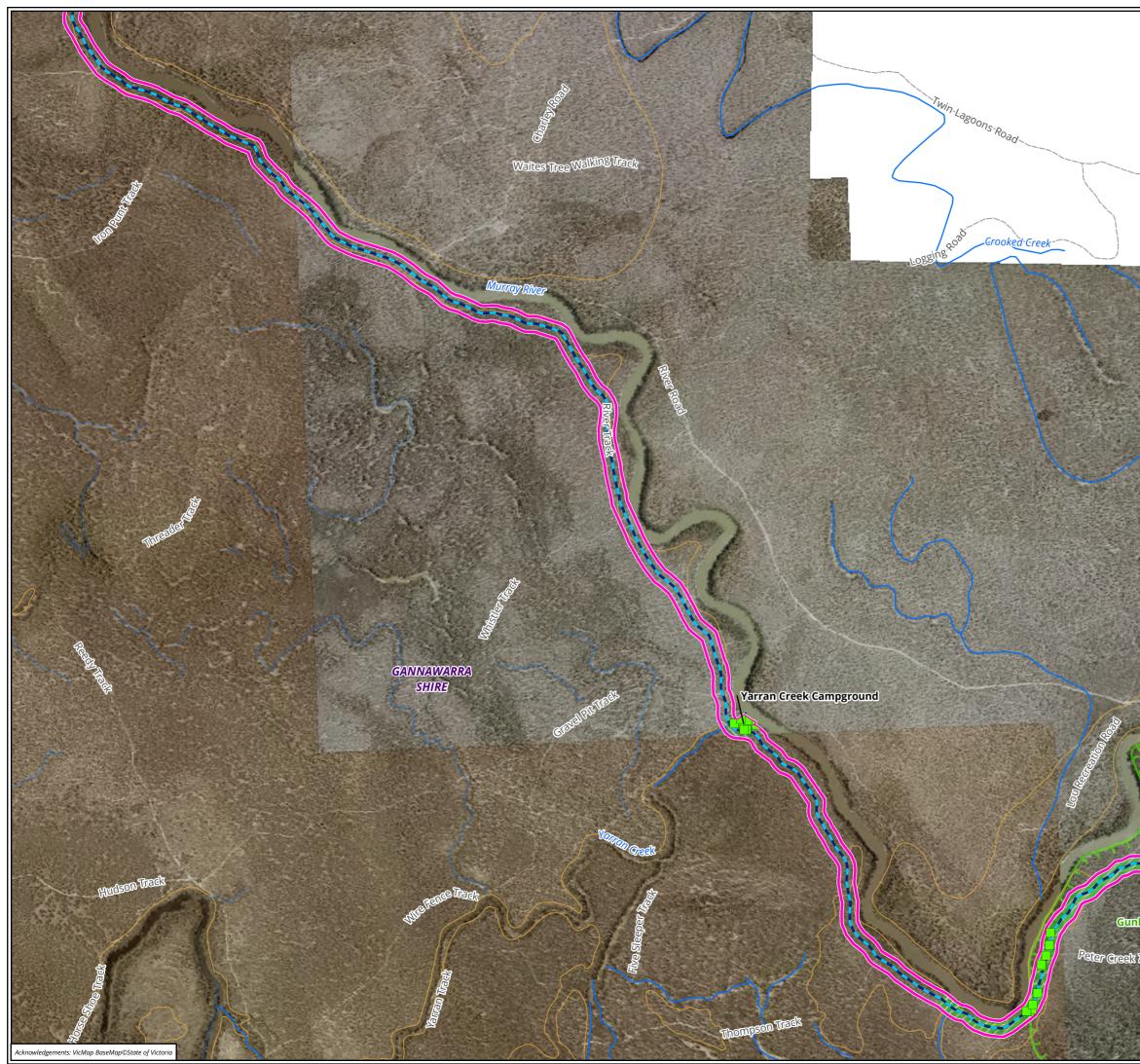
Figure 2.82 Ecological features of the study area

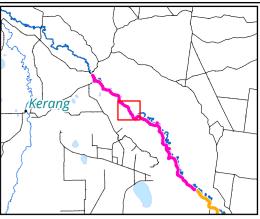




Metres Scale: 1:2,000 @ A3 Coordinate System: GDA2020 Vicgrid







Study area

Section 11

- **D** National Park
- Large tree in patch
- --- Proposed trail alignment

Habitat Zone (EVC)

$\langle \rangle$	(MuF_0106) Grassy Riverine Forest
	(MuF_0814) Riverine Swamp Forest

Figure 2.83 Ecological features of the study area





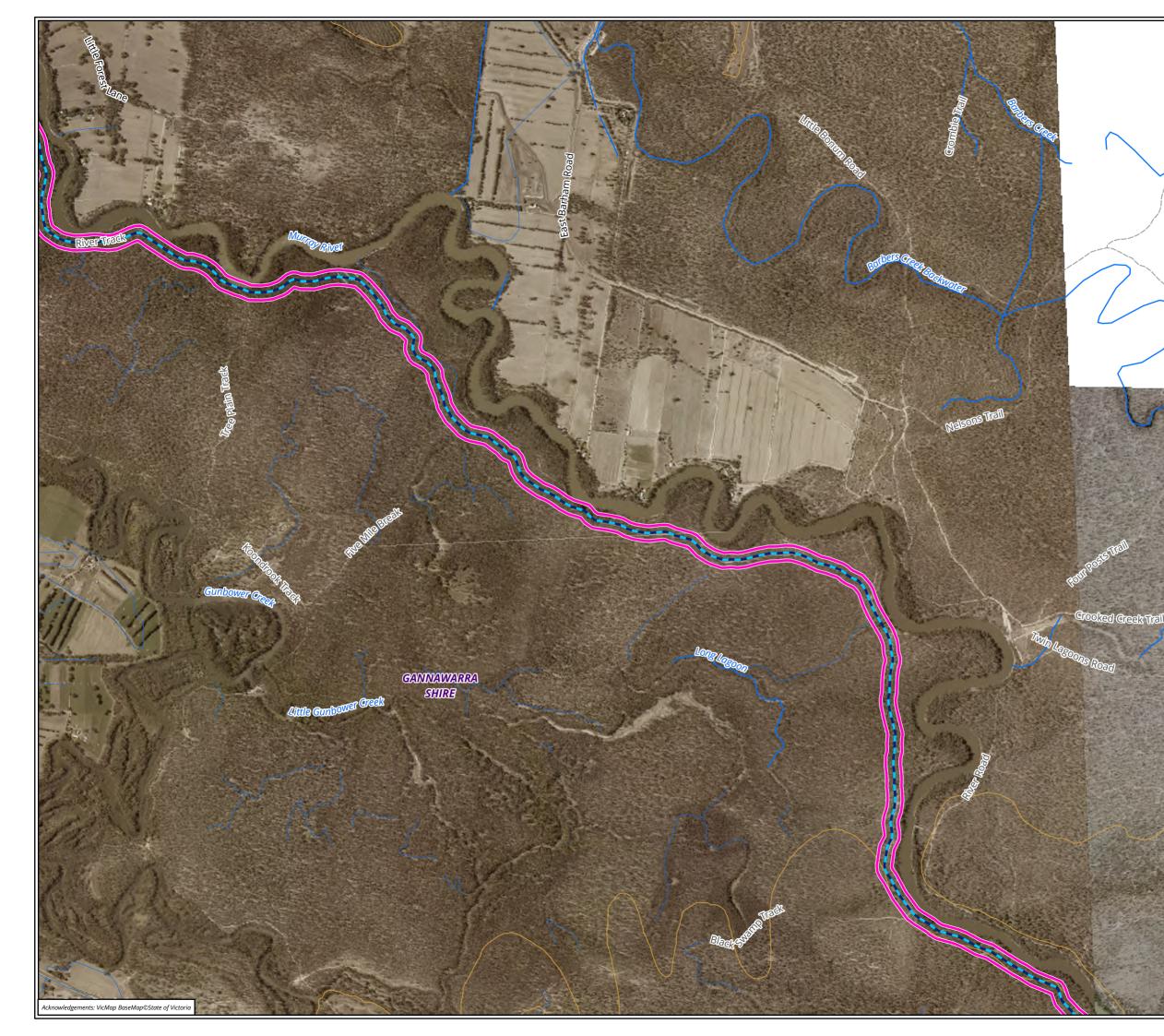
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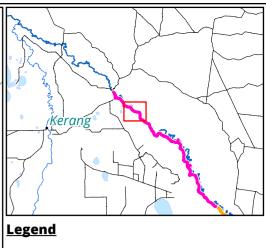


Matter: 37179, Date: 11 October 2024, Prepared for: GZ, Prepared by: MK, Last edited by: mknudsen Layout: 37179_F2_Eco_ALL Project: P:\37100s\37179\Mapping\ 37179_Mapping.aprx

Gunbower NP

Trada





Study area

- Section 11
- Large tree in patch
- ---- Proposed trail alignment

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest

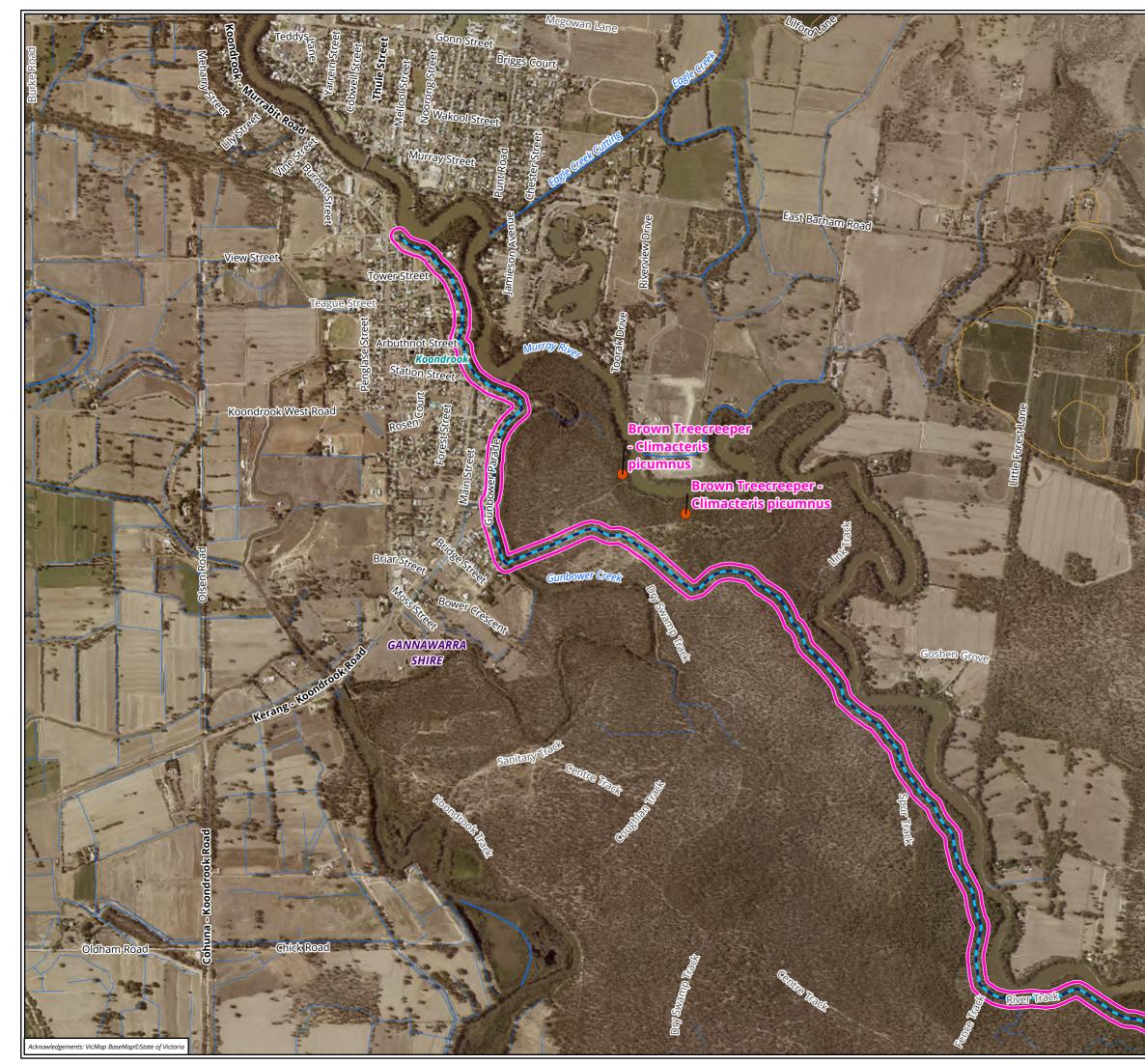
Figure 2.84 Ecological features of the study area



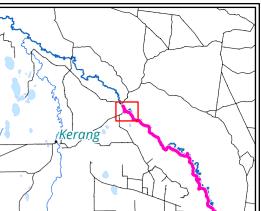


Metres Scale: 1:20,000 @ A3 Coordinate System: GDA2020 Vicgrid





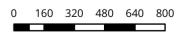




Study area

- Section 11
- Threatened fauna observation
- Large tree in patch
- --- Proposed trail alignment

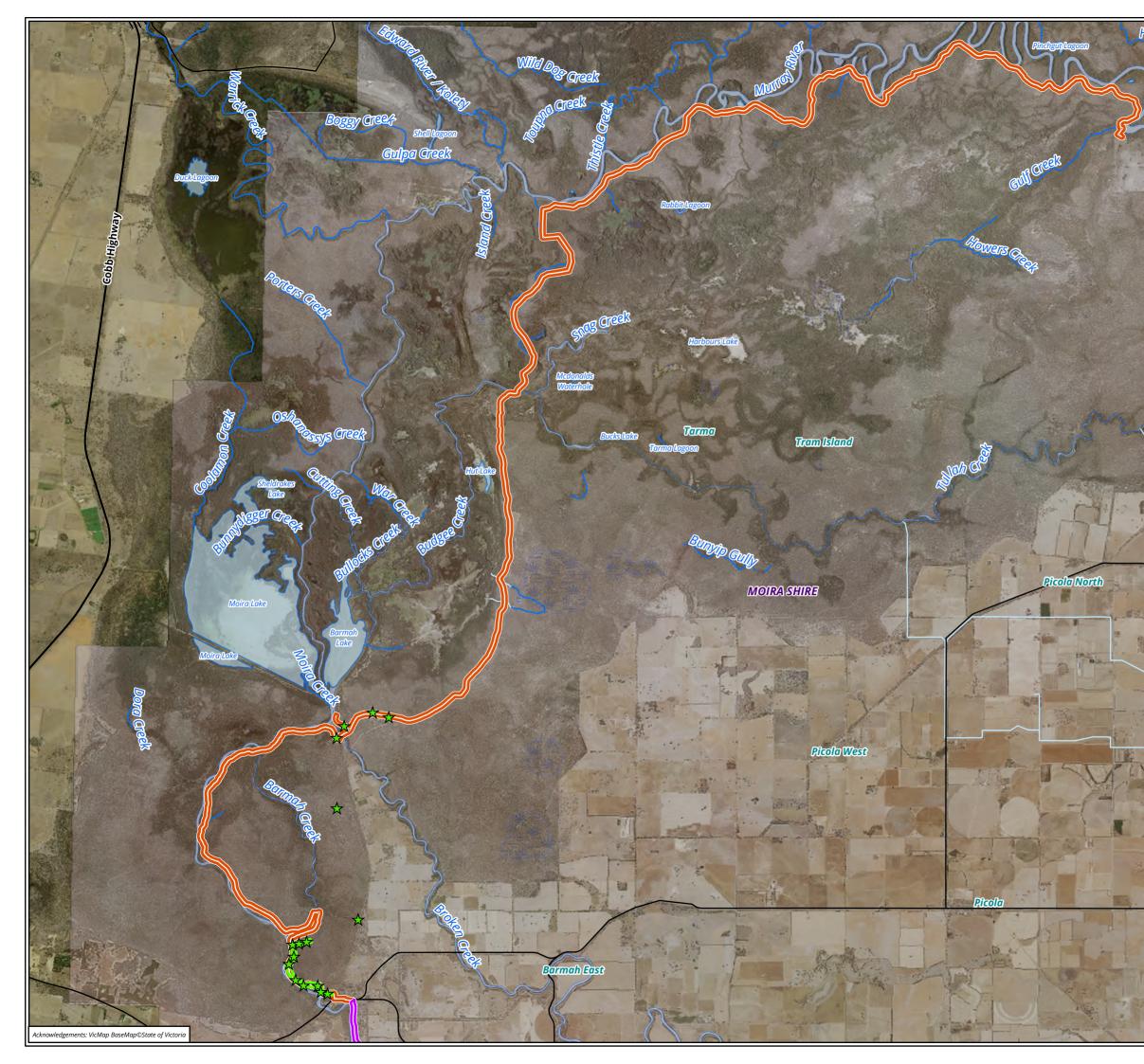
Figure 2.85 Ecological features of the study area

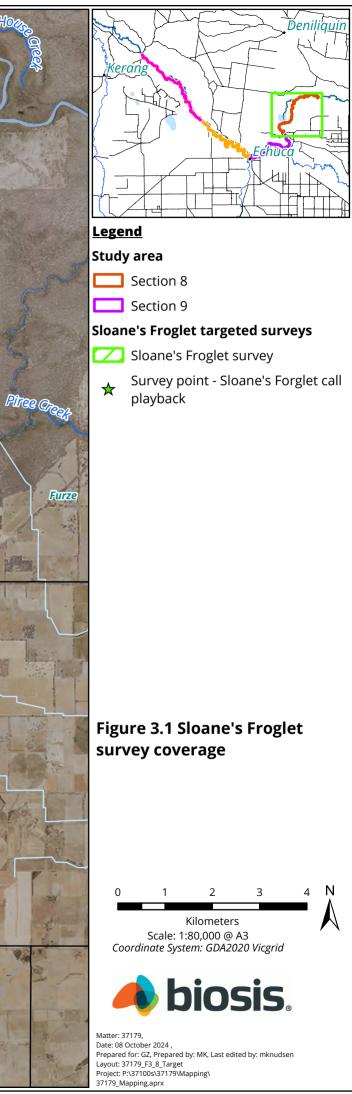


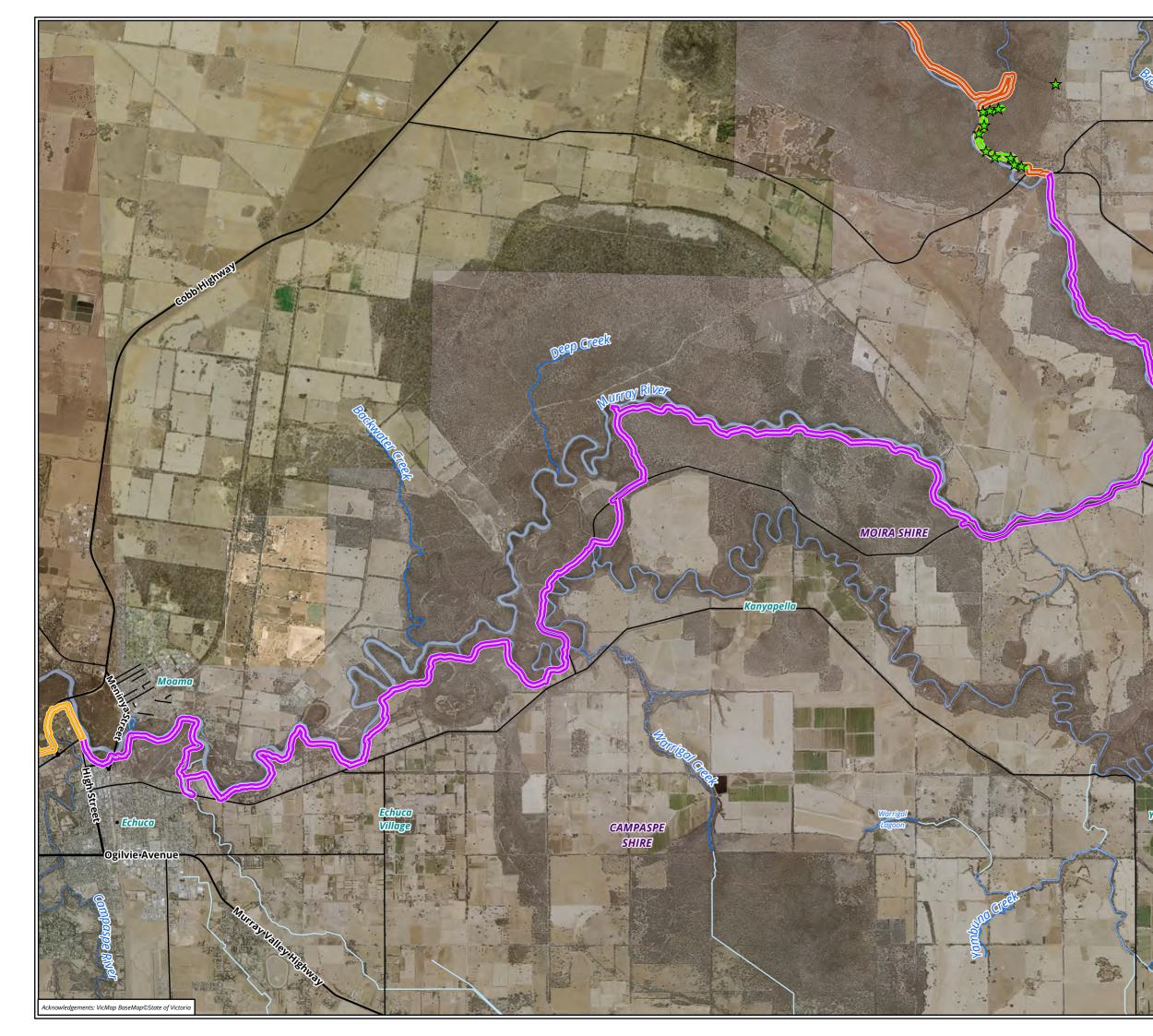


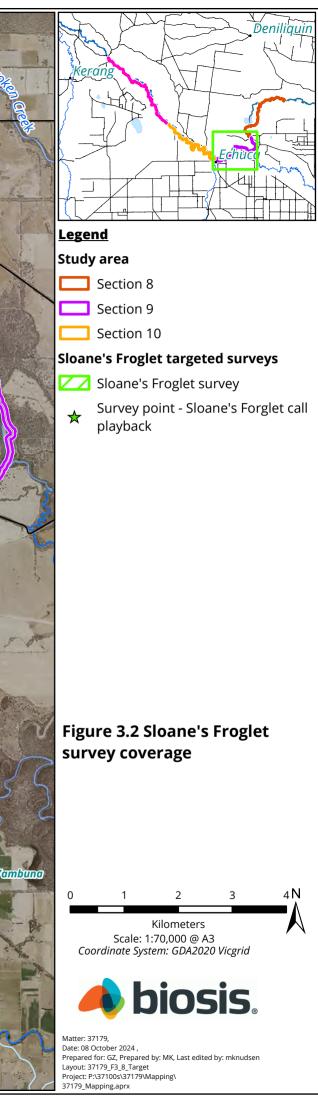
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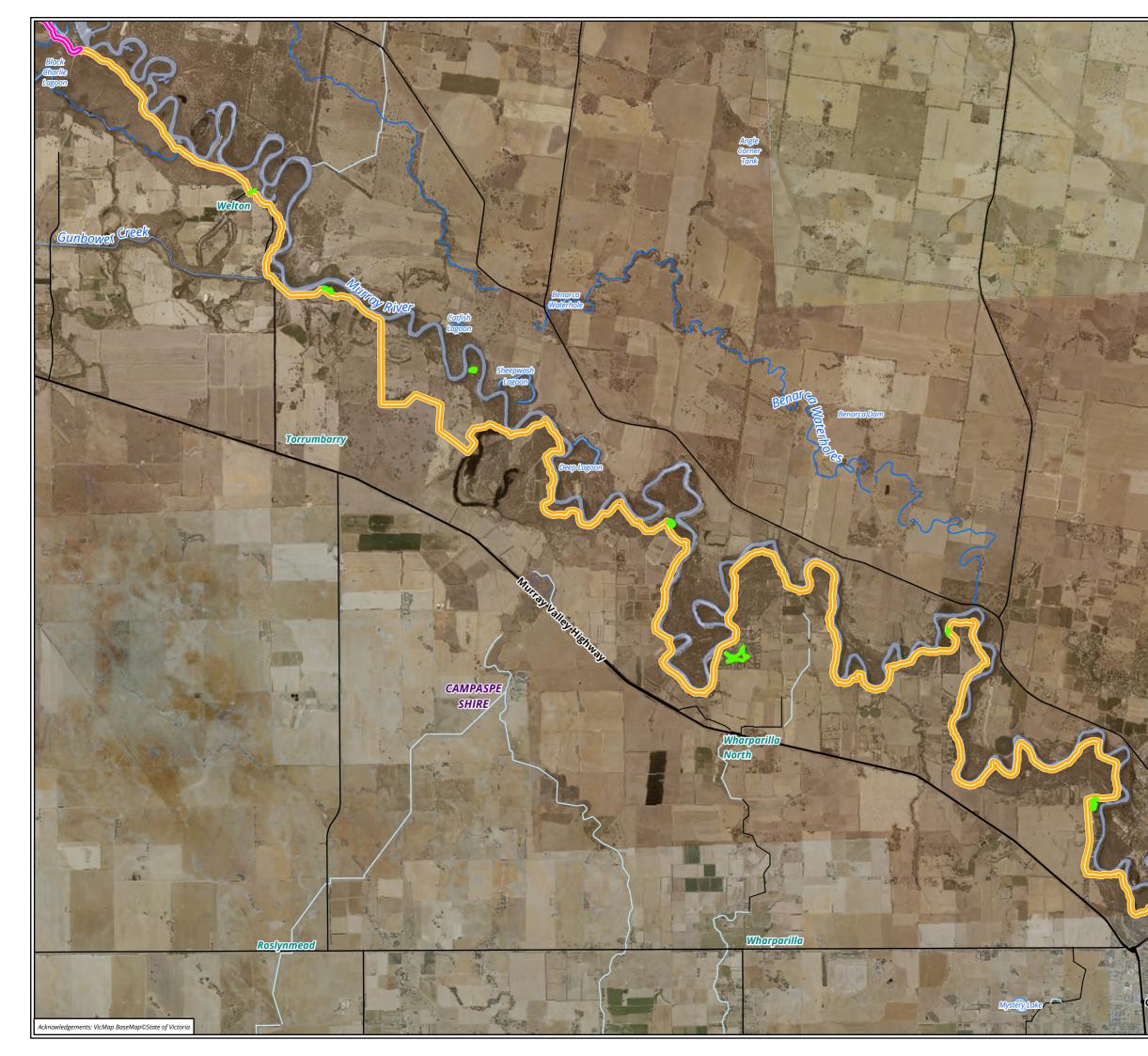






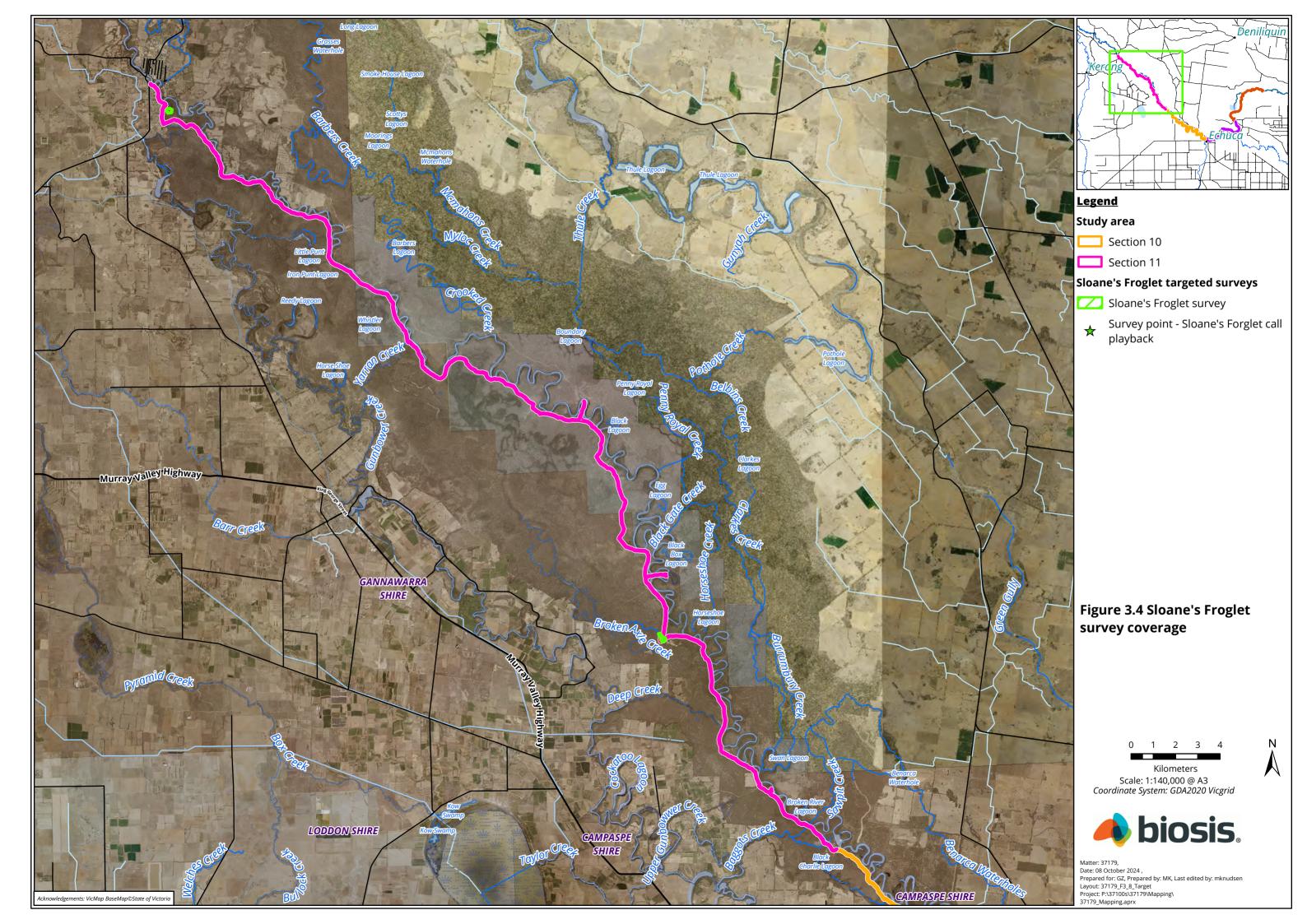


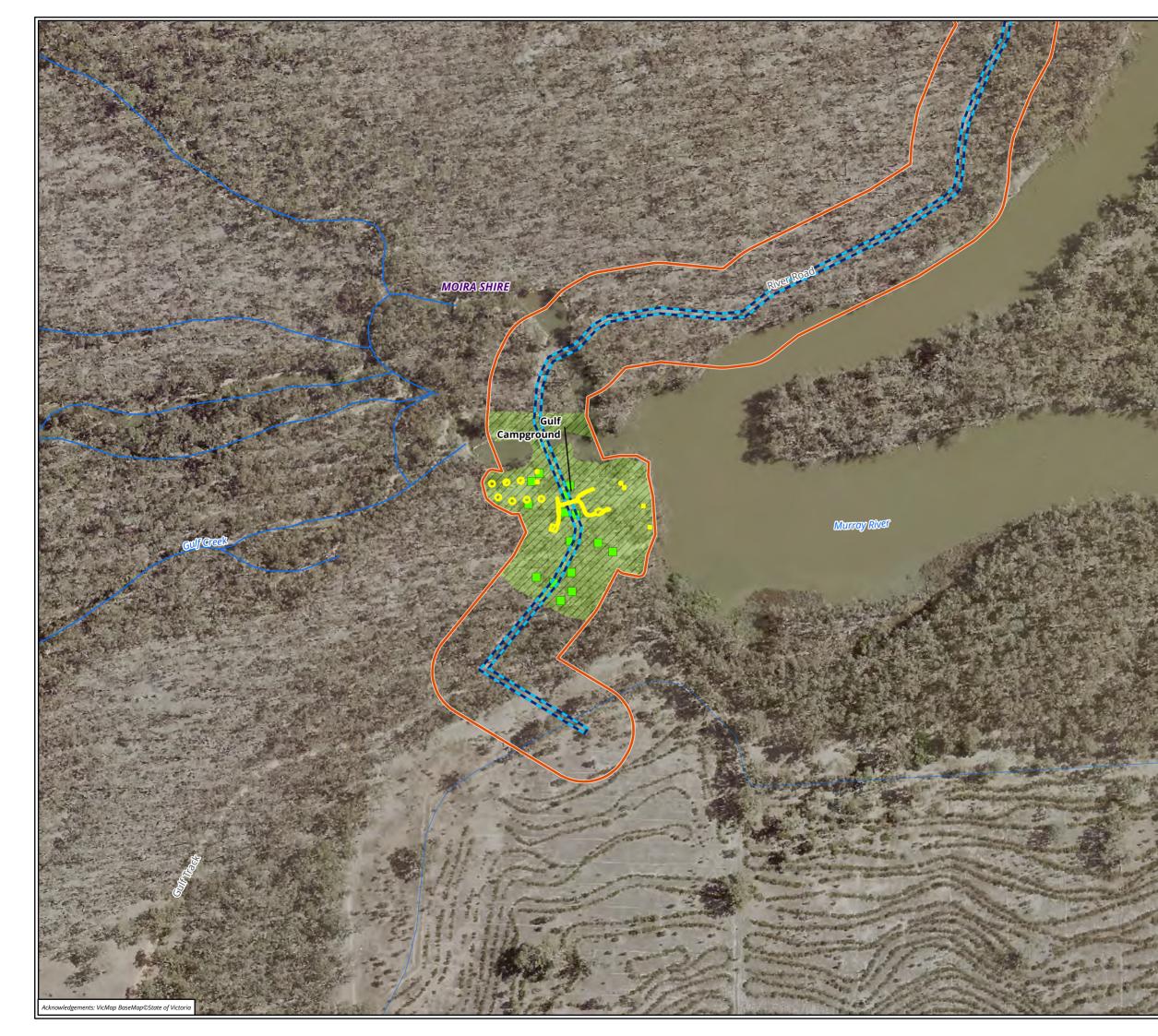


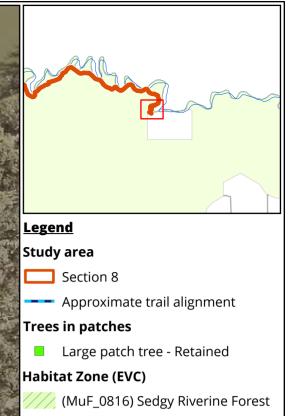




Ogilvie Avenue







🔼 NVR Removal

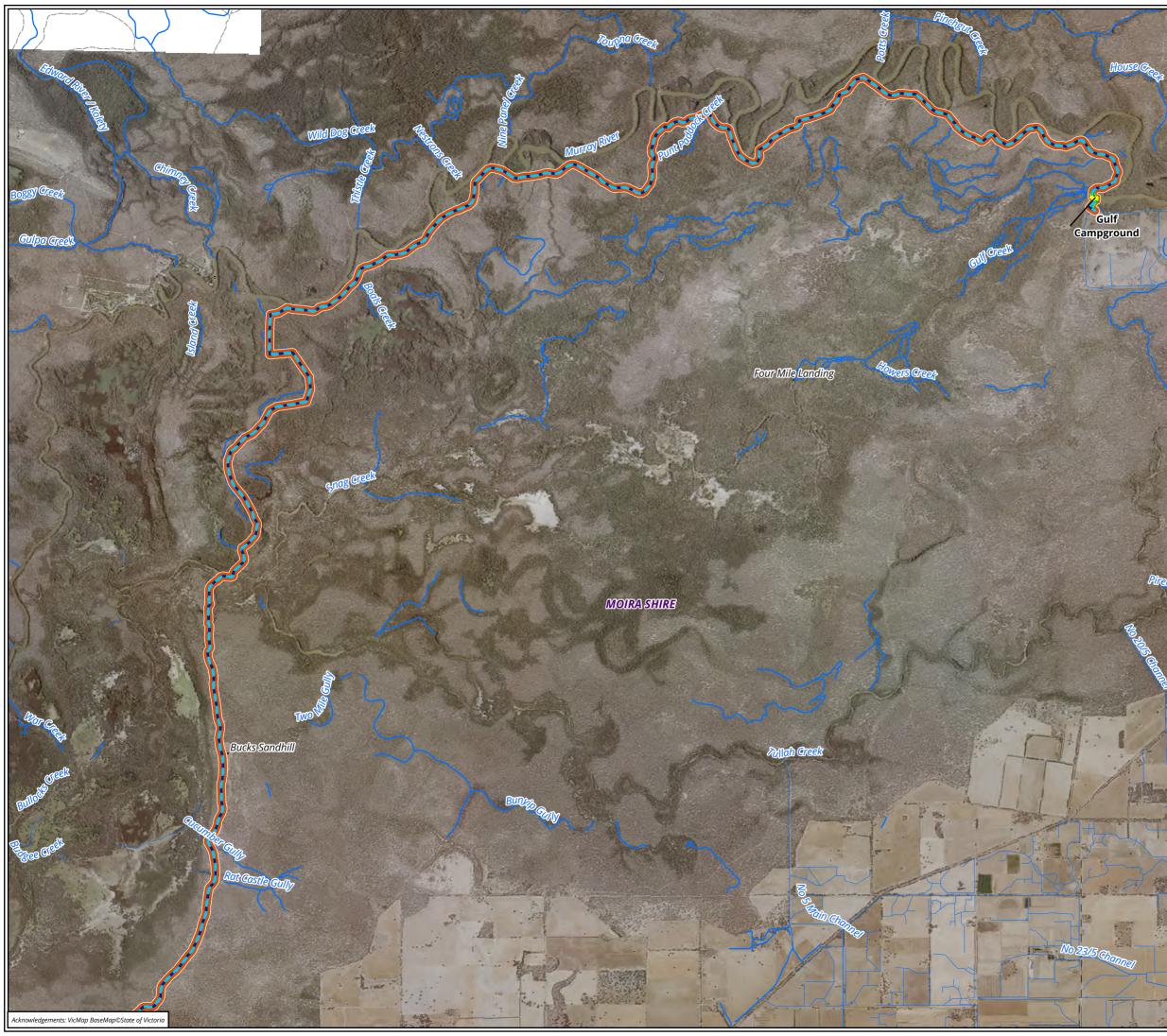


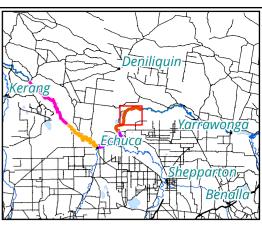
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 8

---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0816) Sedgy Riverine Forest Z NVR Removal

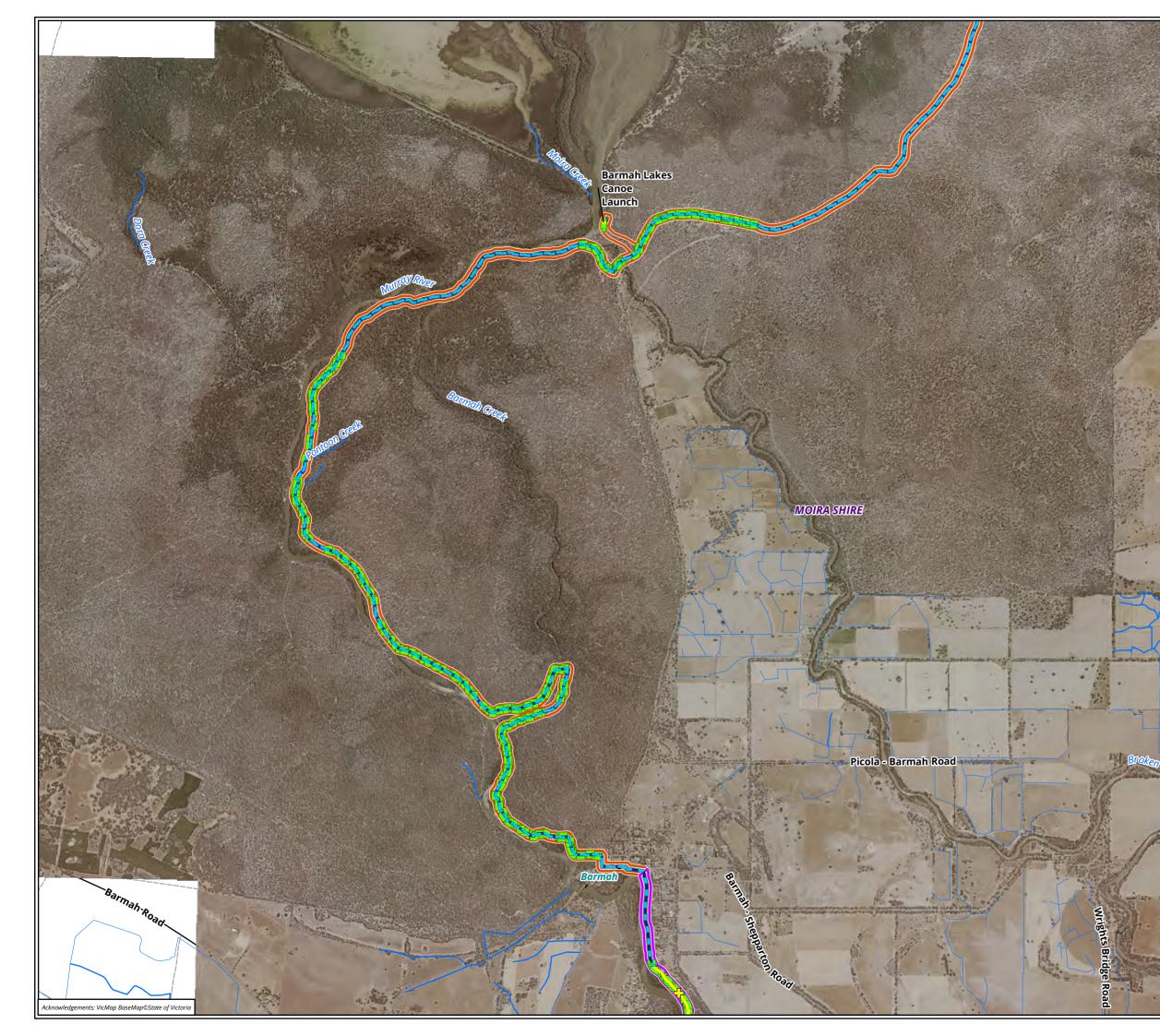


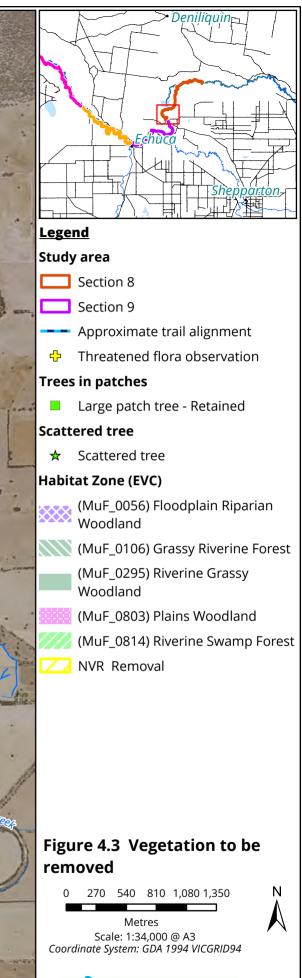
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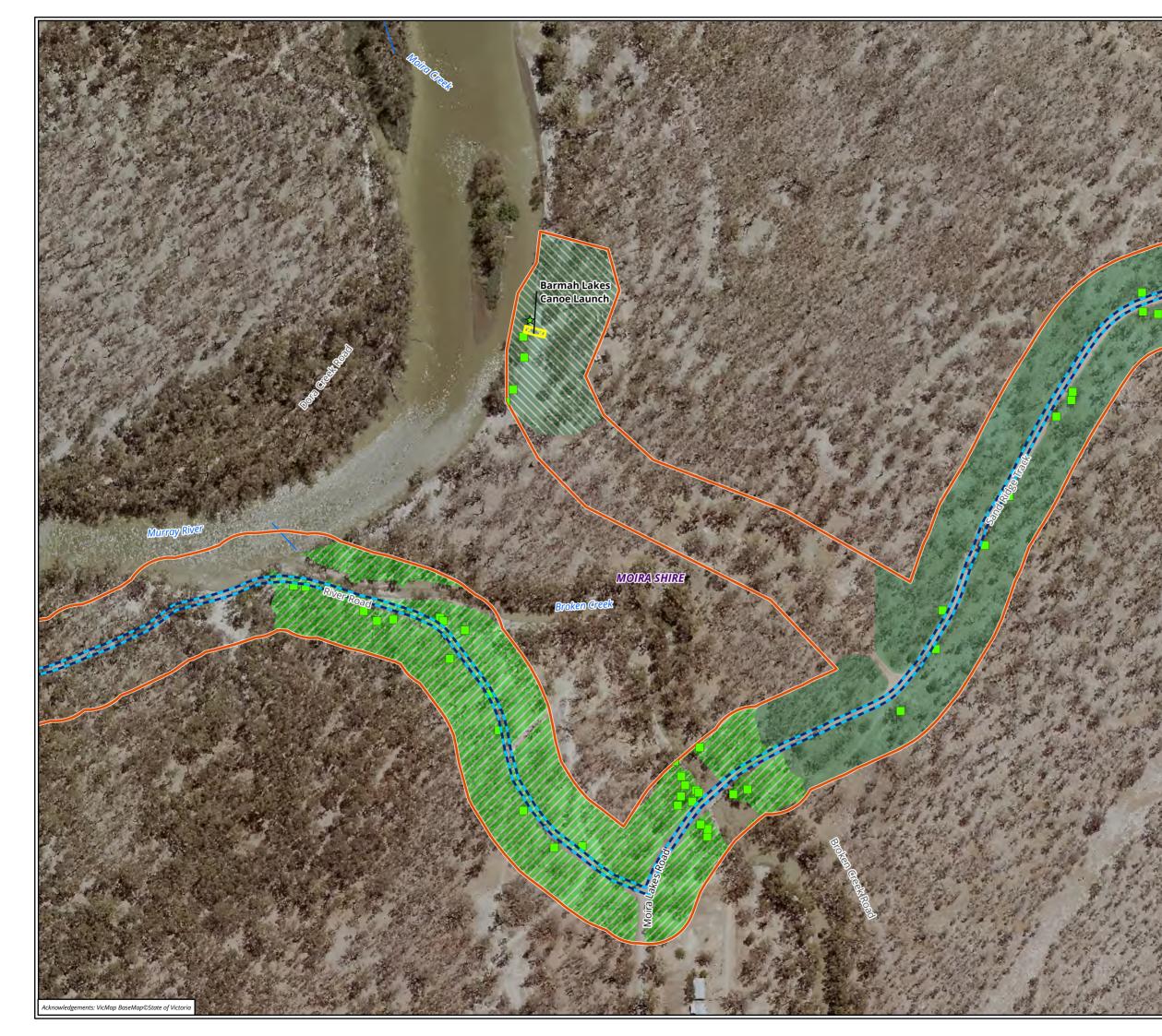
Metres Scale: 1:56,000 @ A3 Coordinate System: GDA 1994 VICGRID94













Study area

Section 8

---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest

(MuF_0295) Riverine Grassy Woodland

(MuF_0814) Riverine Swamp Forest
 NVR Removal

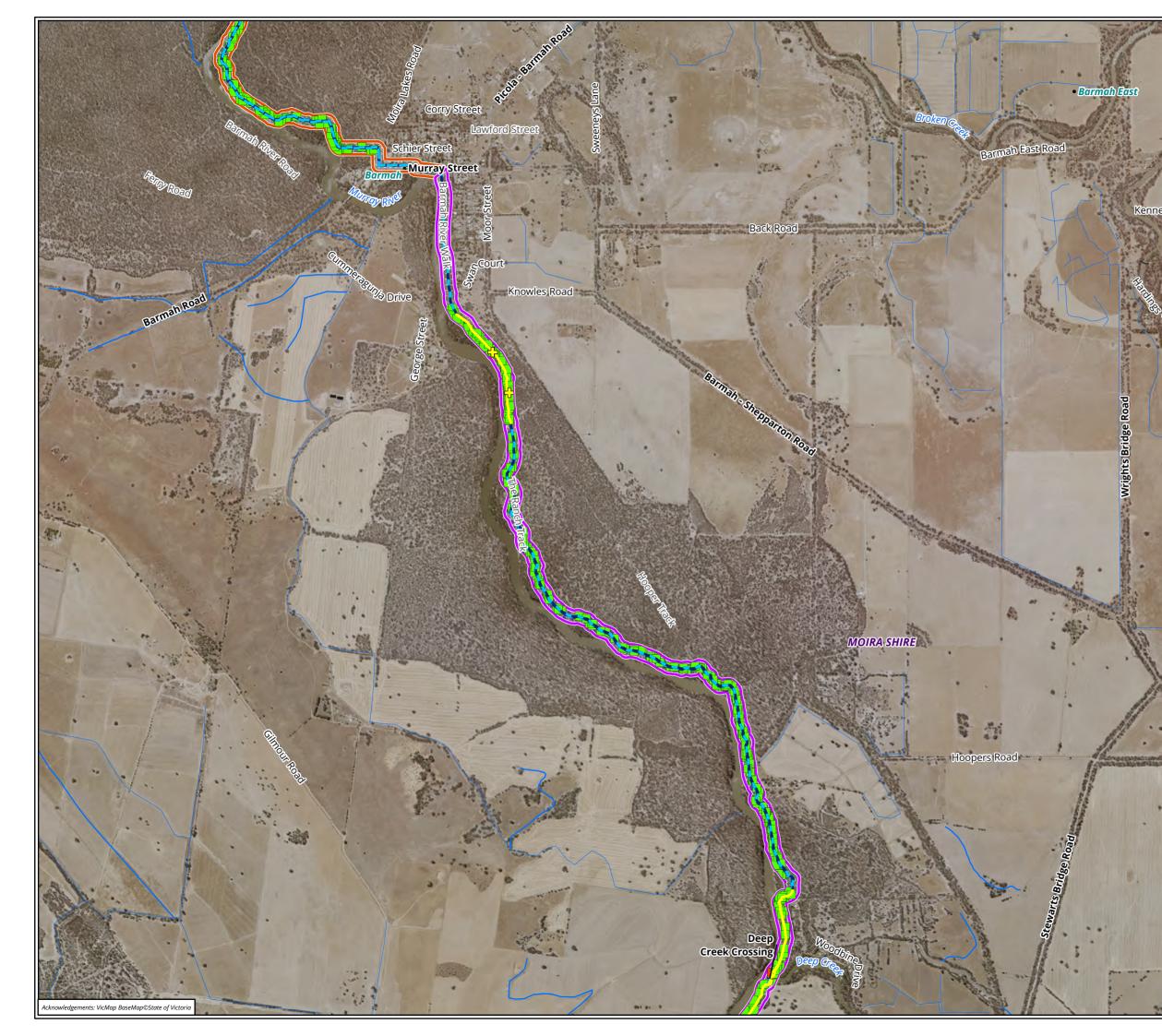
Figure 4.4 Vegetation to be removed

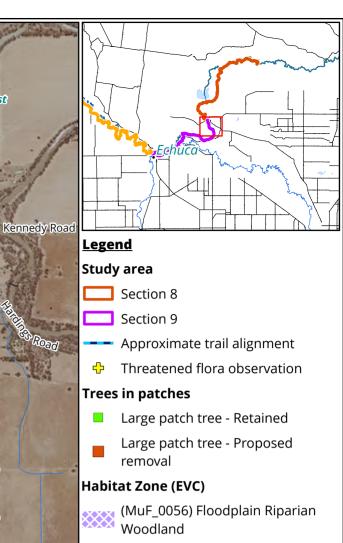
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







(MuF_0103) Riverine Chenopod Woodland

(MuF_0106) Grassy Riverine Forest

(MuF_0295) Riverine Grassy Woodland

(MuF_0803) Plains Woodland

NVR Removal

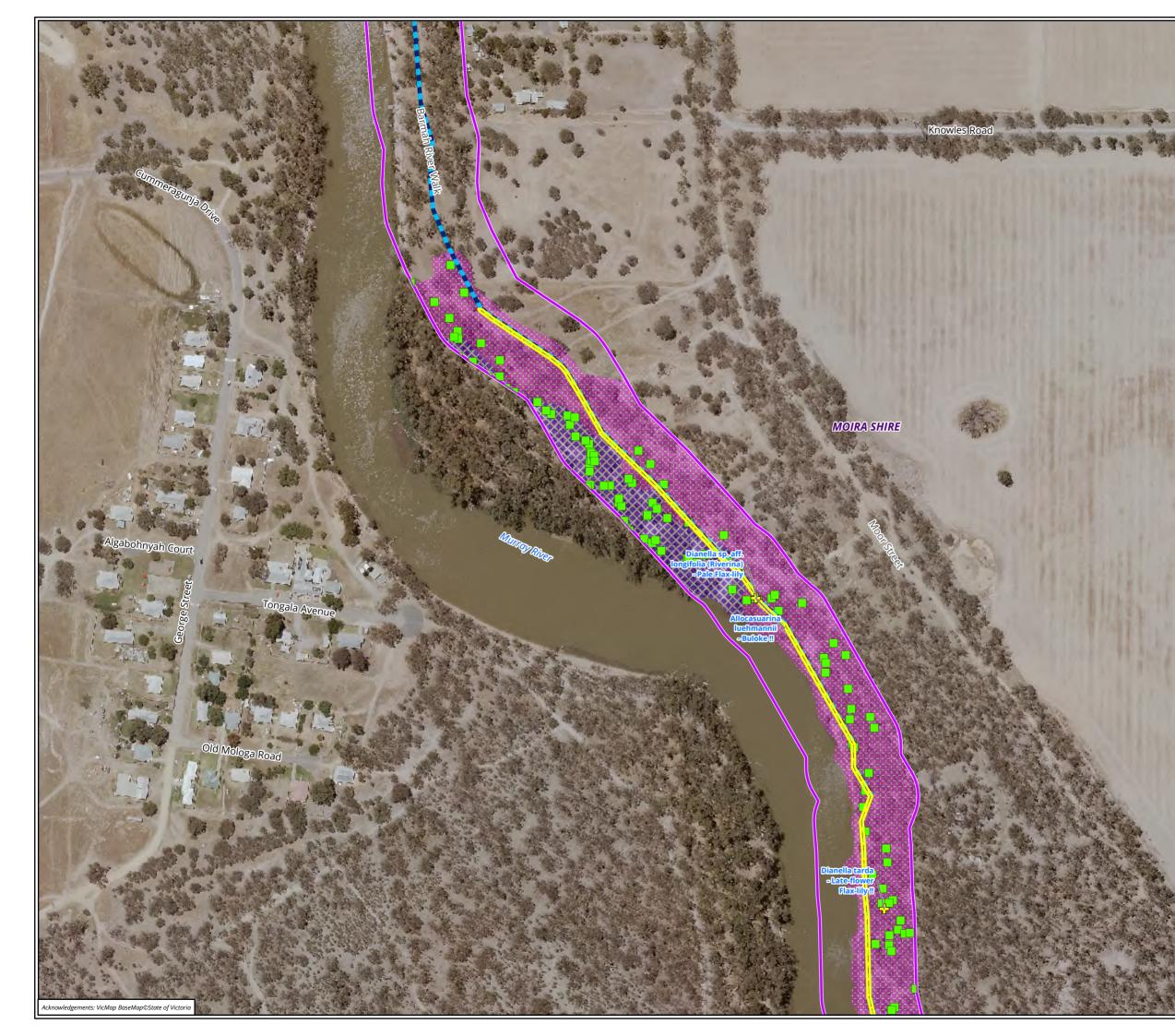
Figure 4.5 Vegetation to be removed

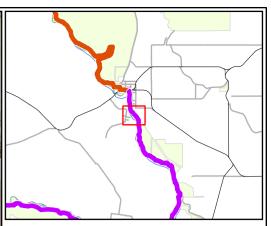
0 190 380 570 760 950



Metres Scale: 1:23,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 9

- --- Approximate trail alignment
- Threatened flora observation

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

- 📱 (MuF_0803) Plains Woodland
- 💋 NVR Removal

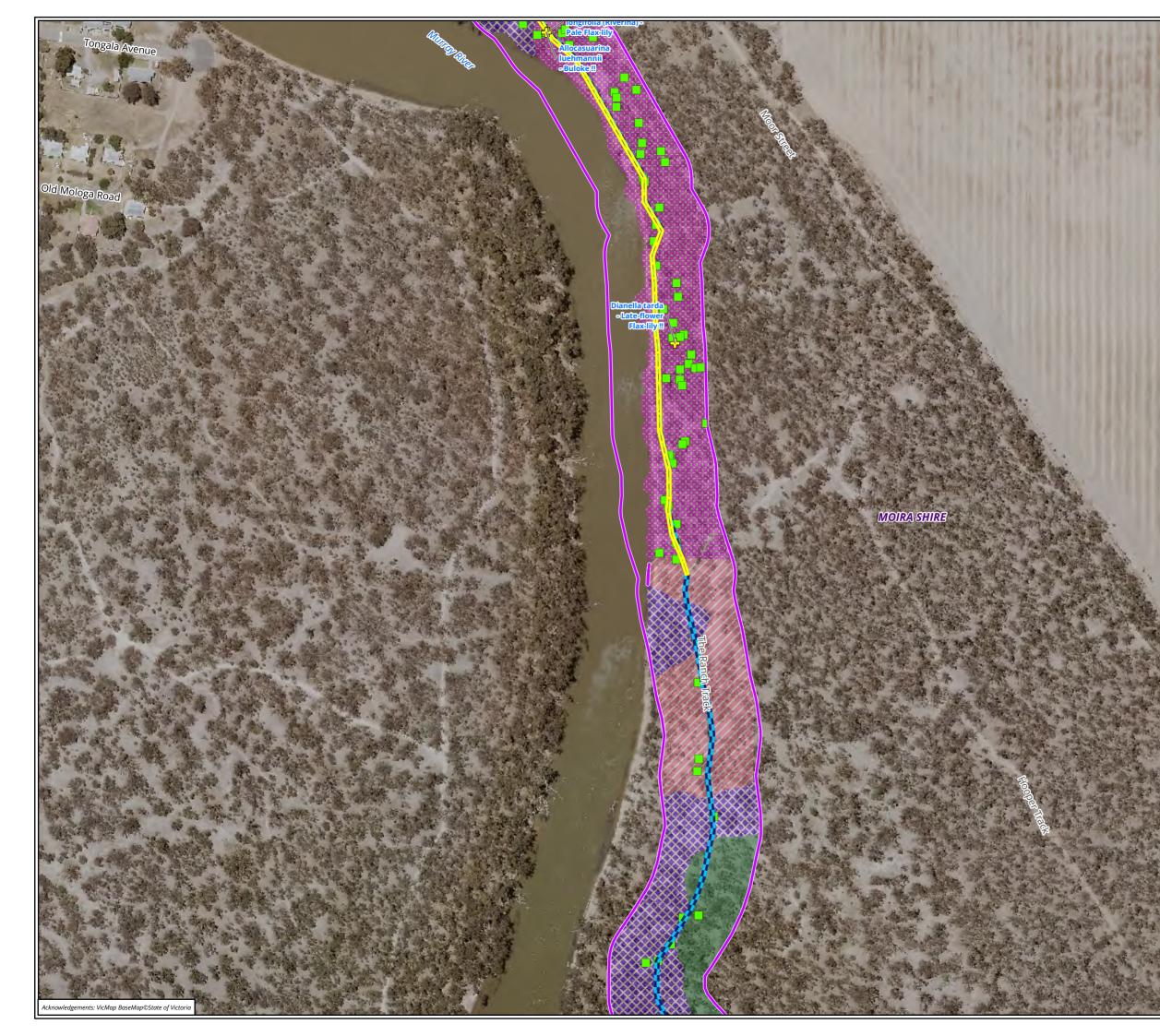
Figure 4.6 Vegetation to be removed

0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94

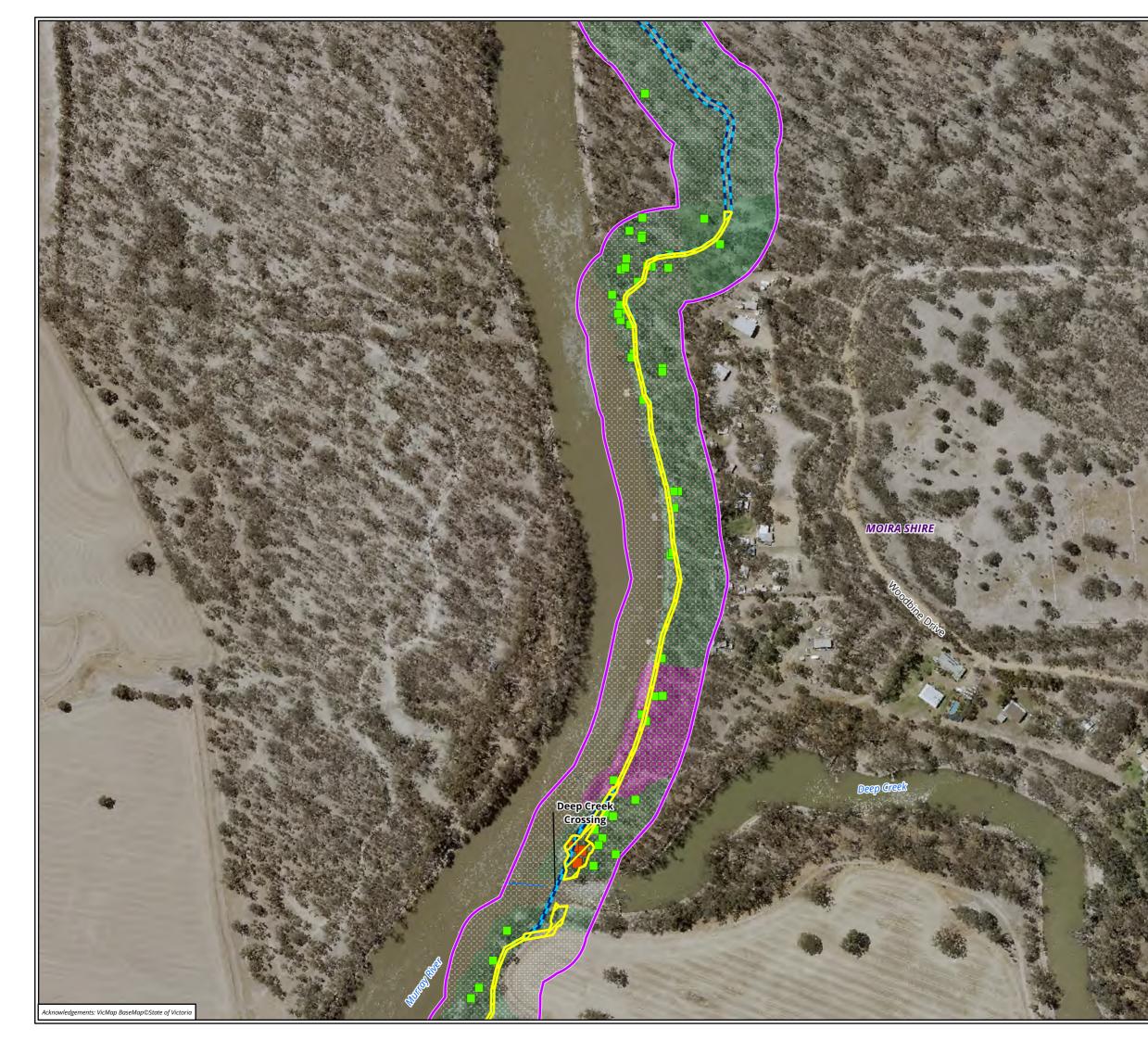




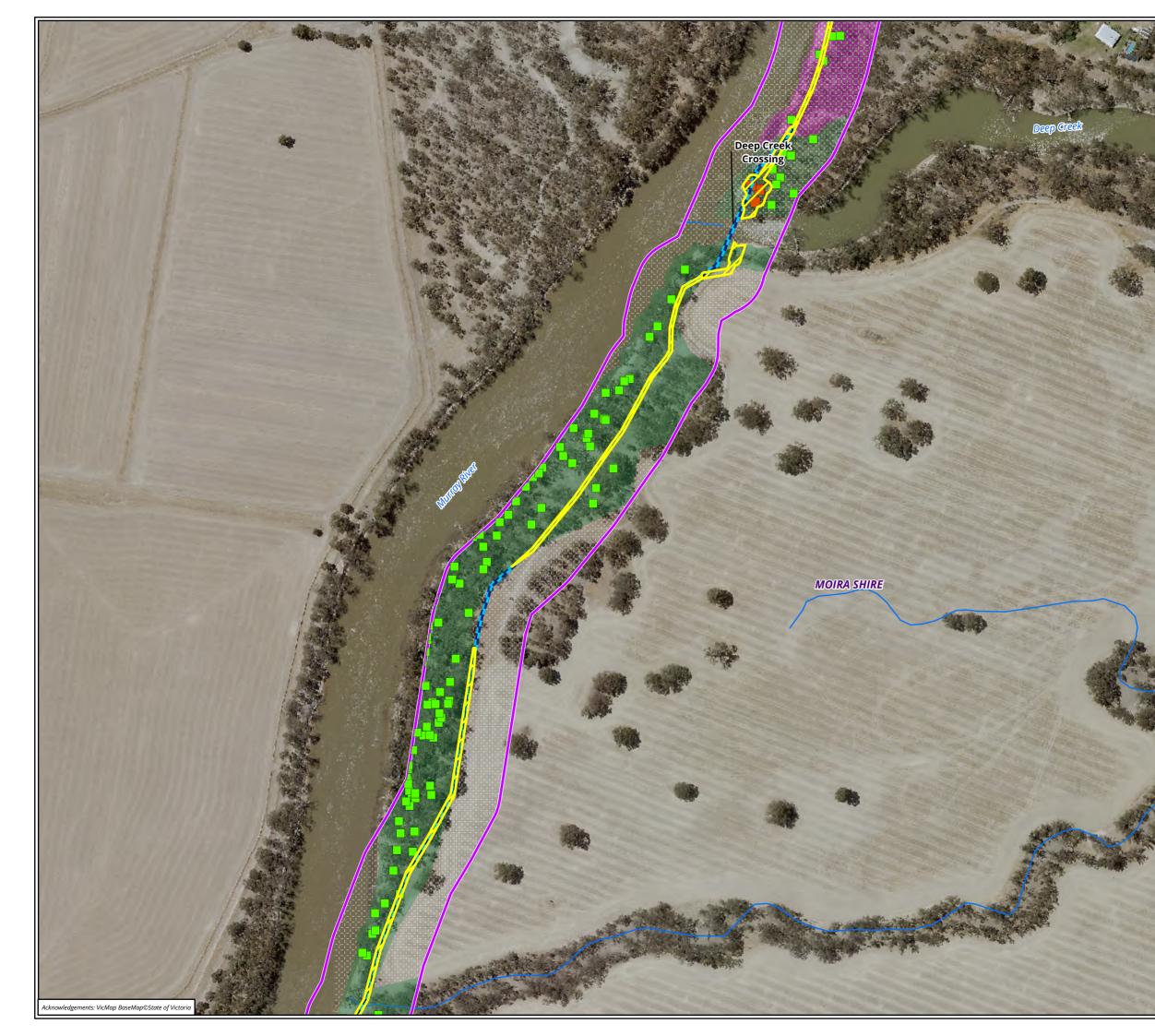


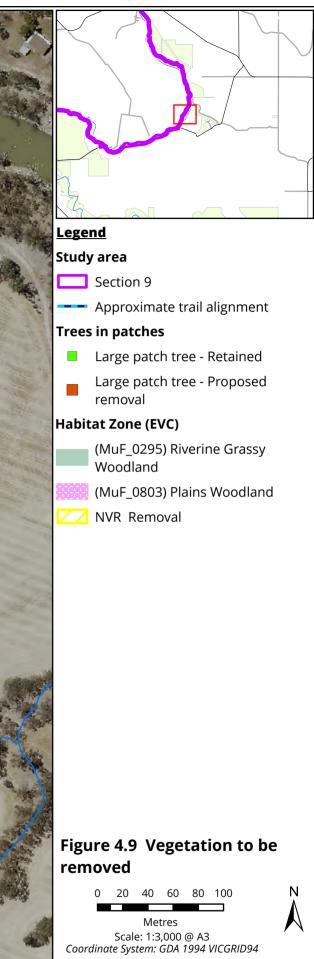
Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94

















Study area

- Section 9
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland
- 🔼 NVR Removal

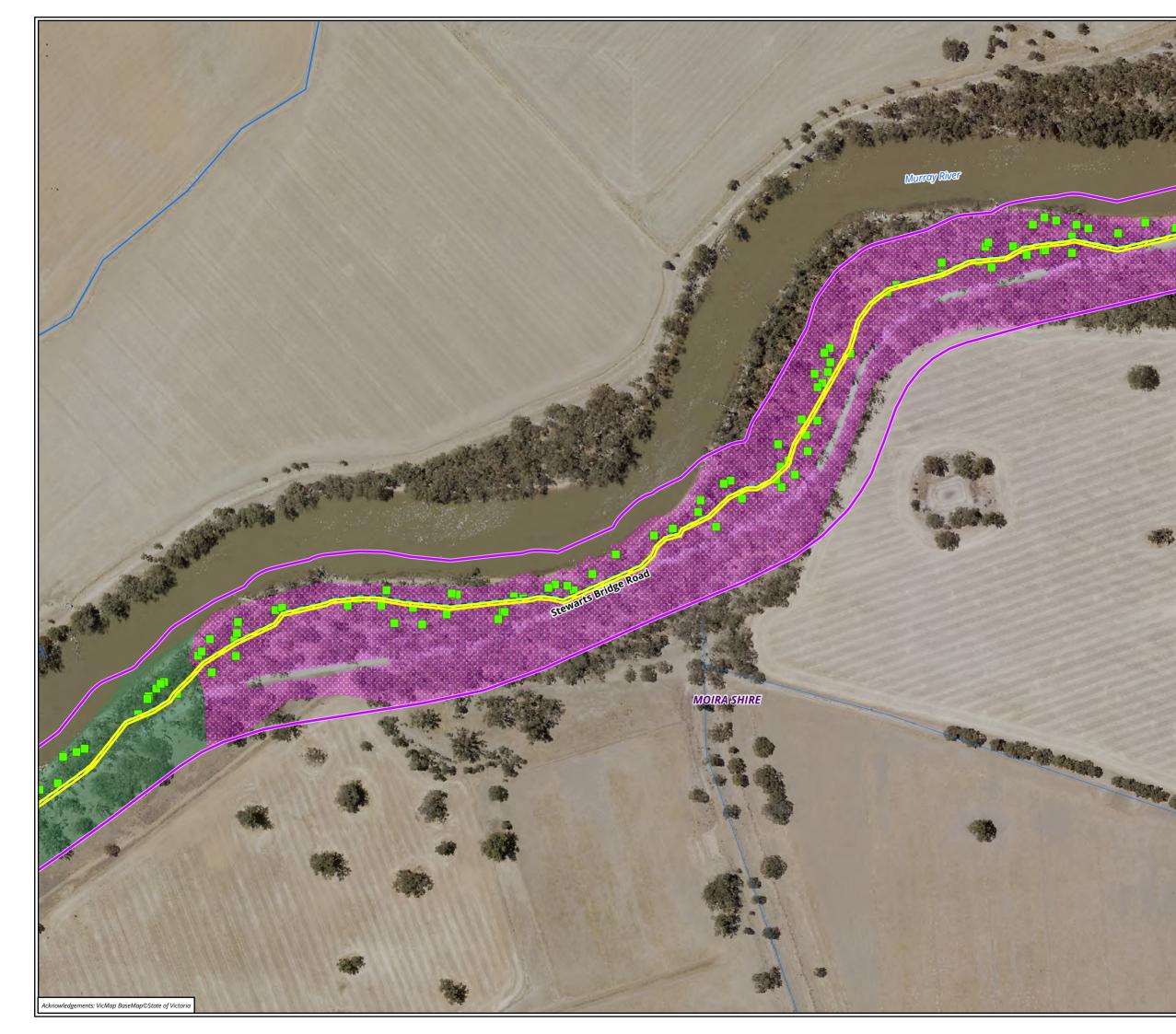


0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

- Section 9
- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland
- 🔼 NVR Removal

-

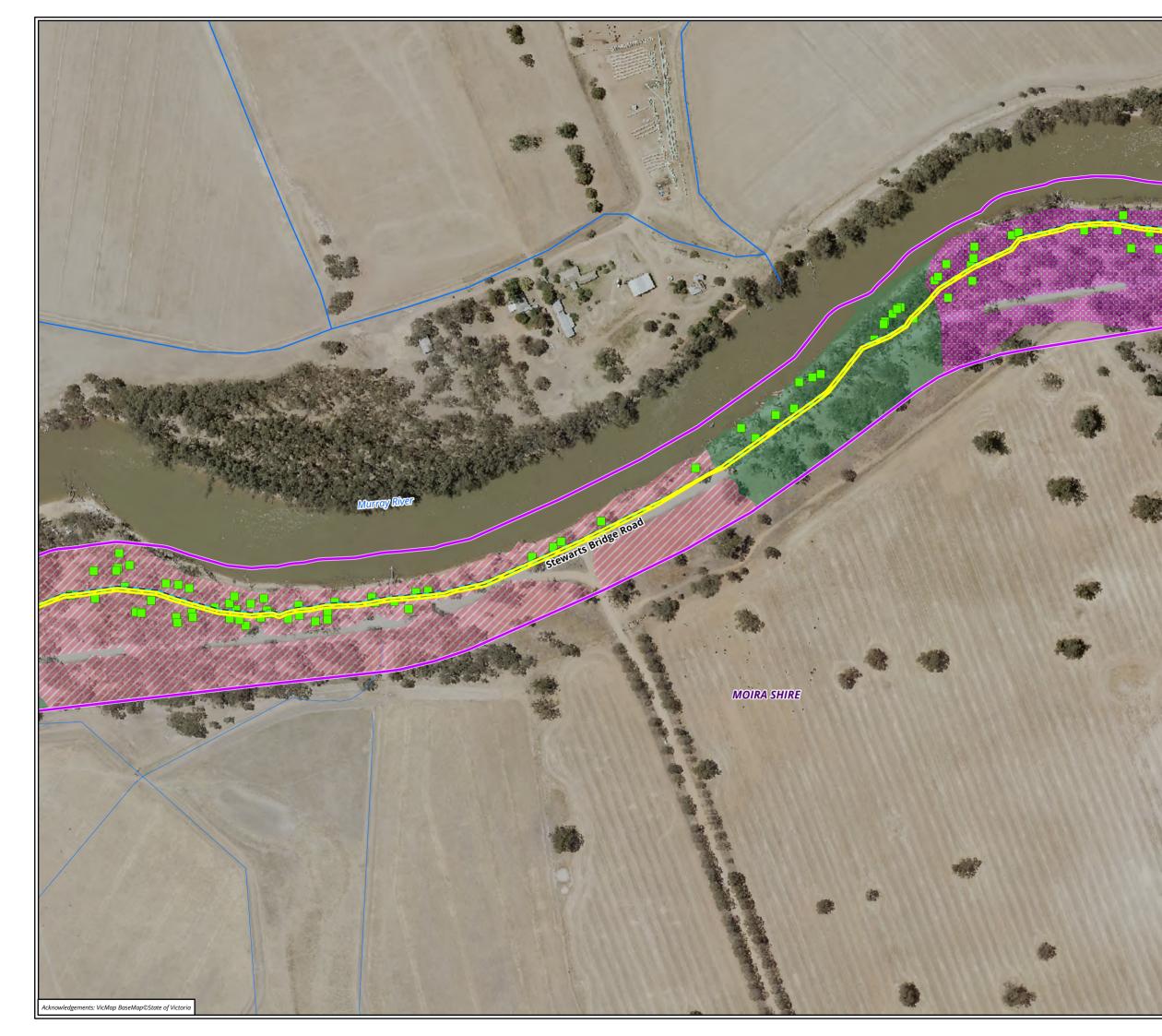
Figure 4.11 Vegetation to be removed

0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

- Section 9
- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0295) Riverine Grassy Woodland

(MuF_0803) Plains Woodland

💋 NVR Removal

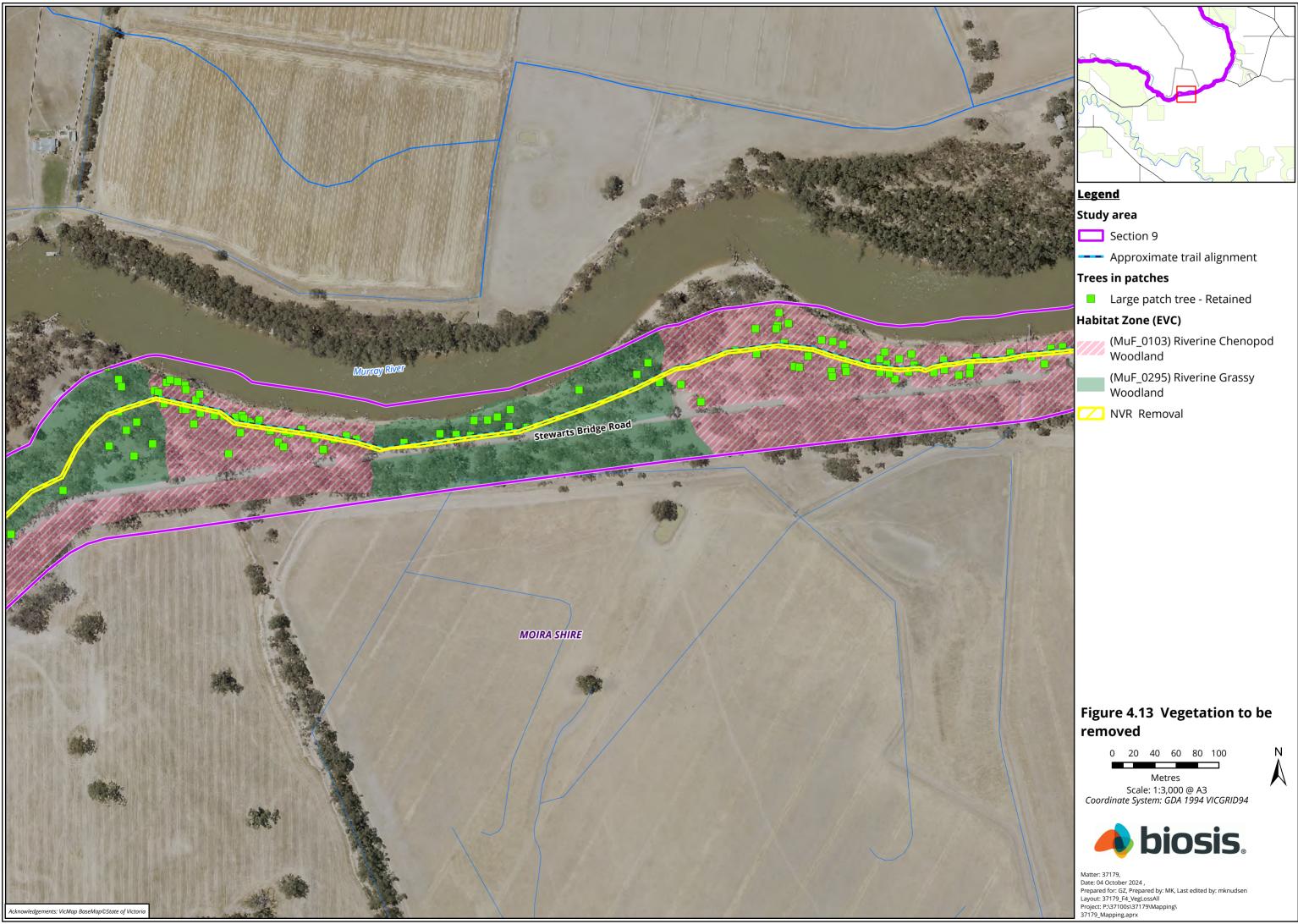


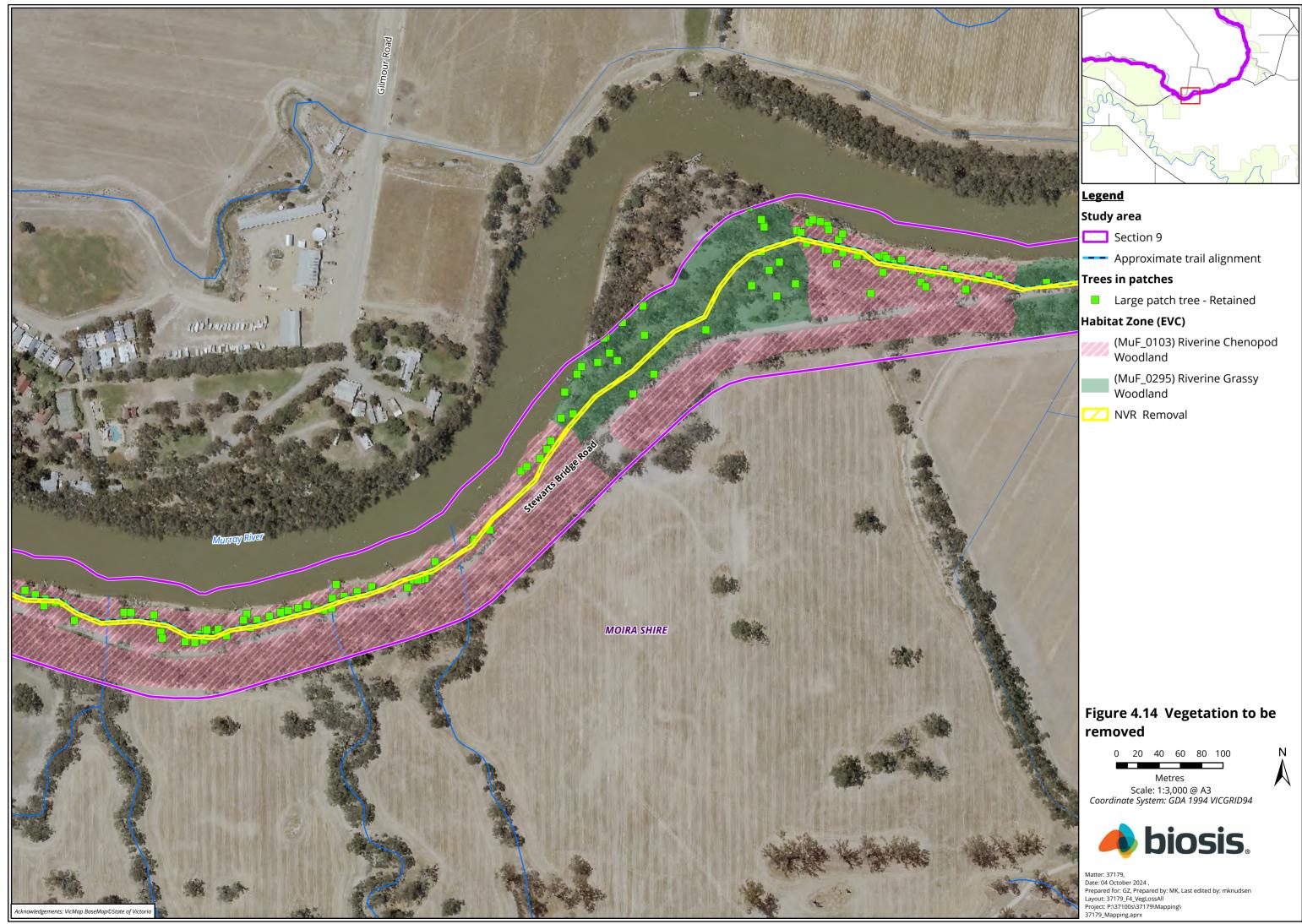
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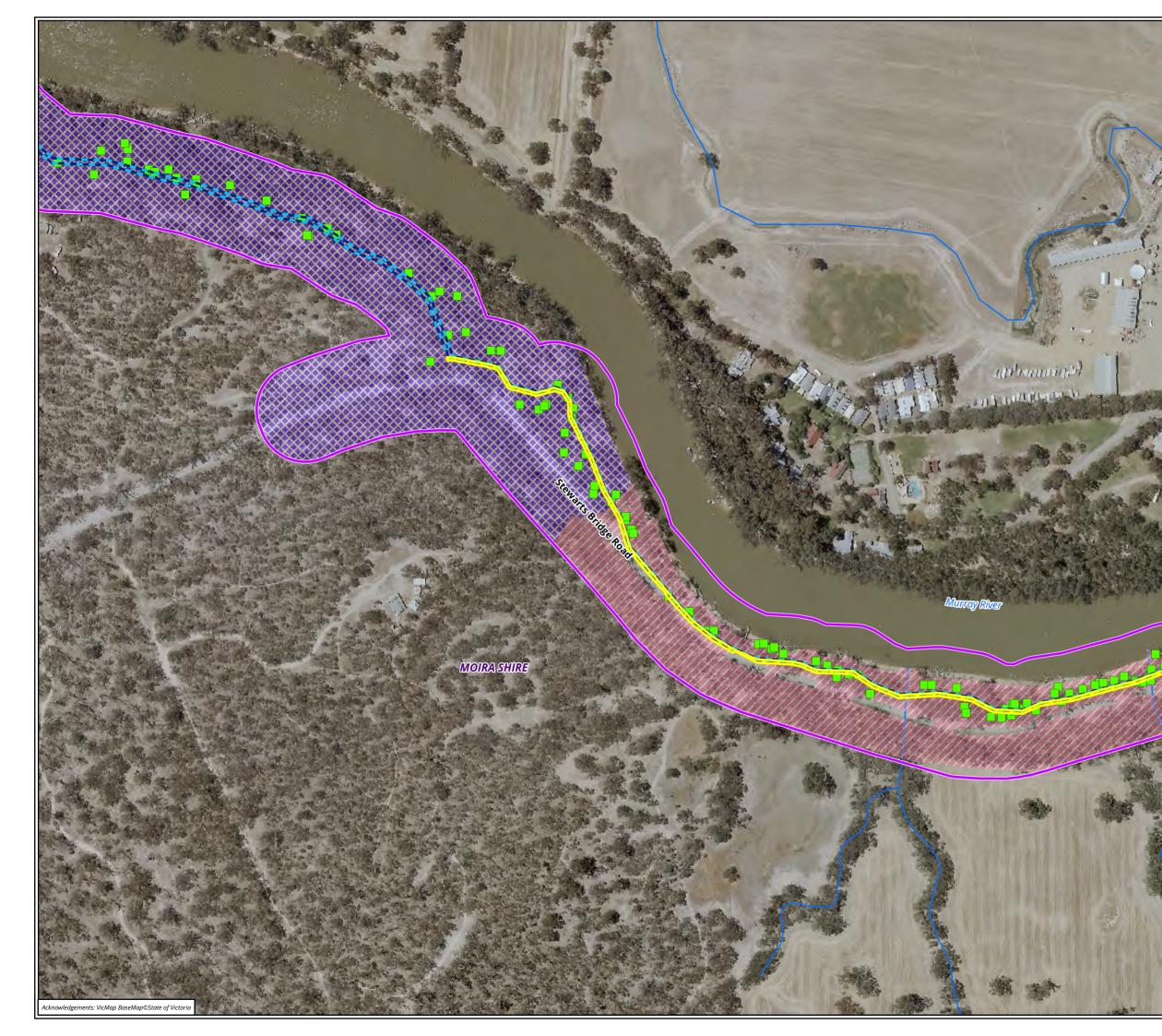


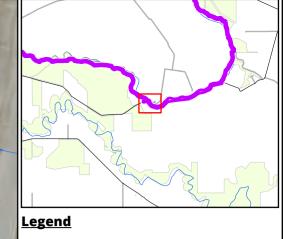
Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94











Study area

Section 9

Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0103) Riverine Chenopod Woodland



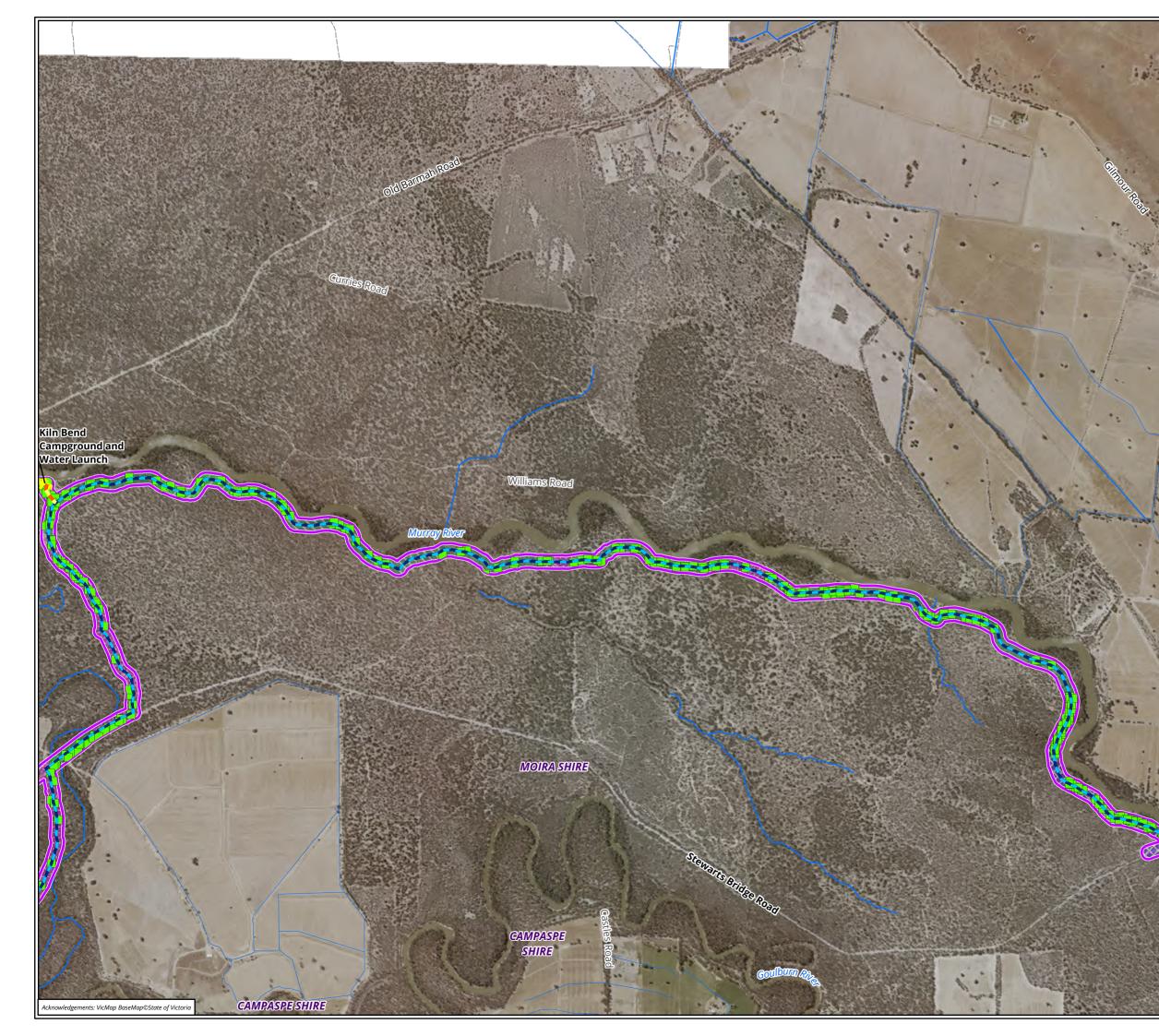


0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0103) Riverine Chenopod Woodland

(MuF_0106) Grassy Riverine Forest

(MuF_0295) Riverine Grassy Woodland

- (MuF_0803) Plains Woodland
- (MuF_0814) Riverine Swamp Forest
- NVR Removal

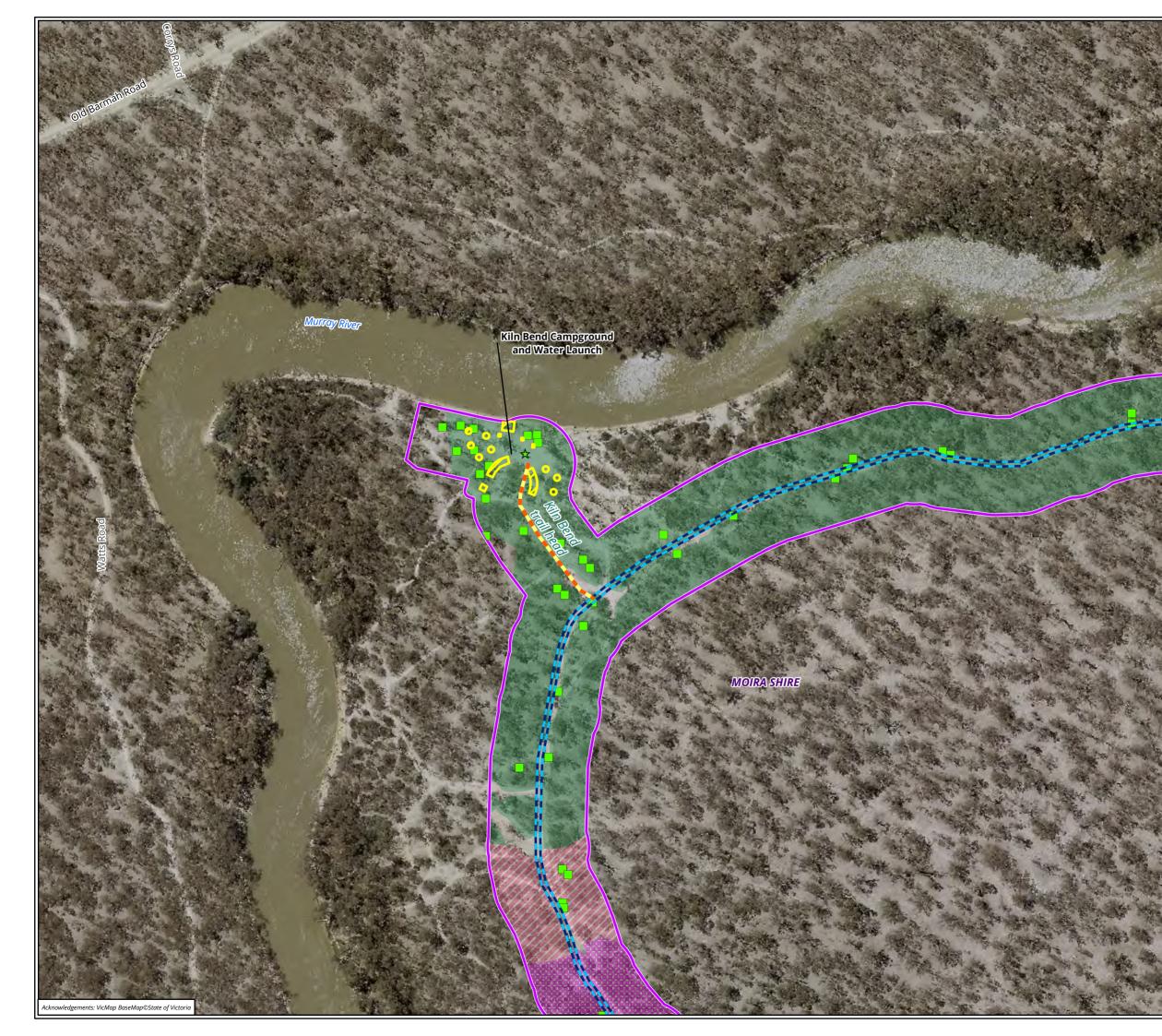
Figure 4.16 Vegetation to be removed

0 180 360 540 720 900



Metres Scale: 1:22,000 @ A3 Coordinate System: GDA 1994 VICGRID94







- --- Approximate trail alignment
- Trailhead_Acess_Roads

Trees in patches

Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0295) Riverine Grassy Woodland
- 🚺 (MuF_0803) Plains Woodland
- 🔼 NVR Removal

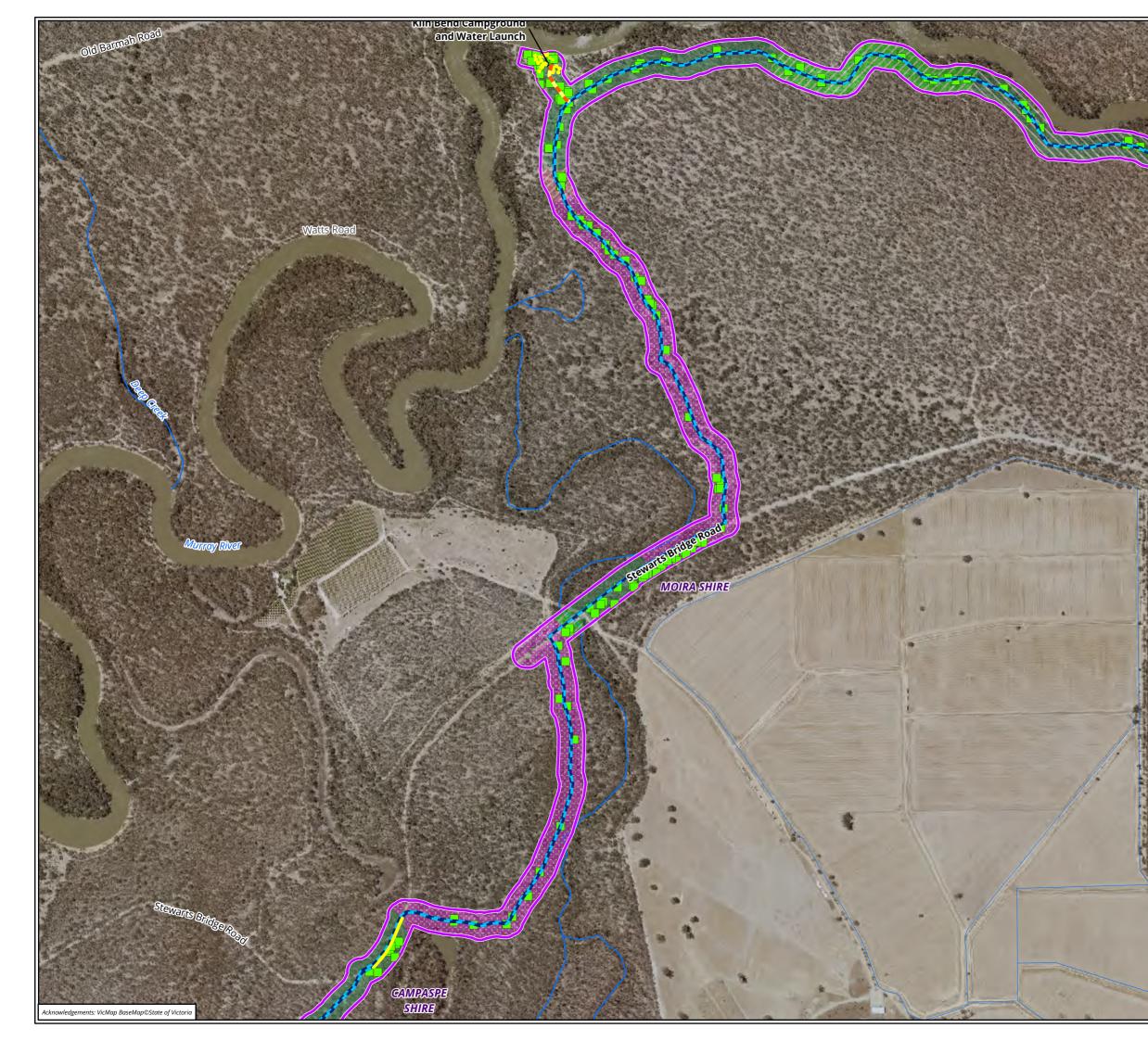


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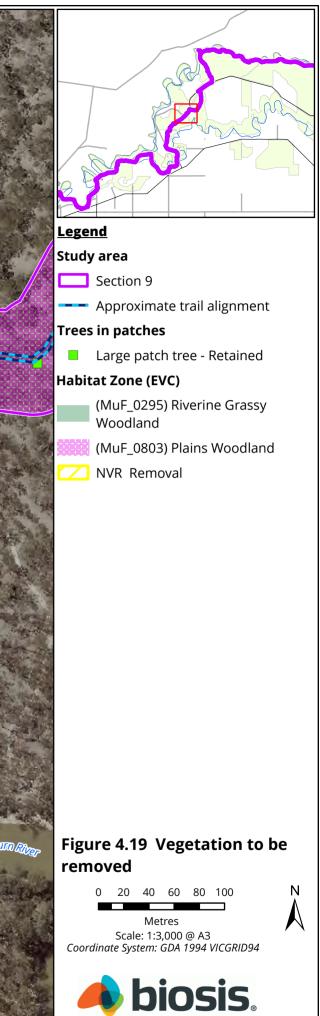
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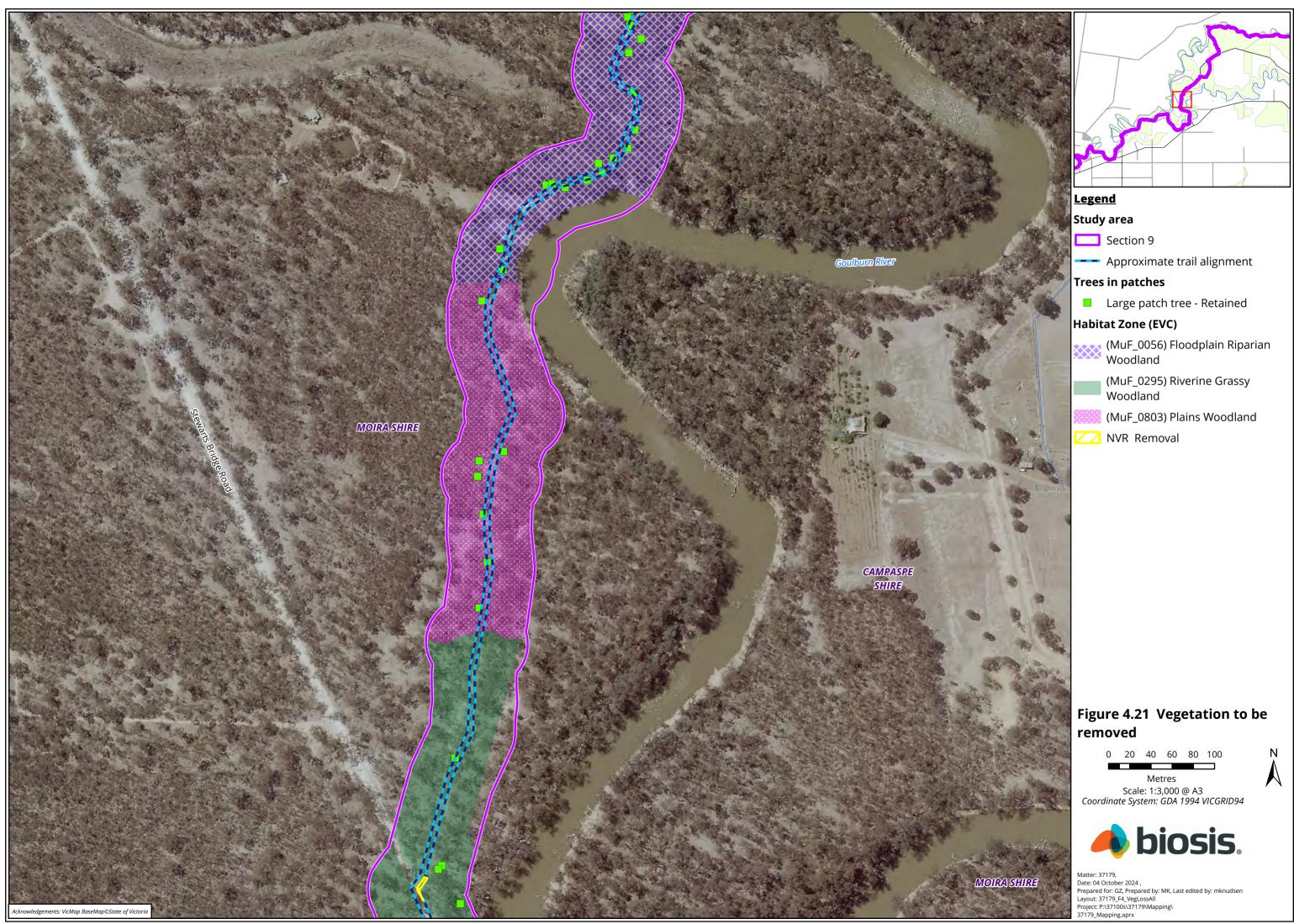




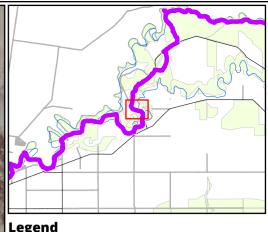












Study area

Section 9

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

> (MuF_0295) Riverine Grassy Woodland

(MuF_0803) Plains Woodland

🔼 NVR Removal

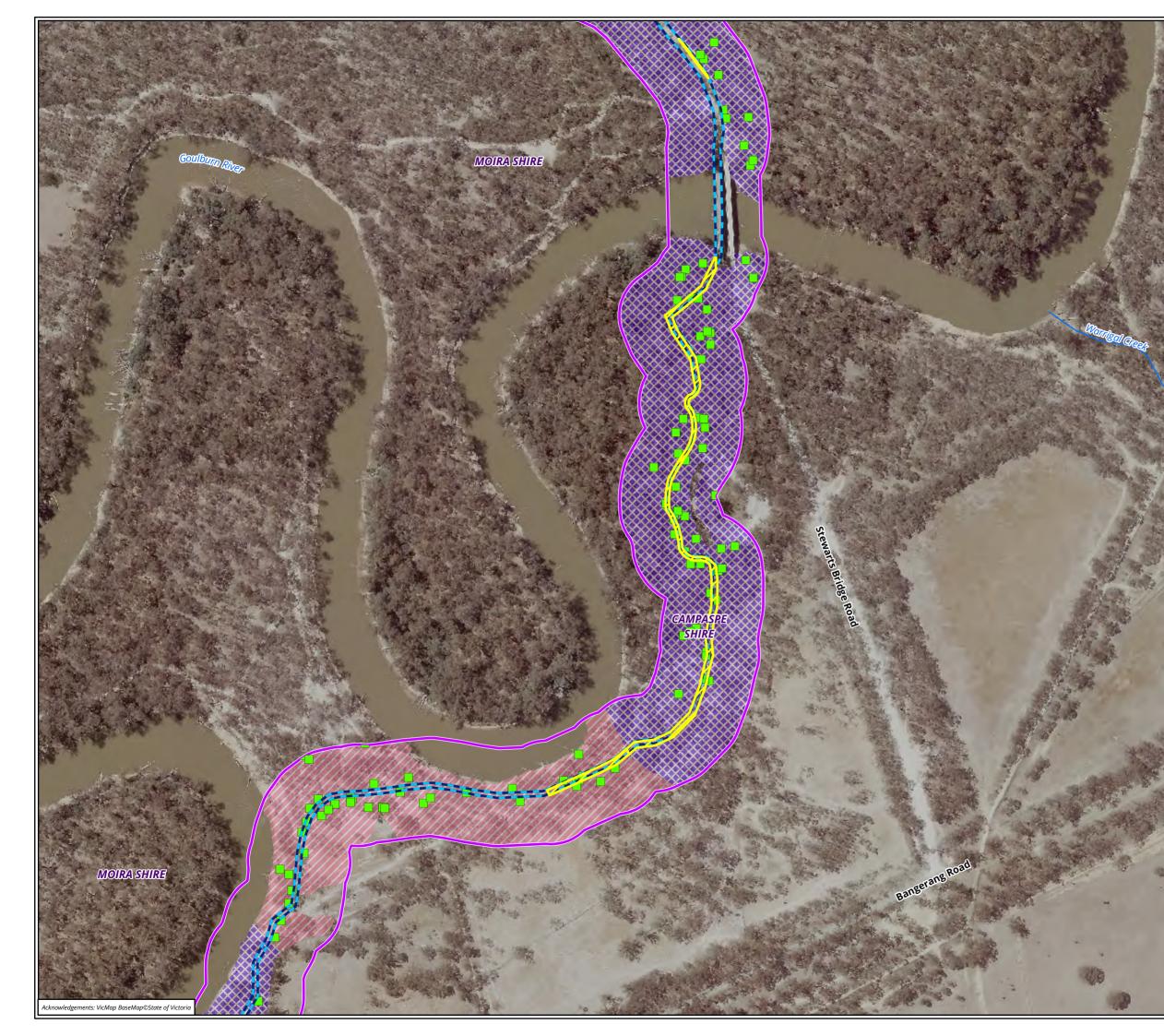


0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

Section 9

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

> (MuF_0103) Riverine Chenopod Woodland



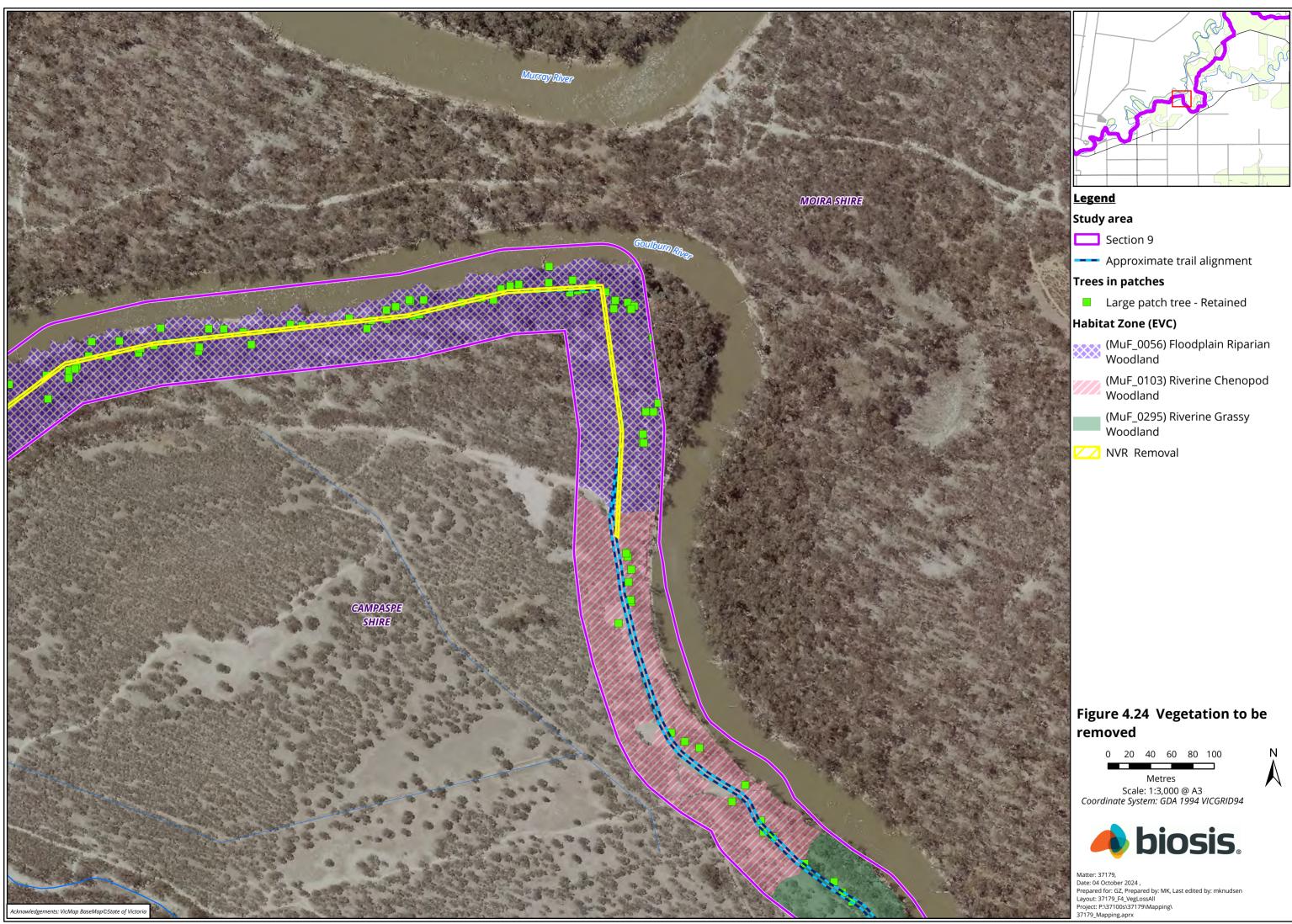


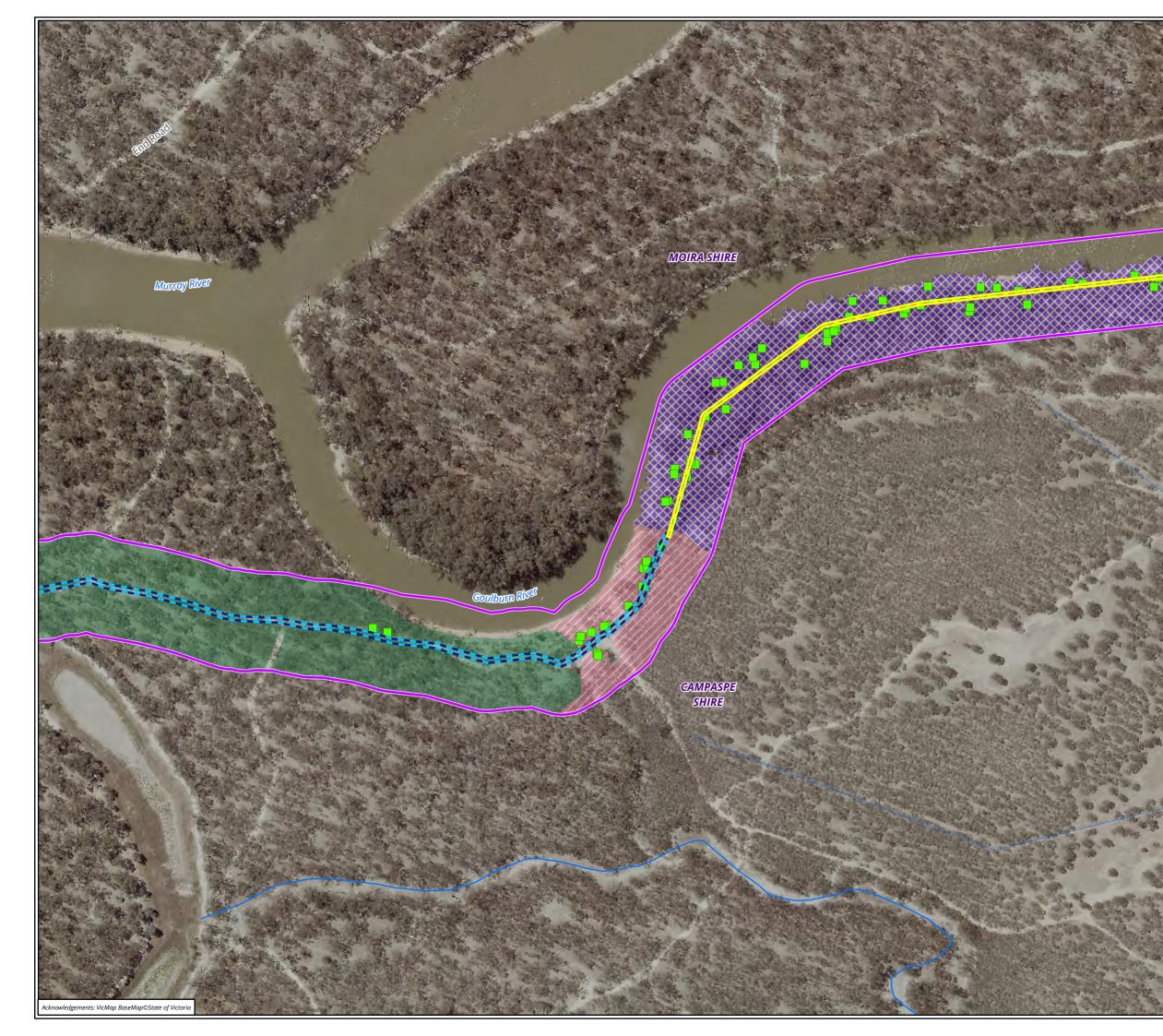
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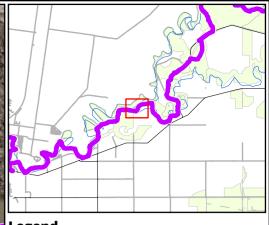


Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94









Study area

Section 9

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0103) Riverine Chenopod Woodland

(MuF_0295) Riverine Grassy Woodland



NVR Removal

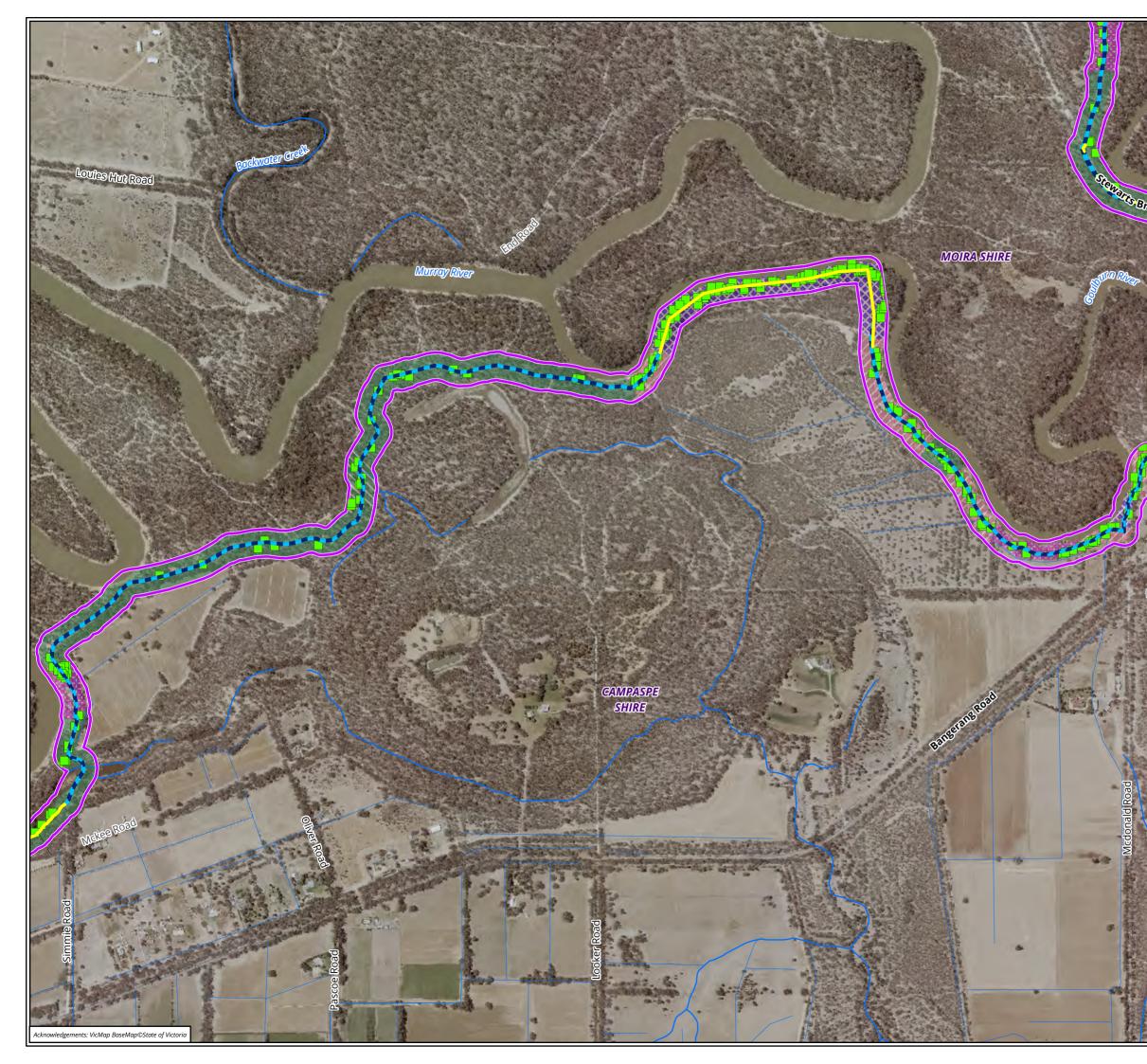


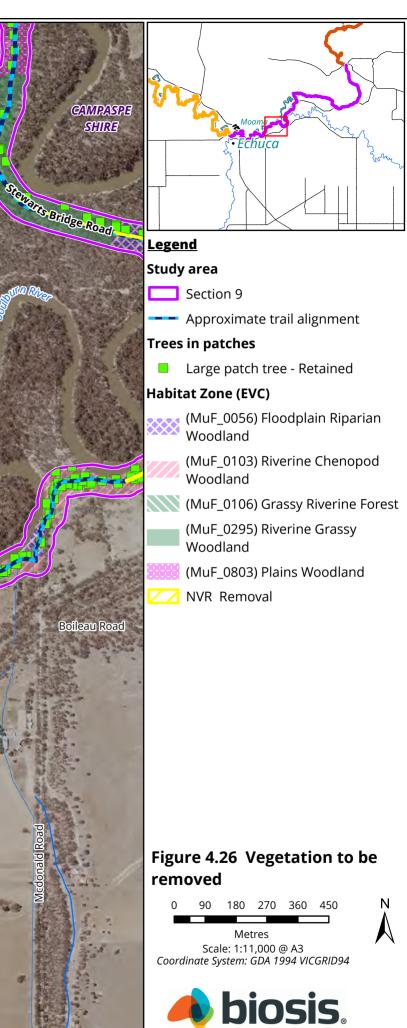
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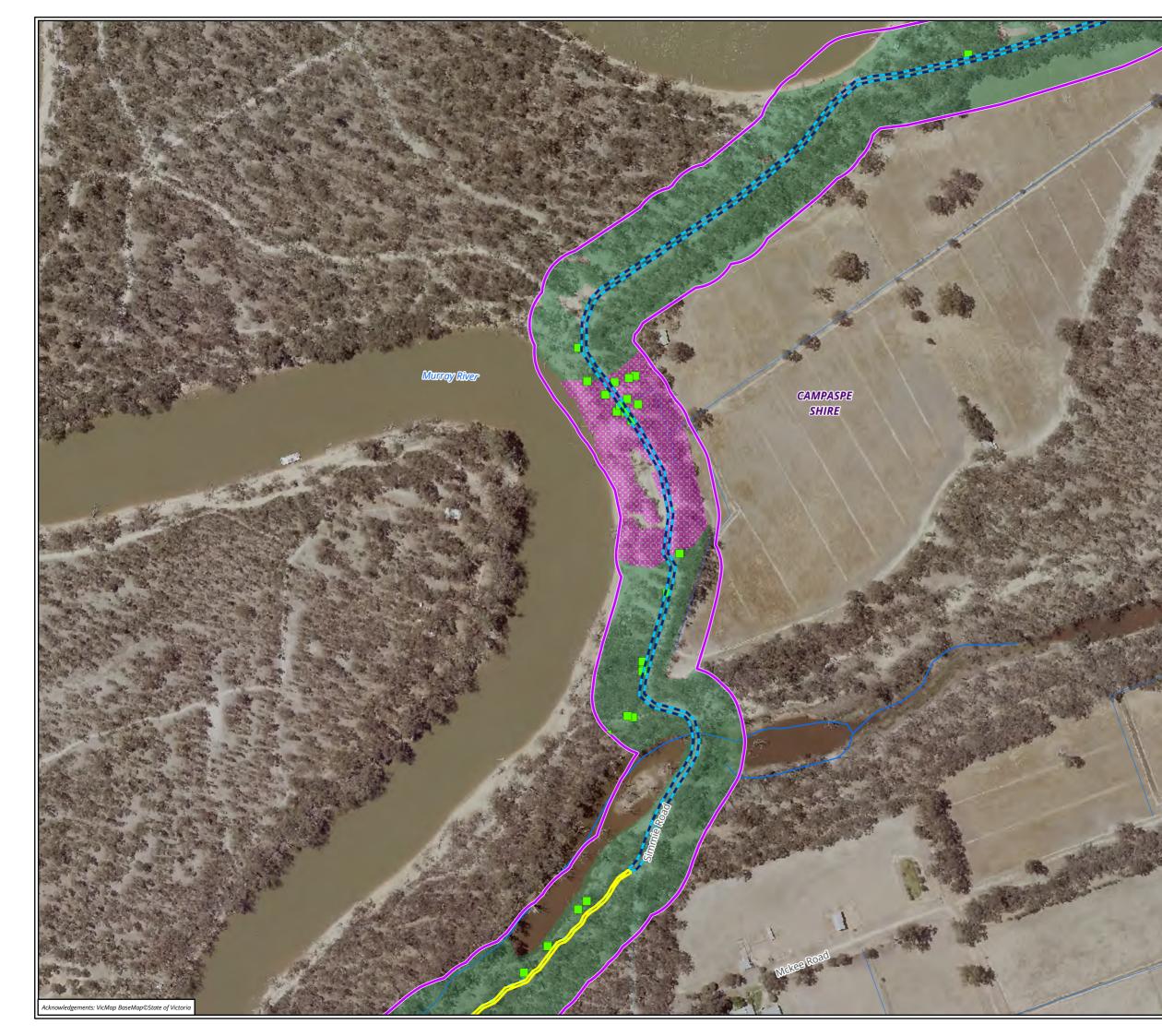


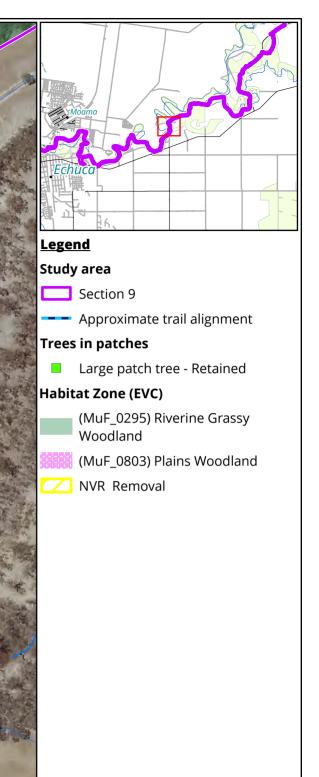
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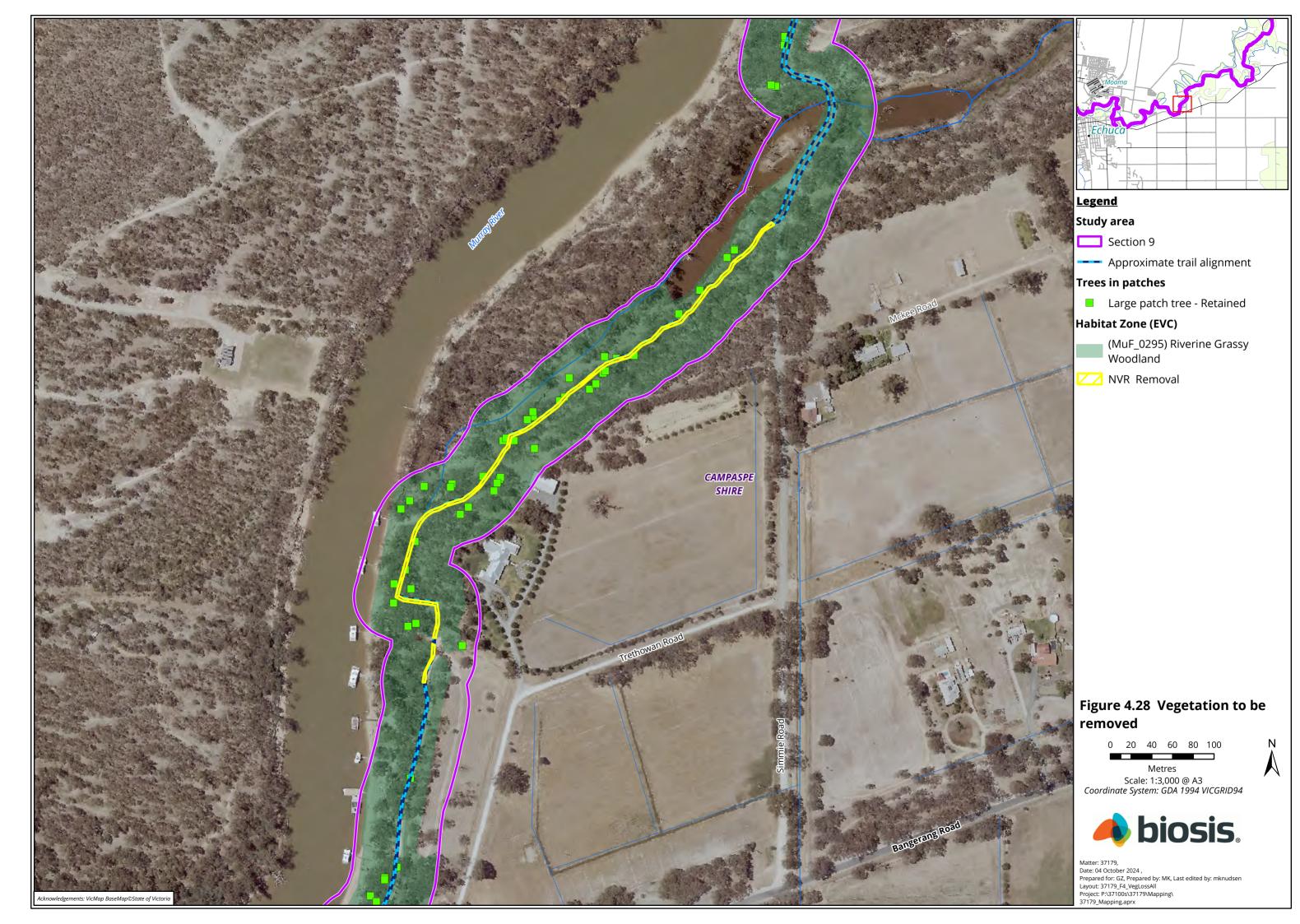


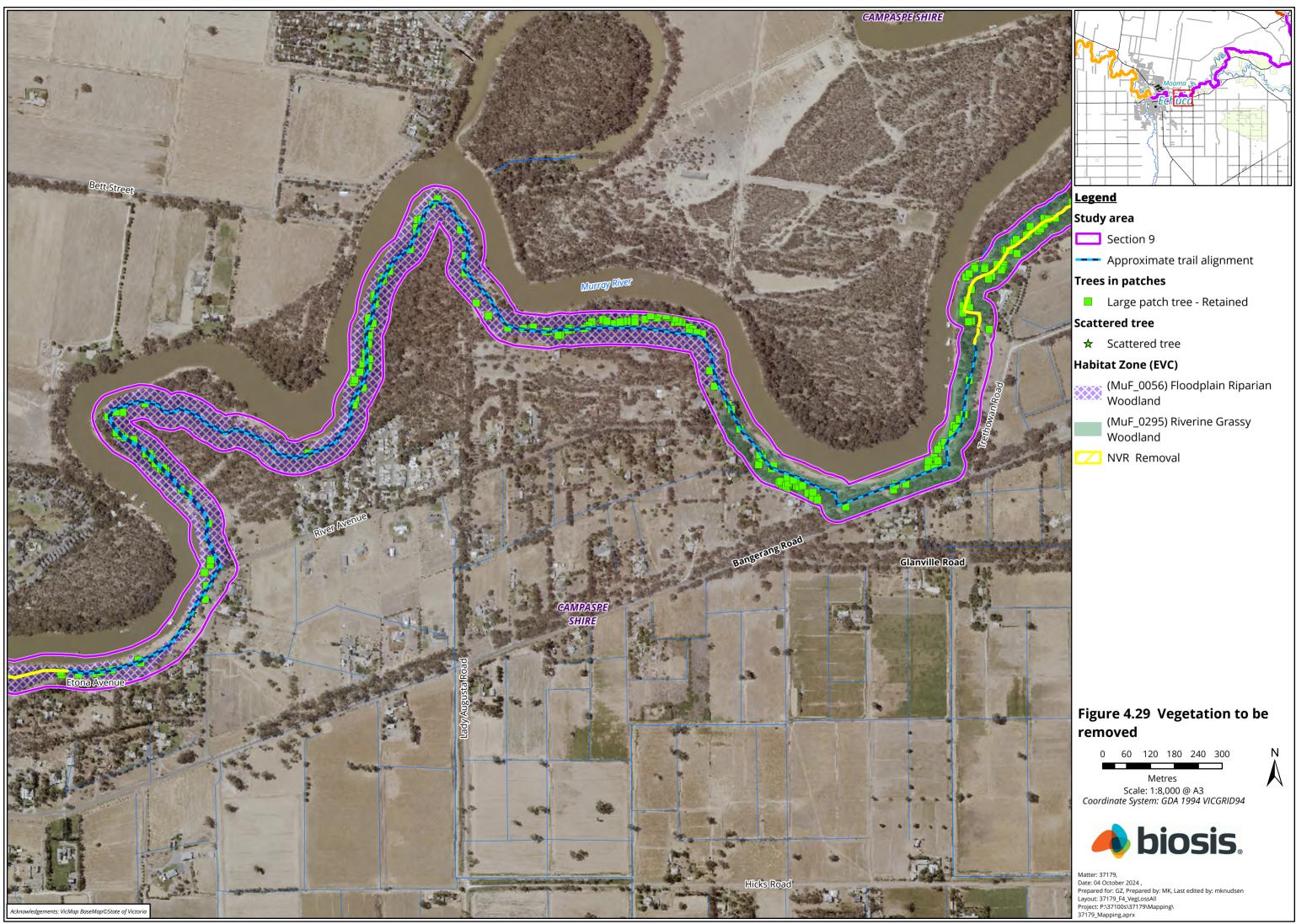
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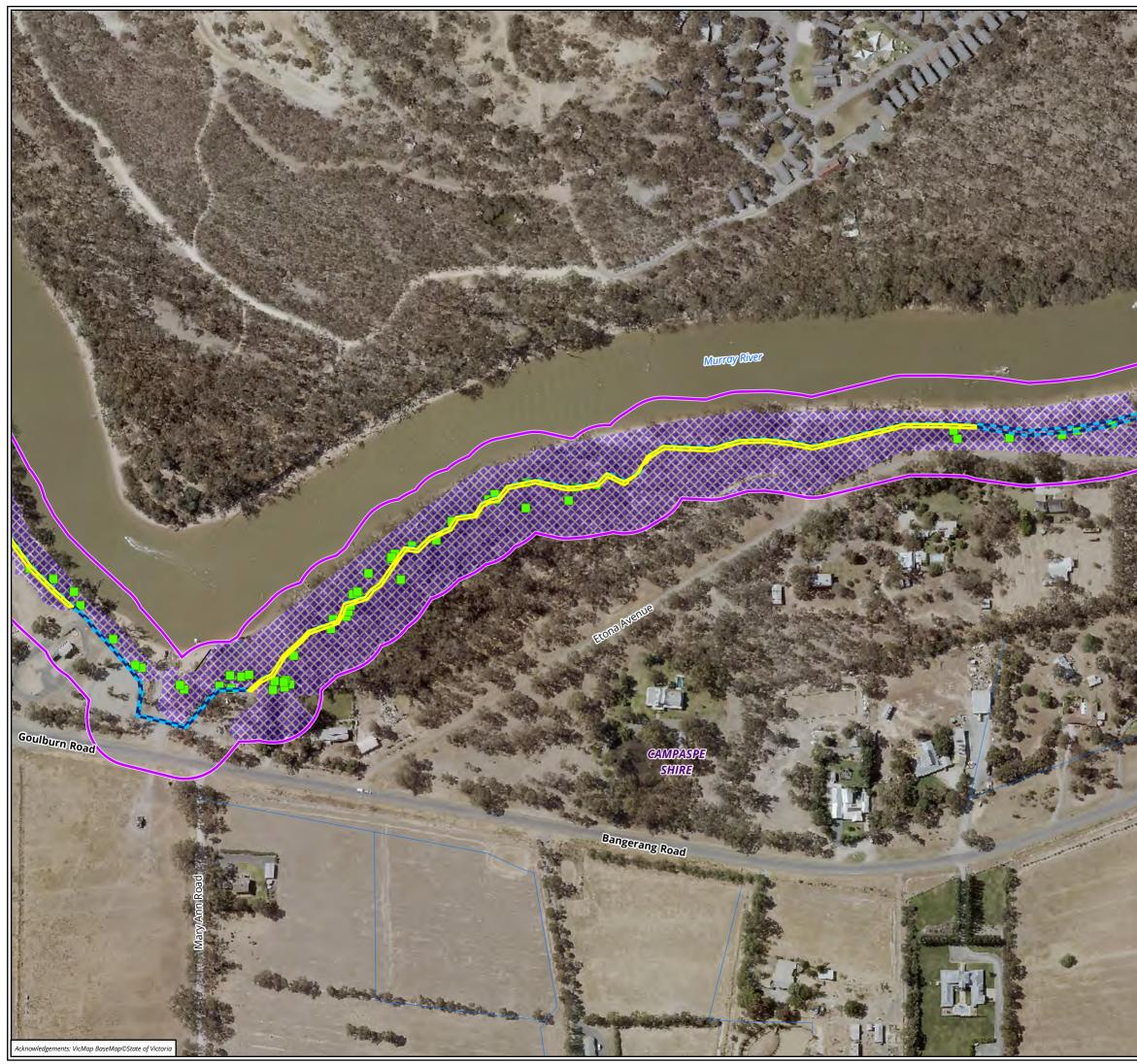


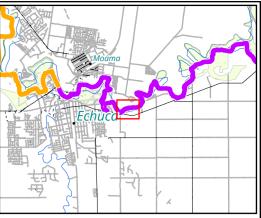
Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94











Study area

- Section 9
- ---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0056) Floodplain Riparian Woodland
- 🔼 NVR Removal

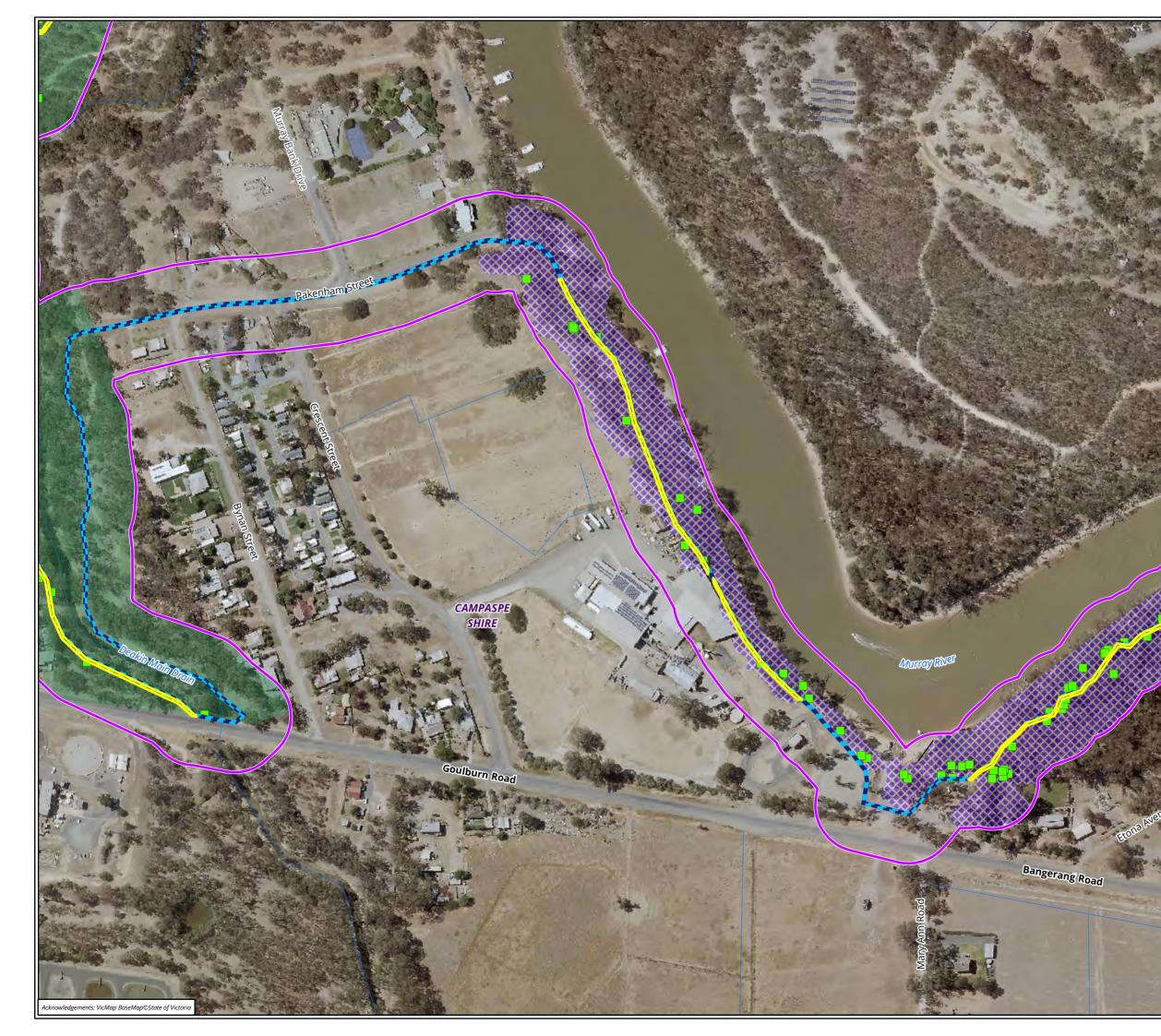


0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

- Section 9
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0295) Riverine Grassy Woodland



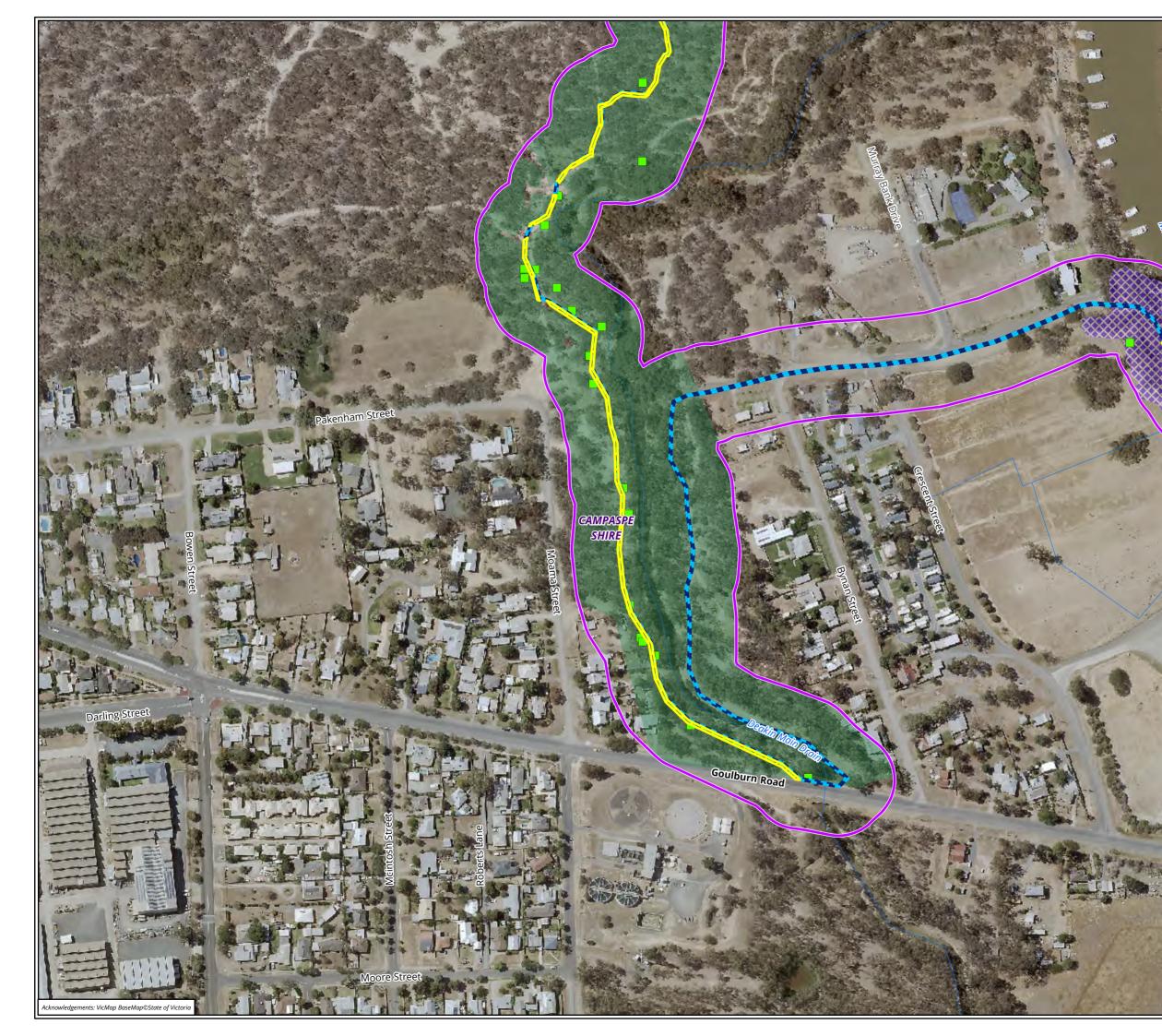


0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 9

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

- (MuF_0295) Riverine Grassy Woodland
- NVR Removal

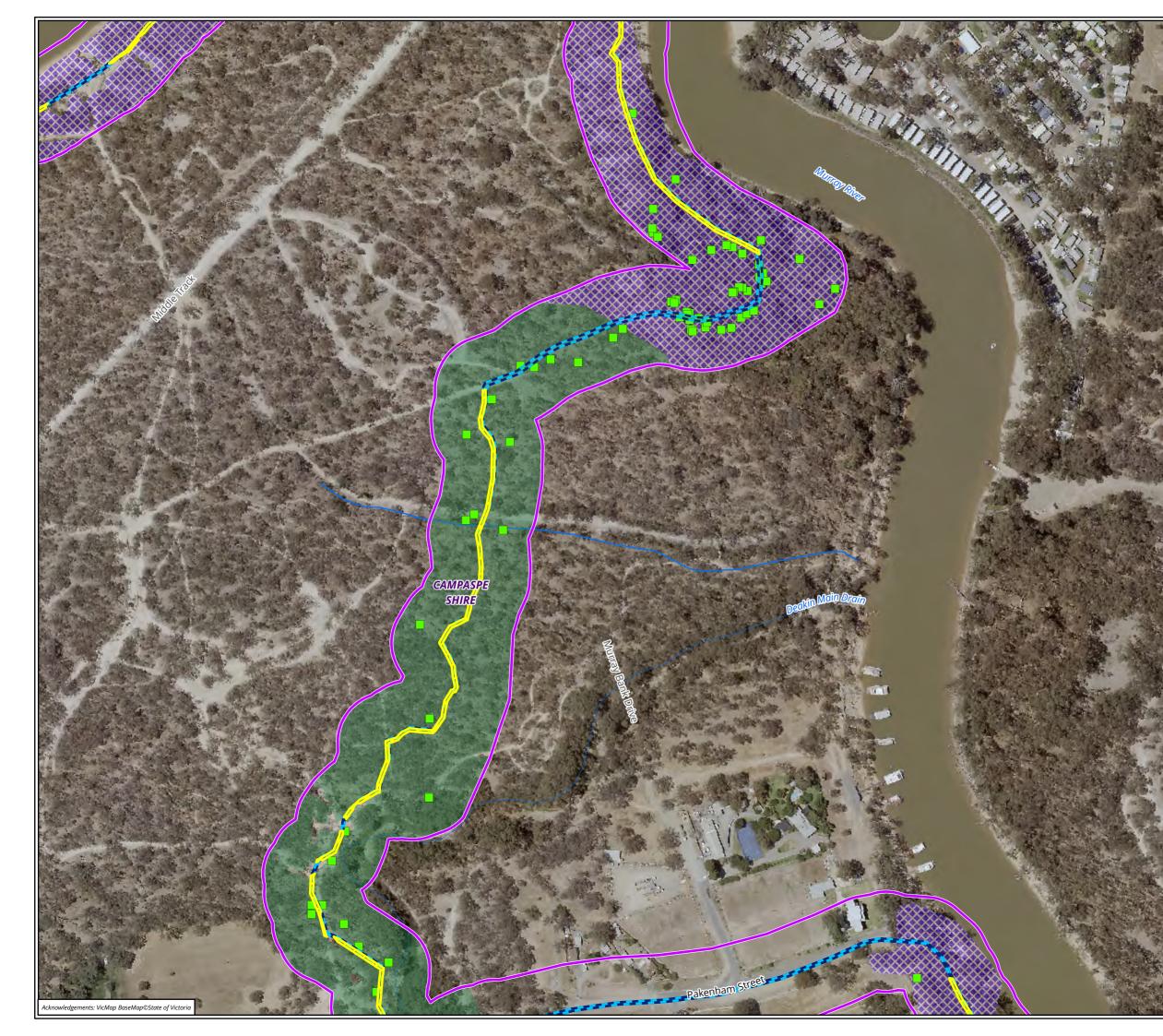


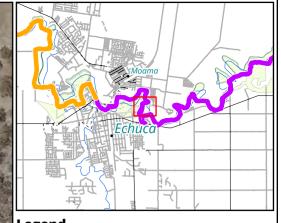
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 9

Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0295) Riverine Grassy Woodland

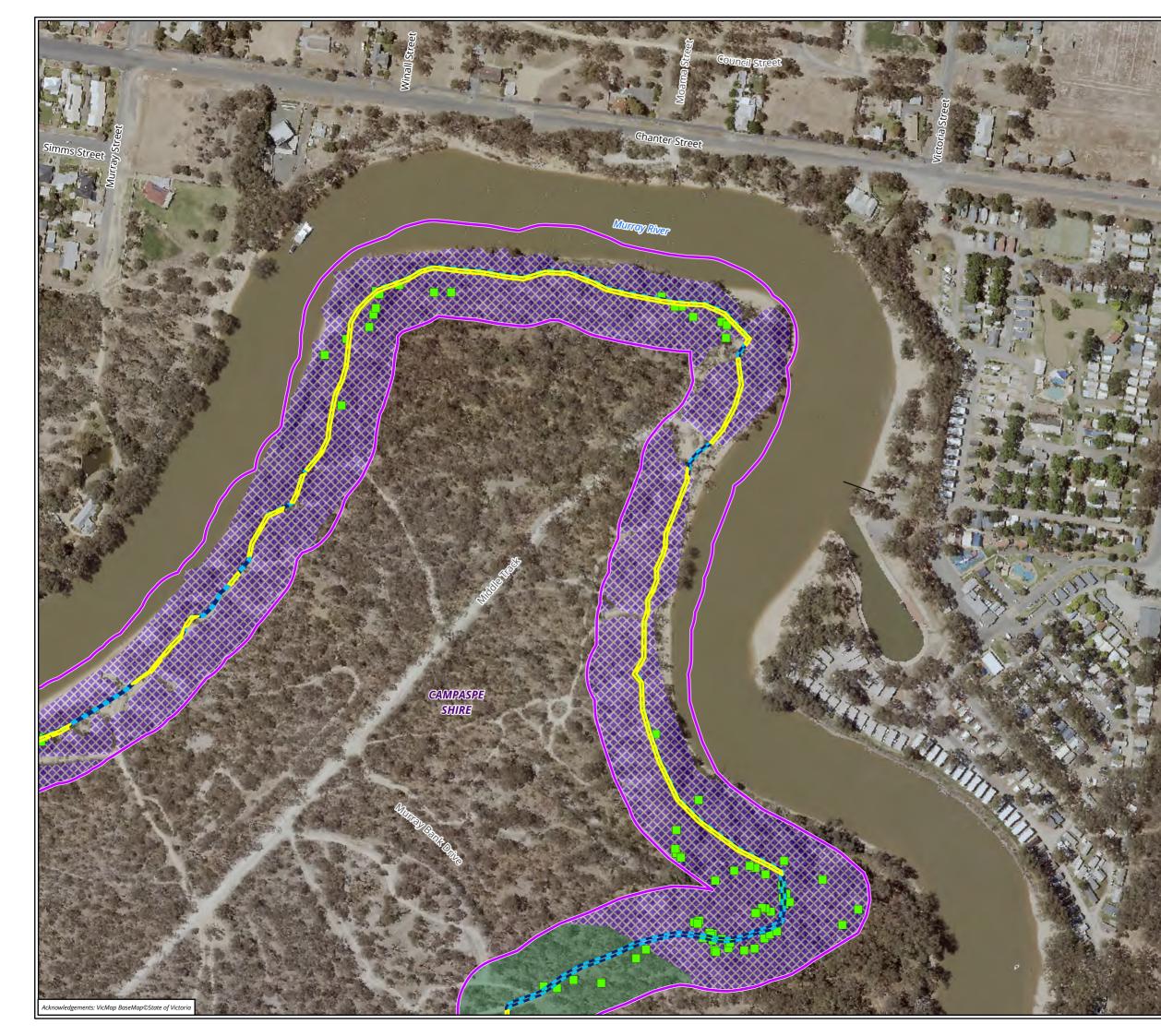


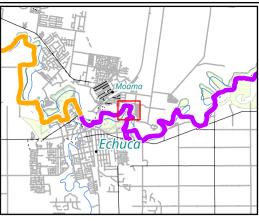




Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 9

Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0295) Riverine Grassy Woodland



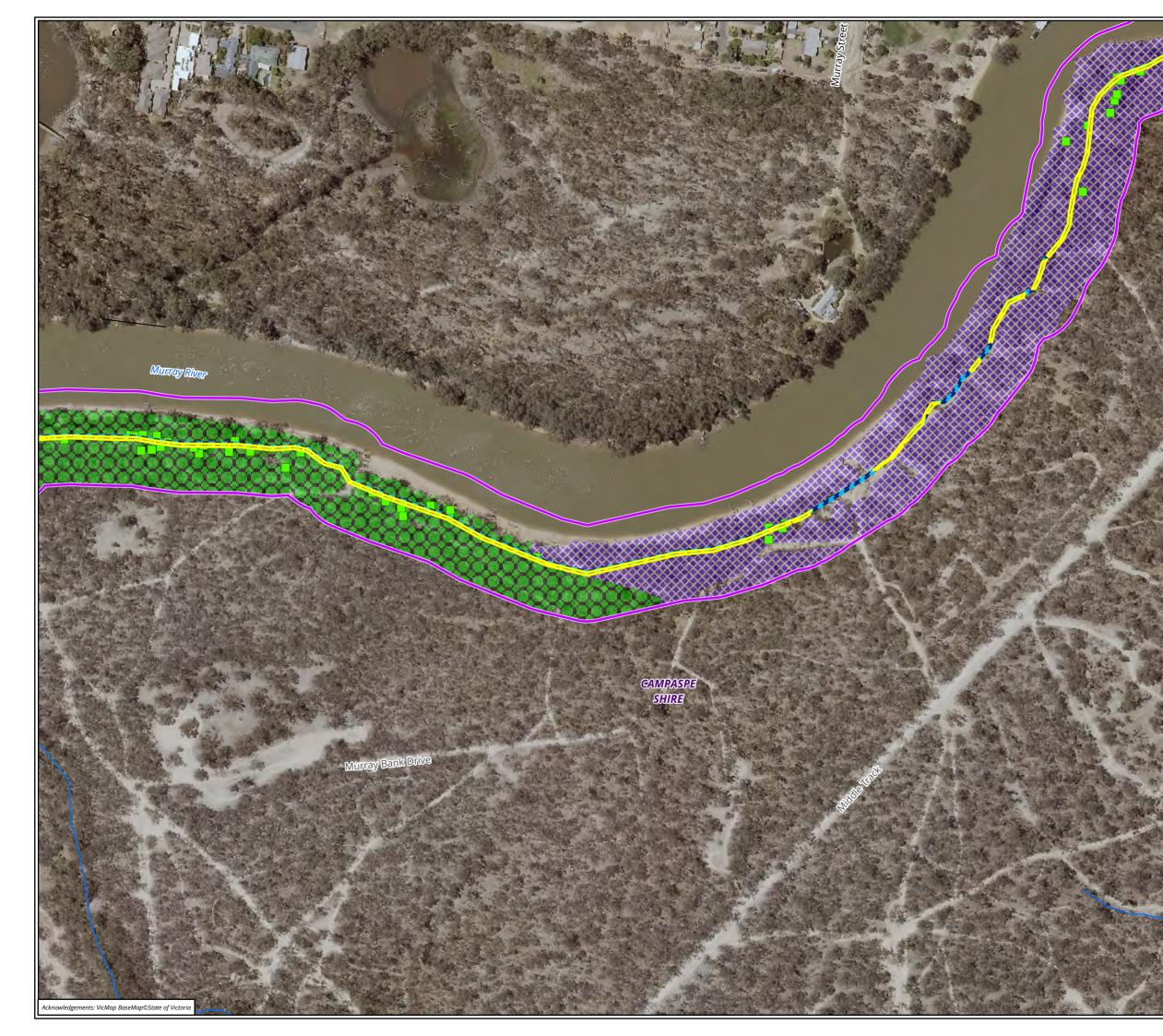


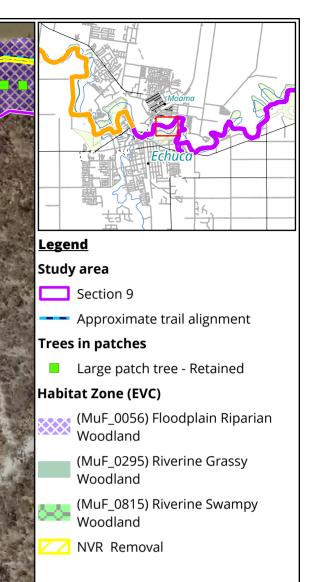
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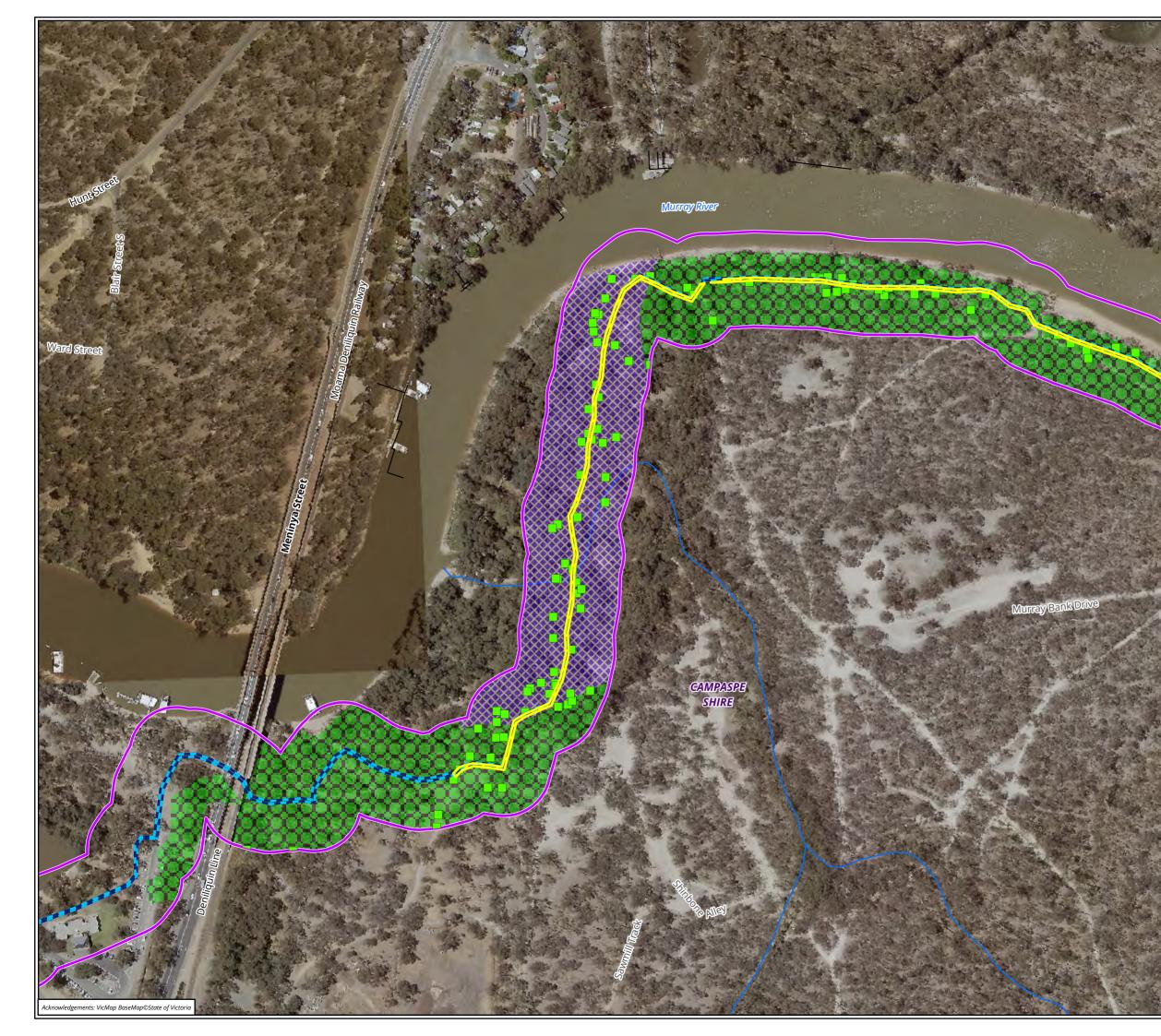


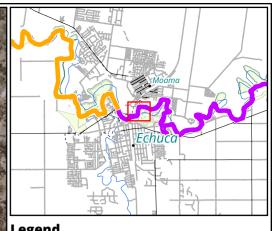
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 9
- ---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0056) Floodplain Riparian Woodland

(MuF_0815) Riverine Swampy Woodland



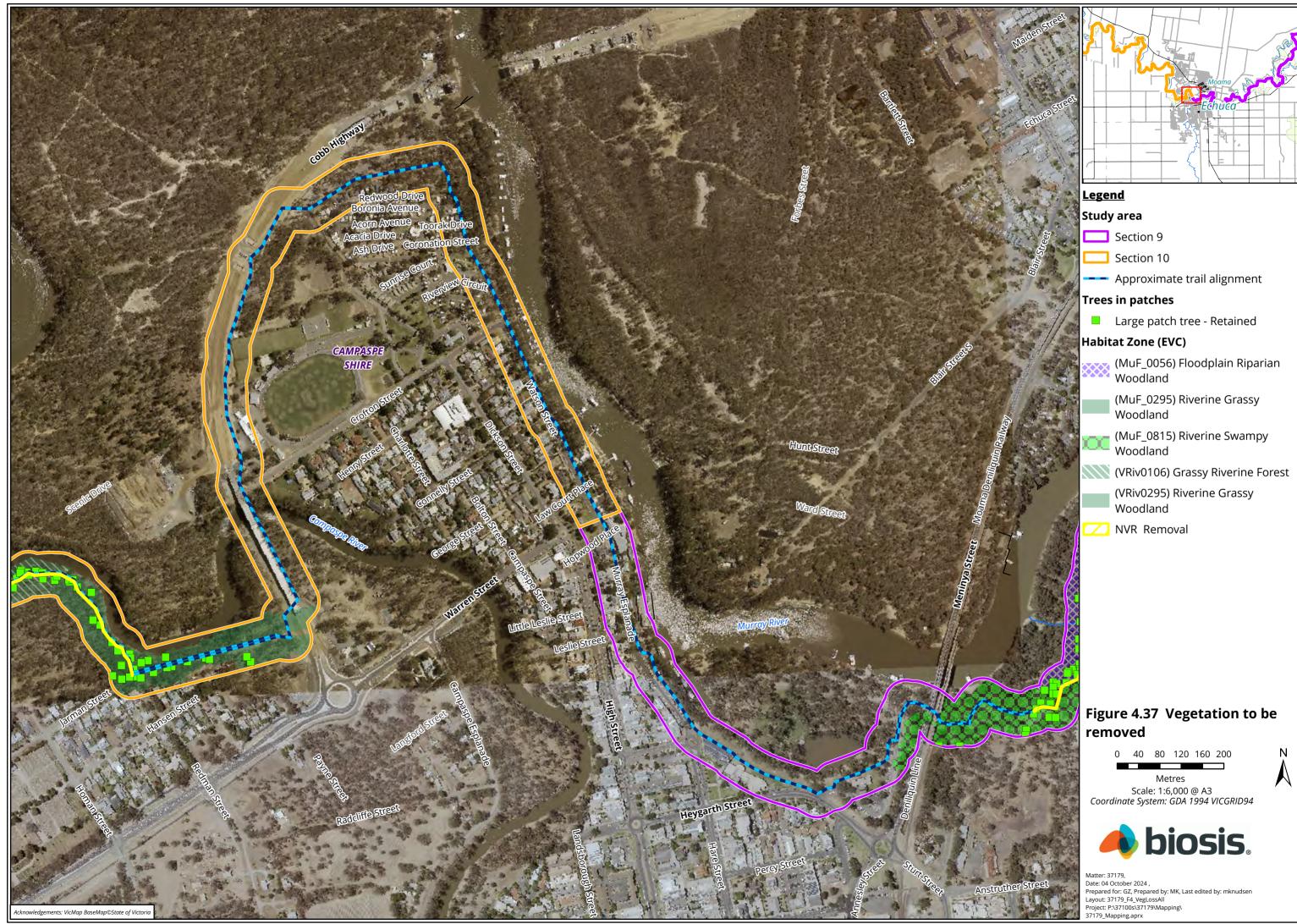


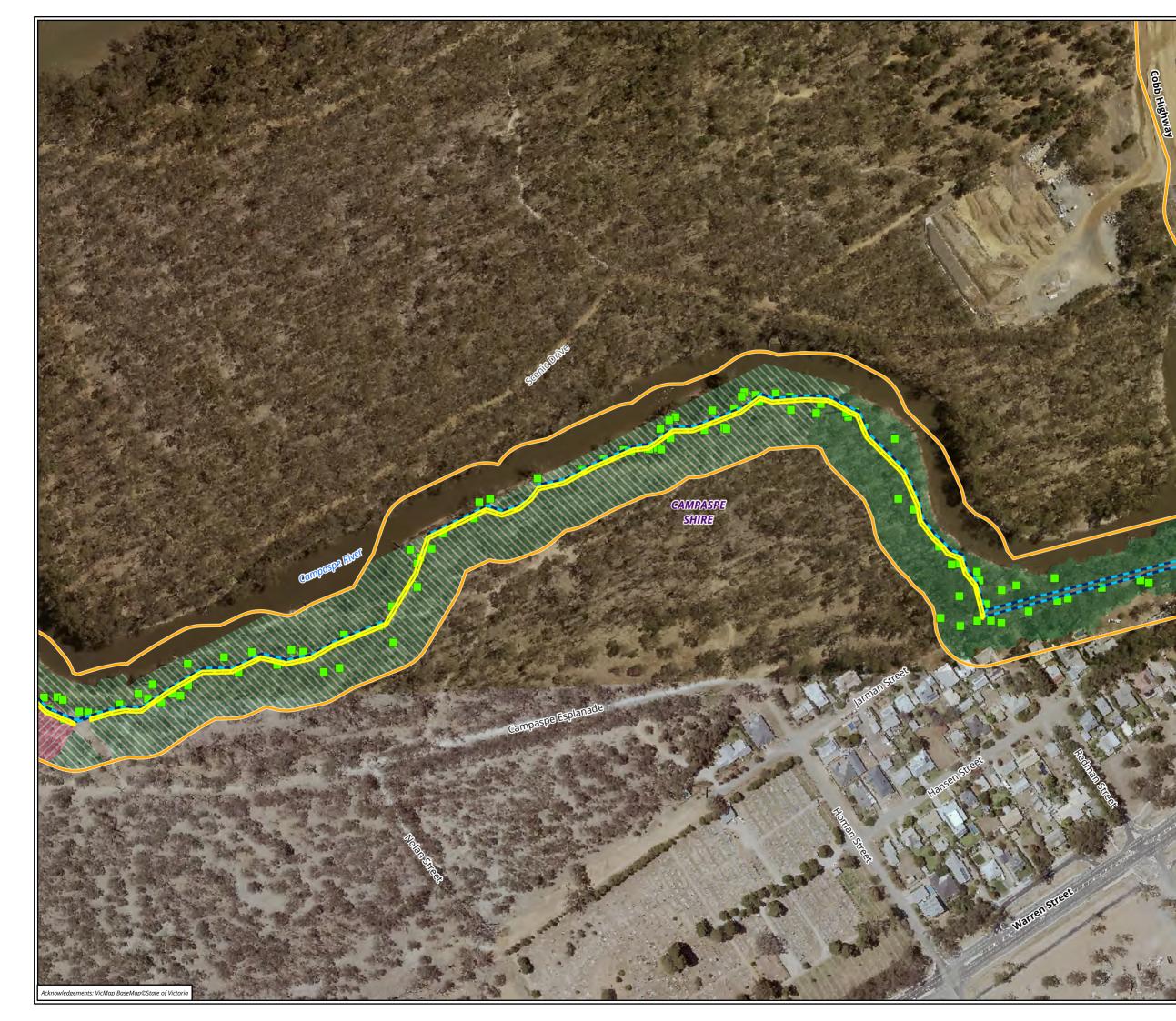
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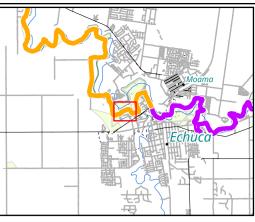


Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94









Study area

- Section 10
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0106) Grassy Riverine Forest

(MuF_0295) Riverine Grassy Woodland

(VRiv0106) Grassy Riverine Forest

(VRiv0295) Riverine Grassy Woodland



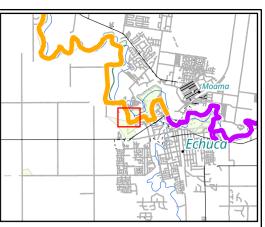




Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 10

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0106) Grassy Riverine Forest
- (VRiv0106) Grassy Riverine Forest
 - (VRiv0295) Riverine Grassy Woodland
 - NVR Removal

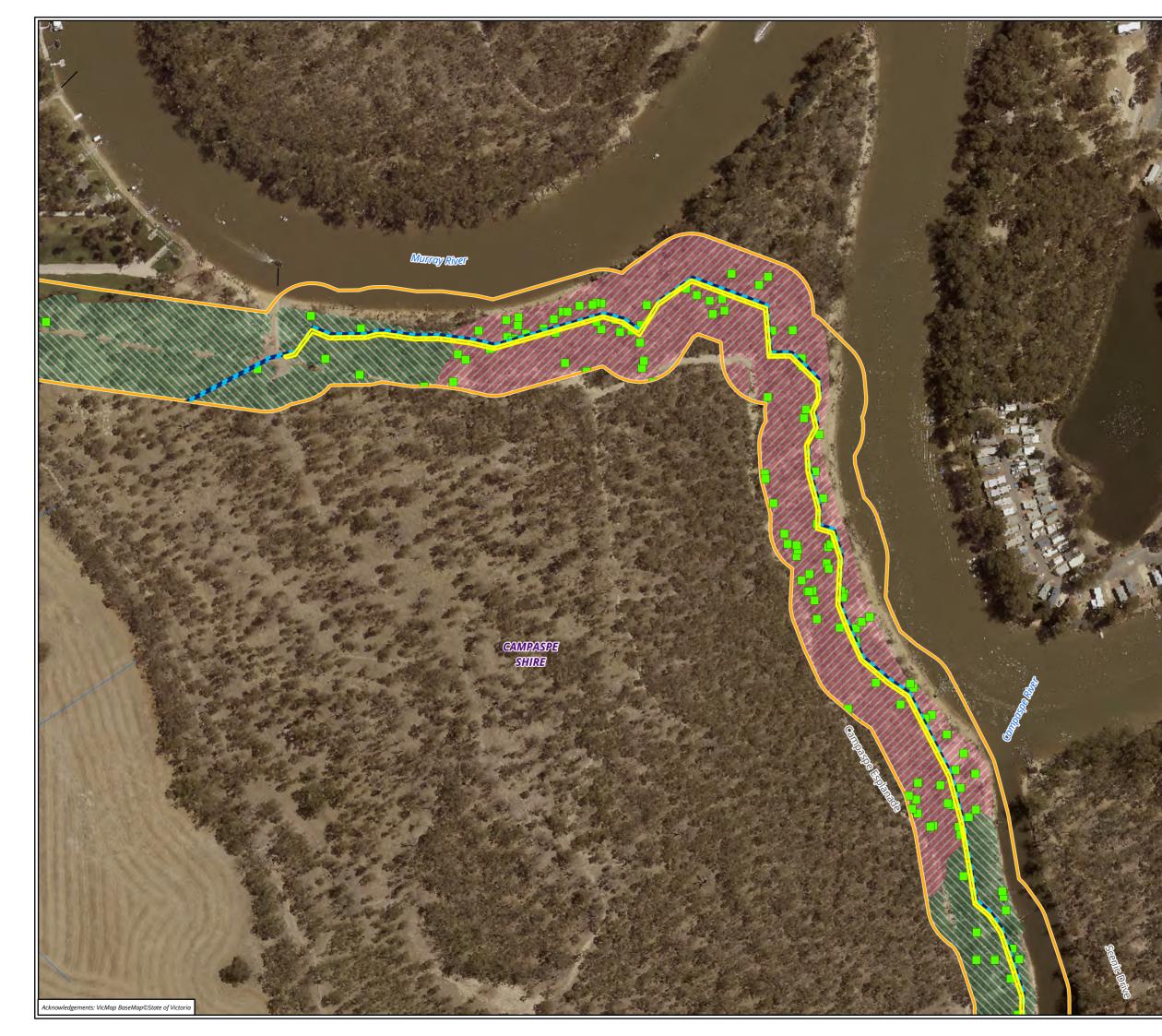


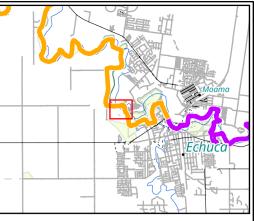
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 10

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0106) Grassy Riverine Forest



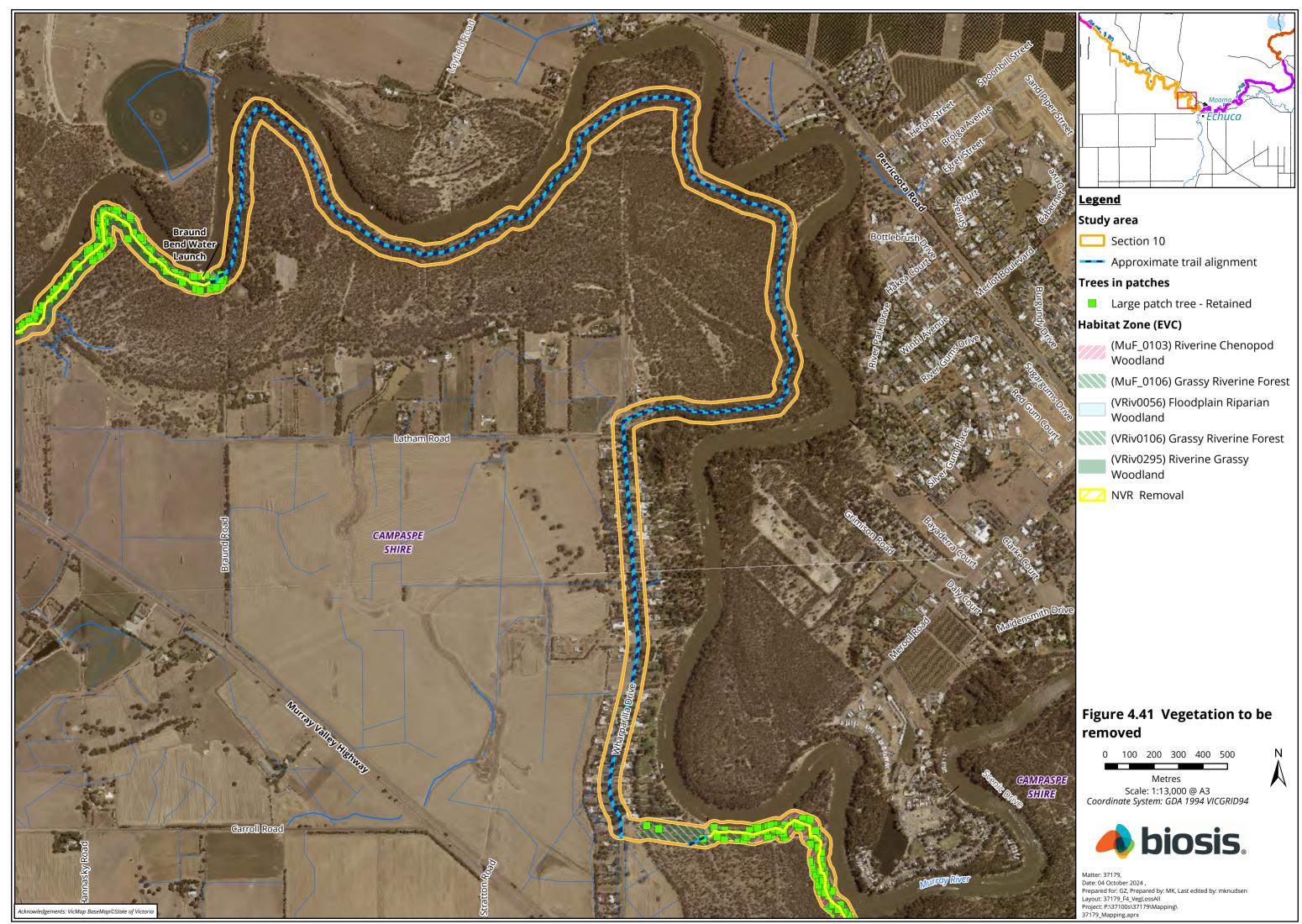
Figure 4.40 Vegetation to be removed

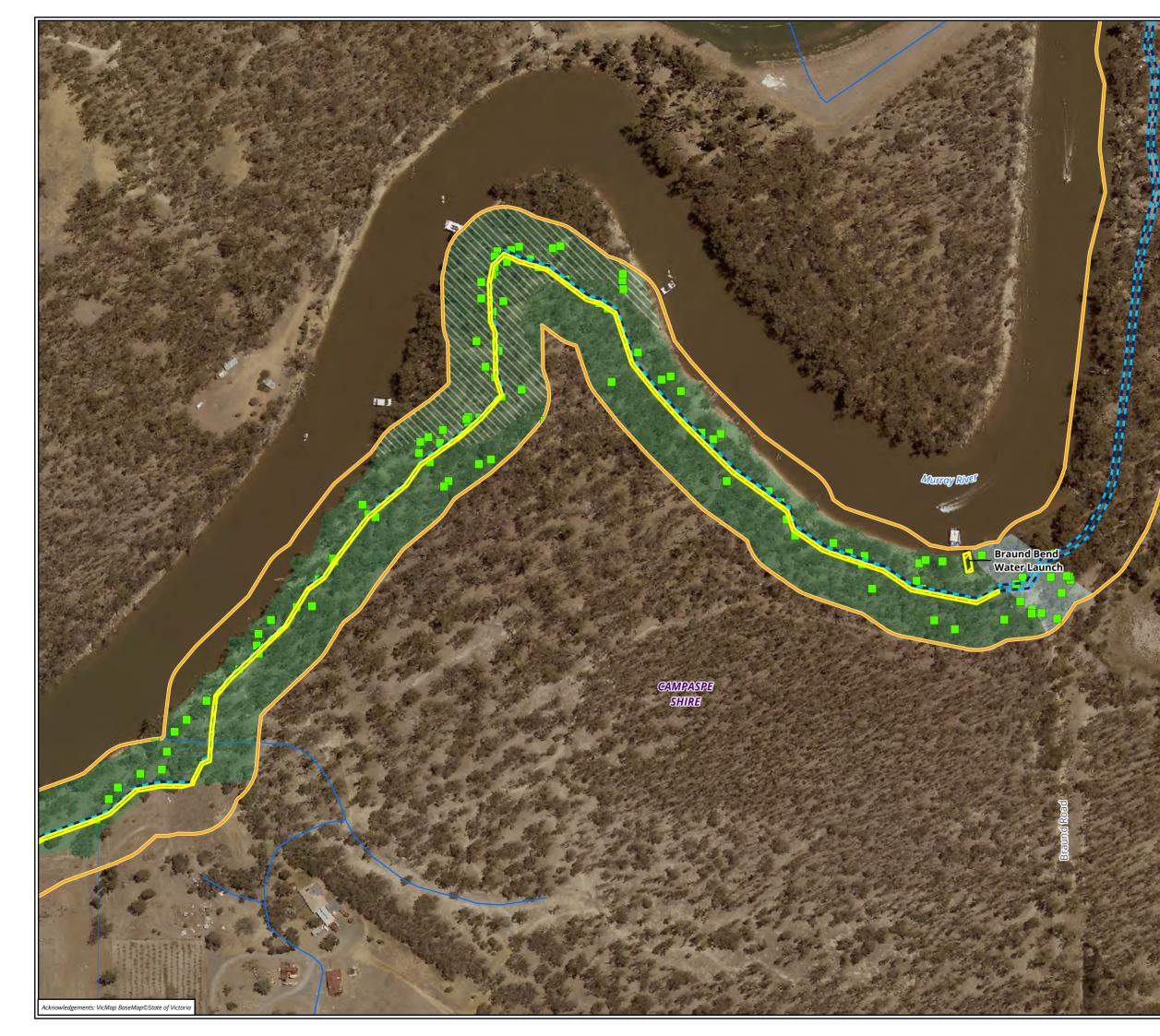
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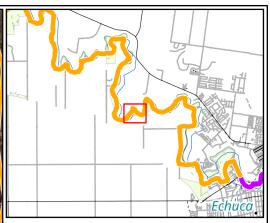


Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94









Study area

Section 10

---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (VRiv0056) Floodplain Riparian Woodland
- (VRiv0106) Grassy Riverine Forest
 - (VRiv0295) Riverine Grassy Woodland
- 🔼 NVR Removal

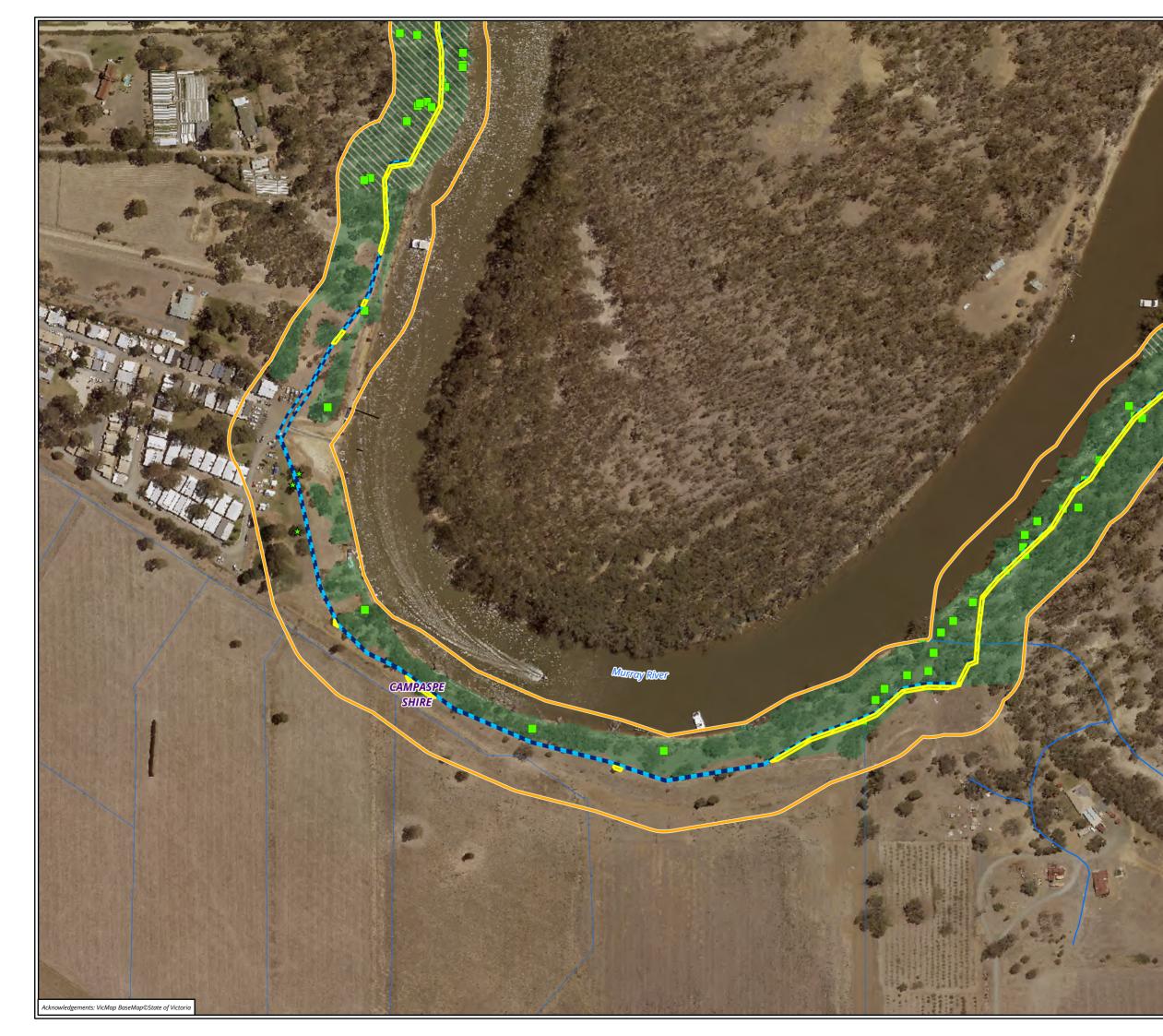


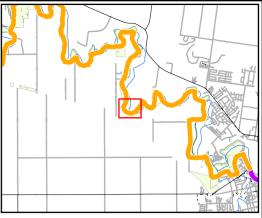
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 10

---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

(VRiv0106) Grassy Riverine Forest

(VRiv0295) Riverine Grassy Woodland

🖊 NVR Removal

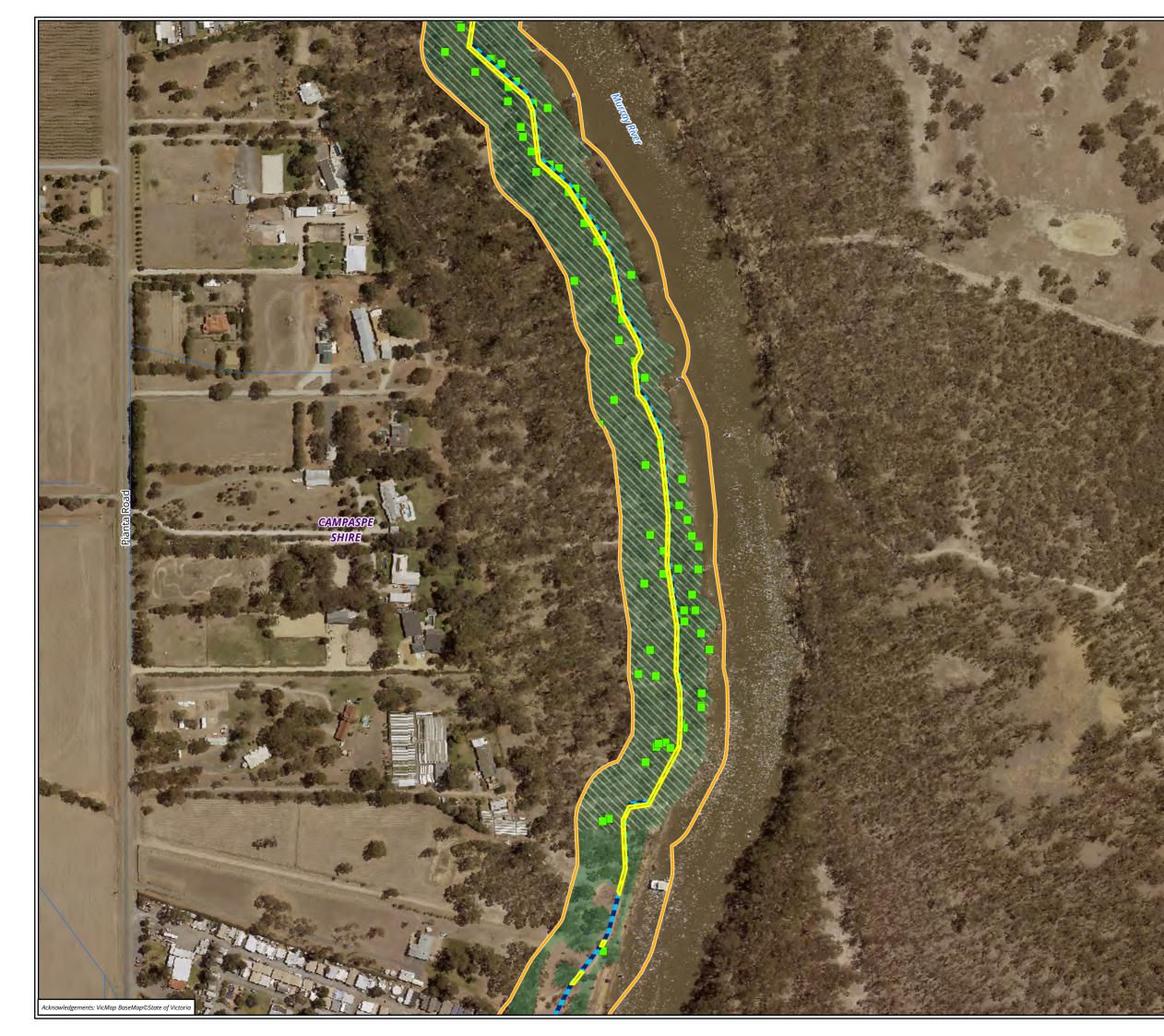


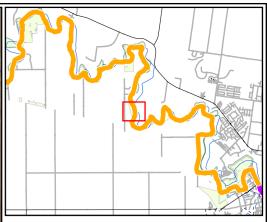
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 10

Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (VRiv0106) Grassy Riverine Forest
 - (VRiv0295) Riverine Grassy Woodland
 - 🔼 NVR Removal



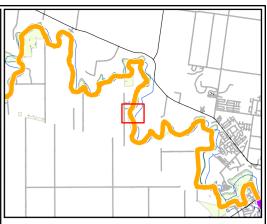
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (VRiv0106) Grassy Riverine Forest
- 🔼 NVR Removal

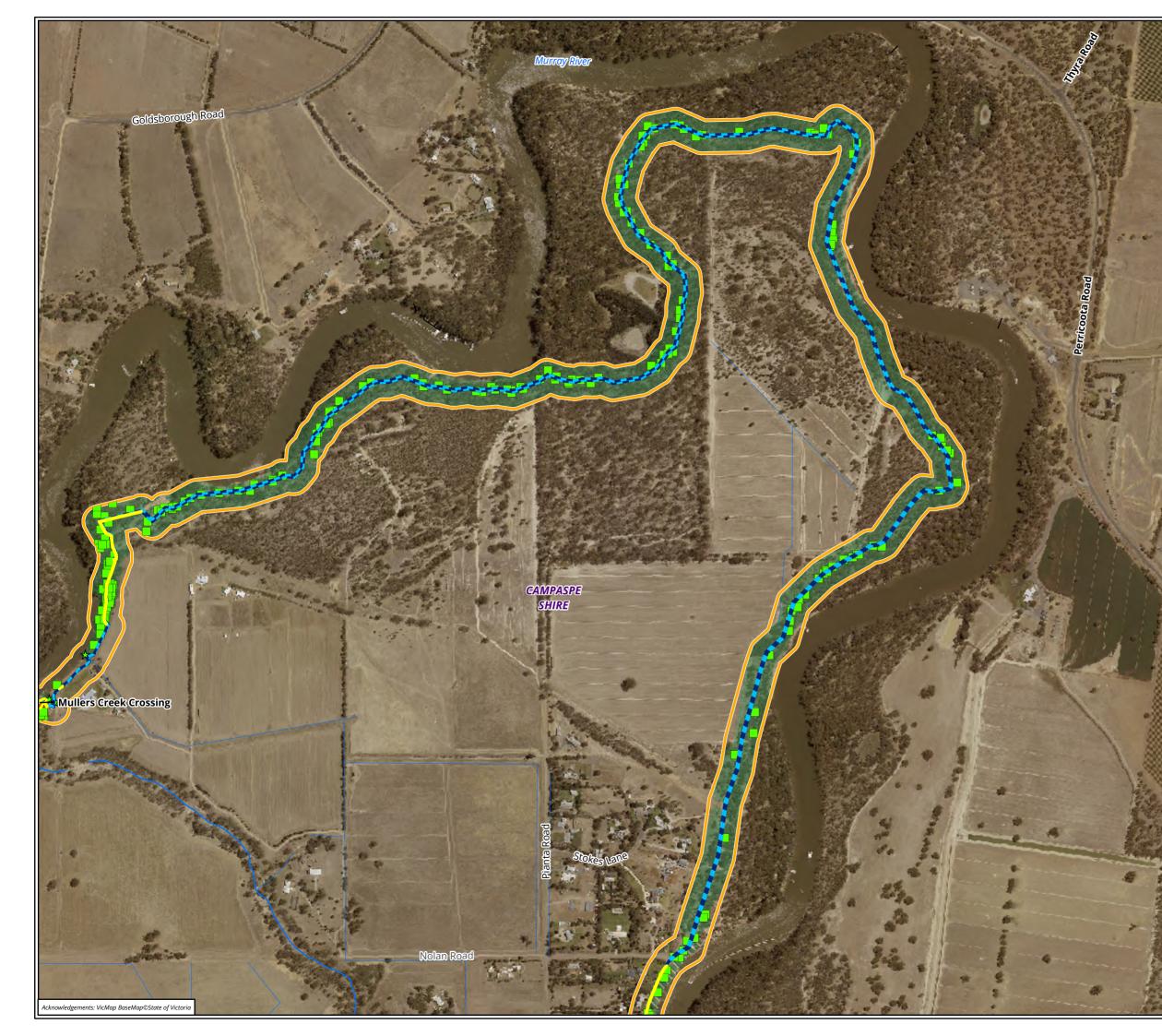


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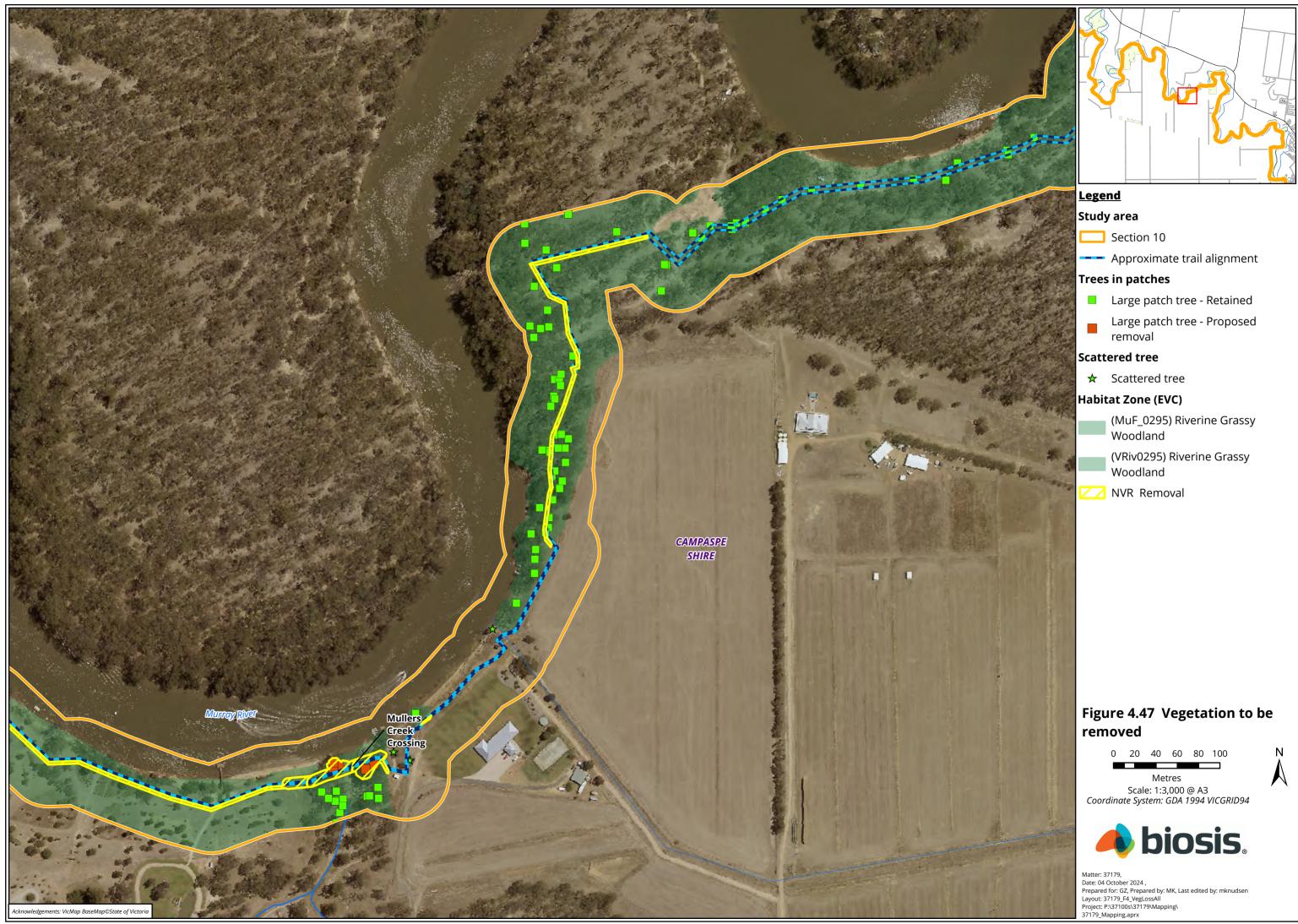


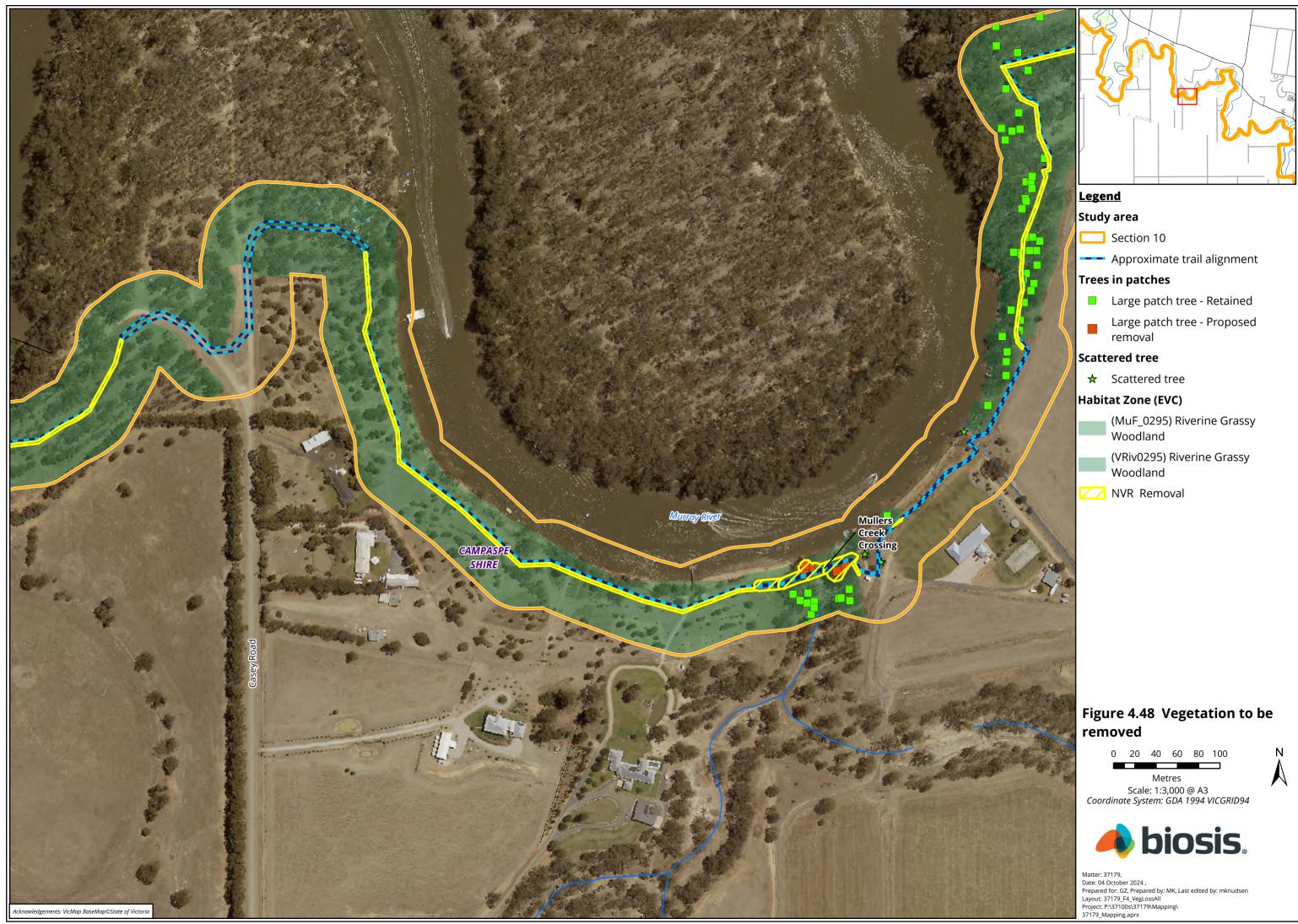
Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94



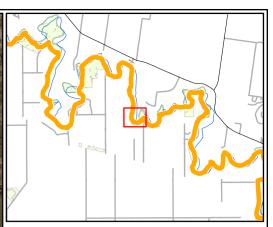












Study area

Section 10

---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland
- 🔼 NVR Removal

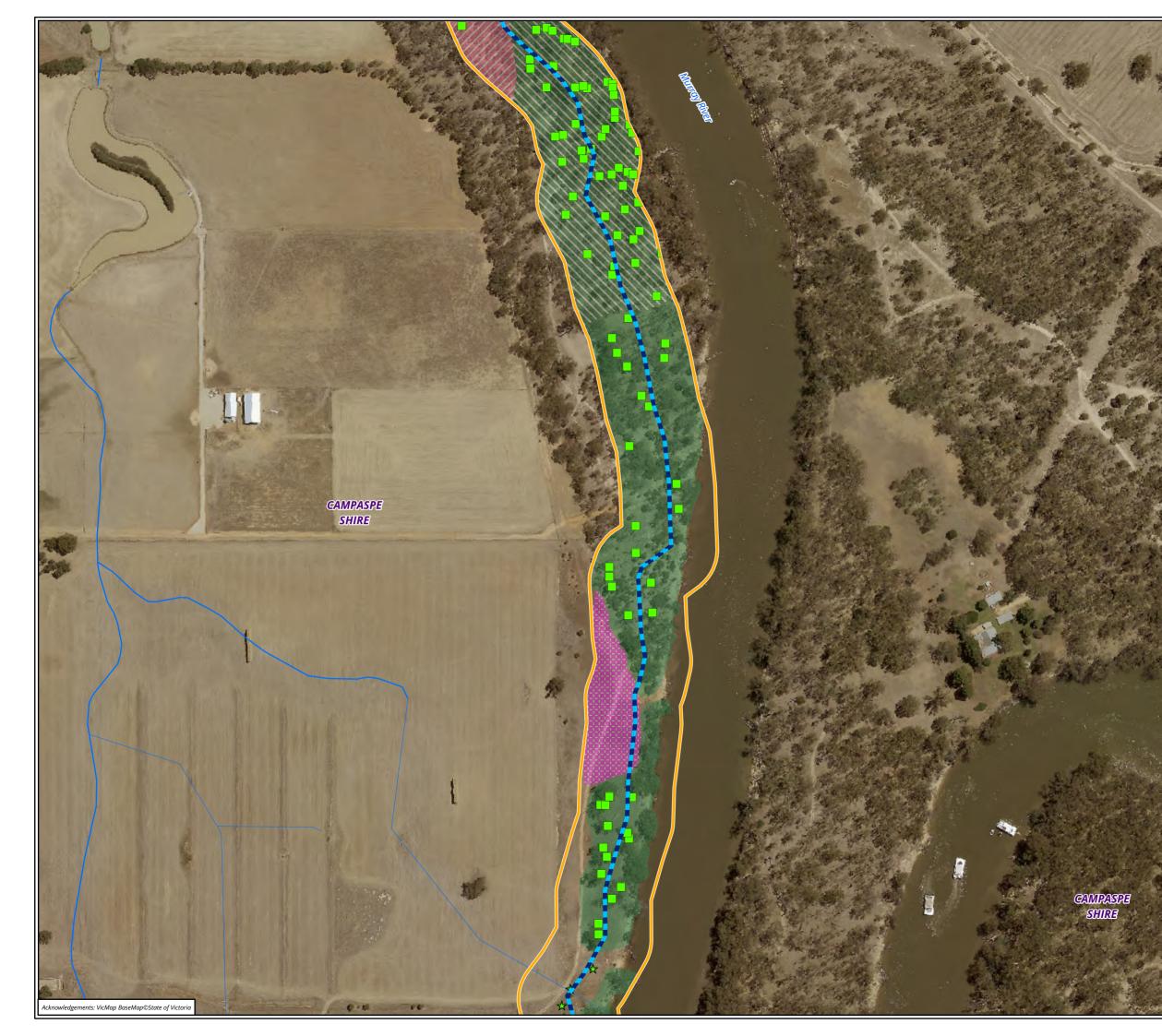


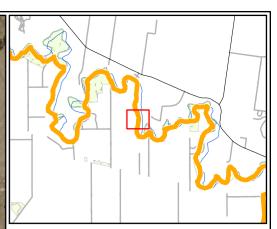
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 10

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0106) Grassy Riverine Forest
 - (MuF_0295) Riverine Grassy Woodland
- 🔛 (MuF_0803) Plains Woodland

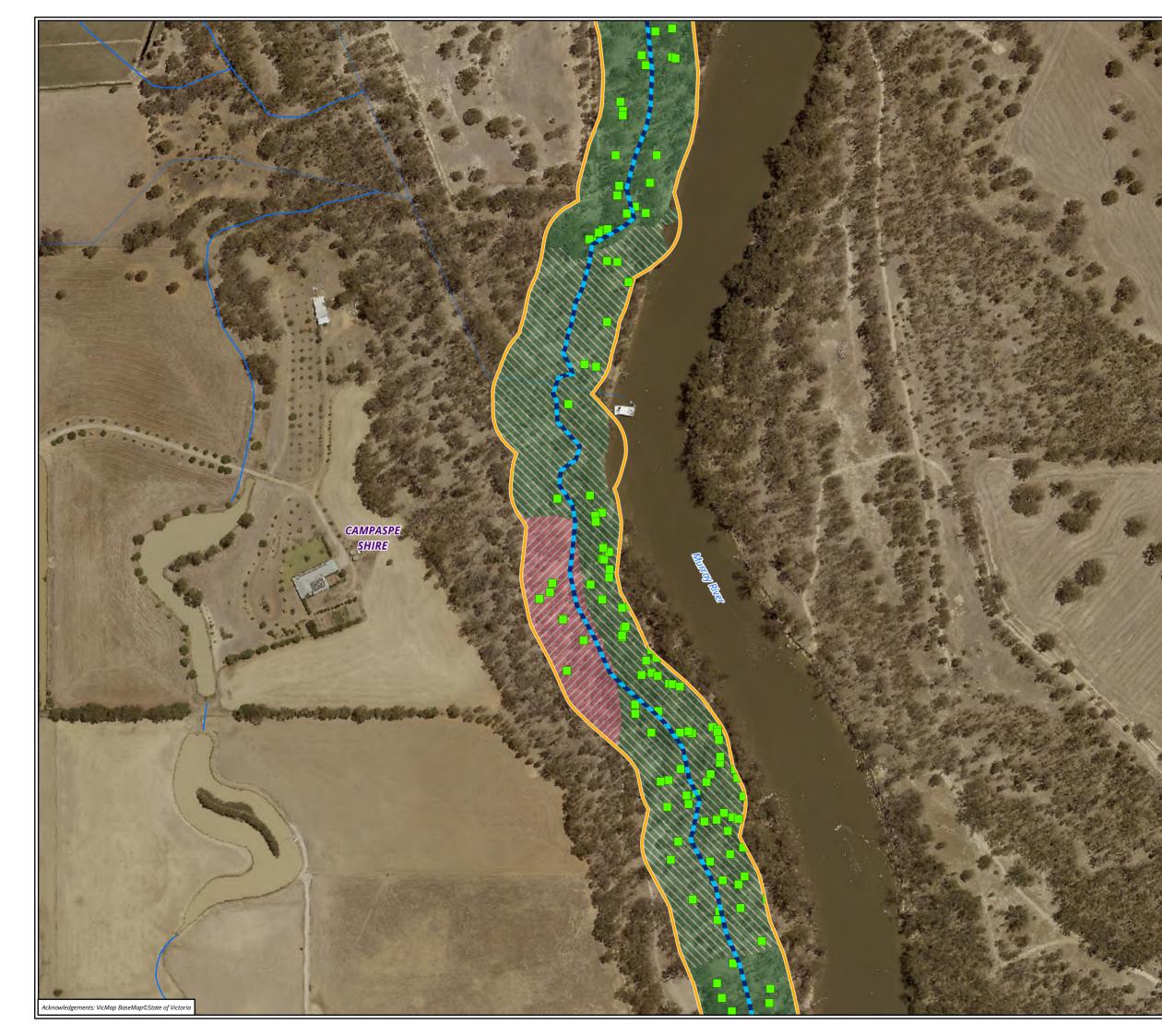
Figure 4.50 Vegetation to be removed

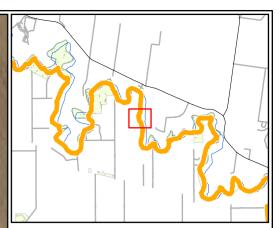
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0106) Grassy Riverine Forest

(MuF_0295) Riverine Grassy Woodland

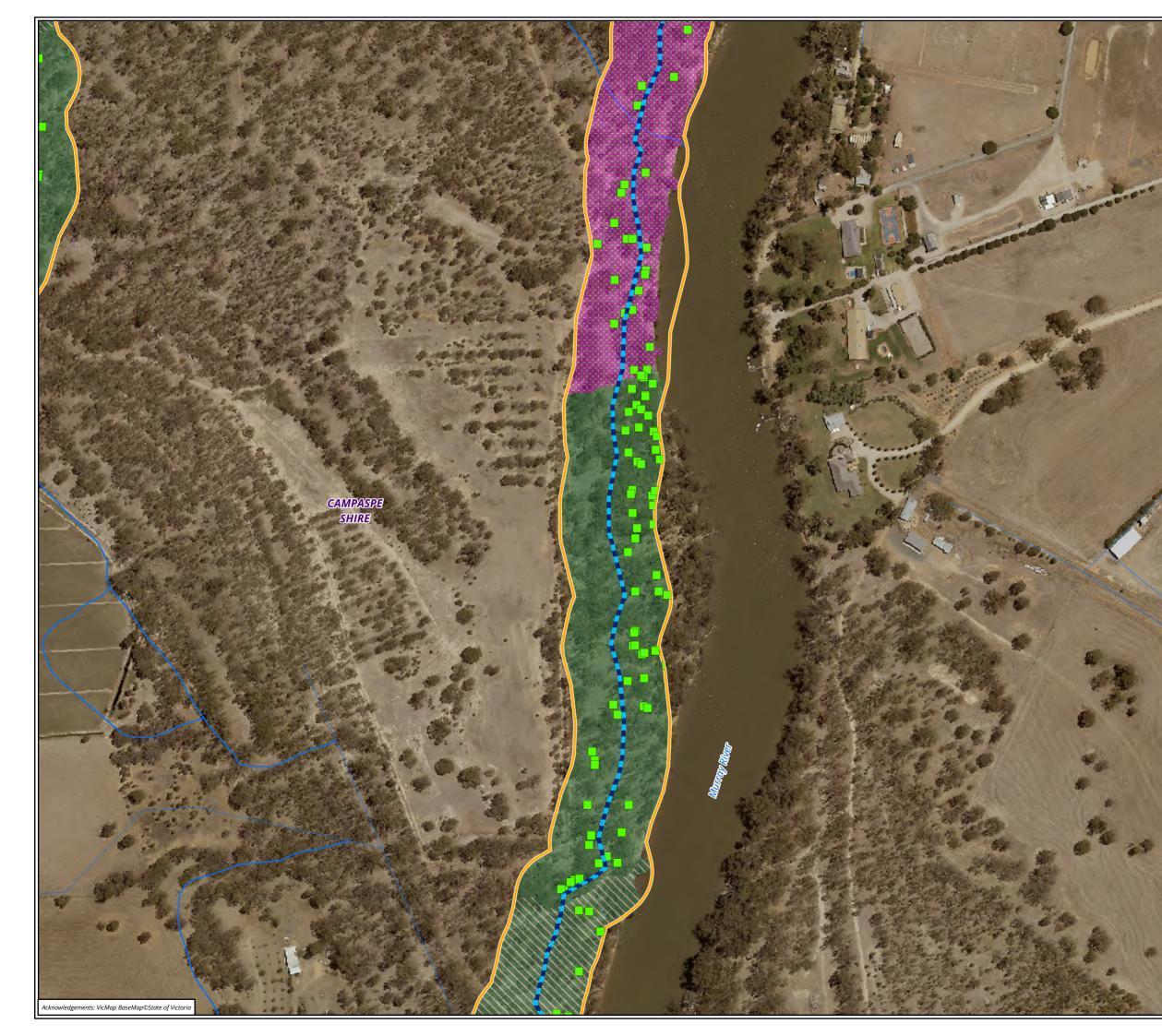
Figure 4.51 Vegetation to be removed

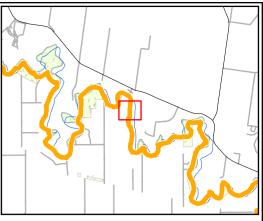
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest
 - (MuF_0295) Riverine Grassy Woodland
 - (MuF_0803) Plains Woodland

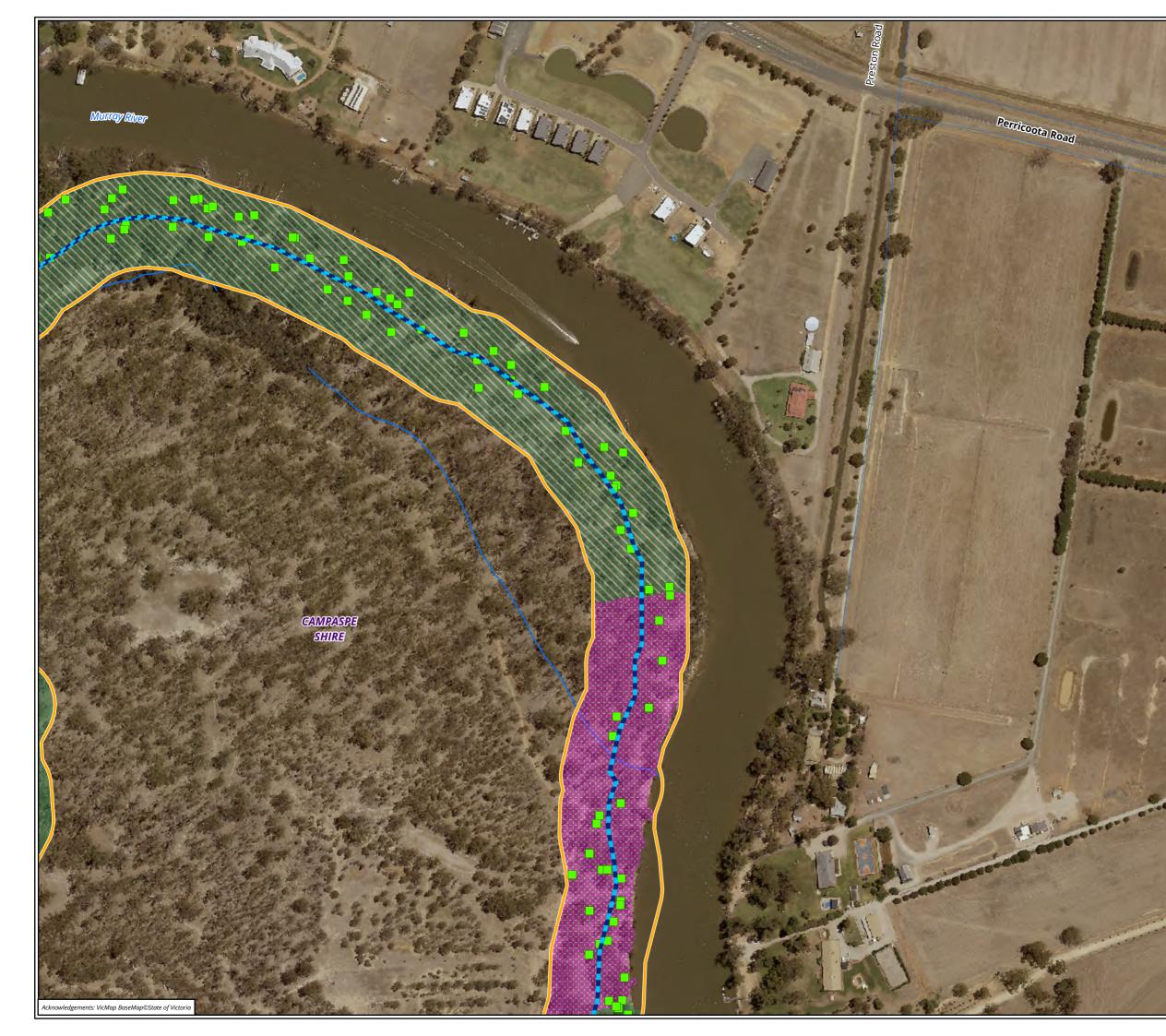
Figure 4.52 Vegetation to be removed

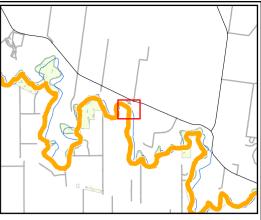
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- ---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest
 - (MuF_0295) Riverine Grassy Woodland
 - (MuF_0803) Plains Woodland

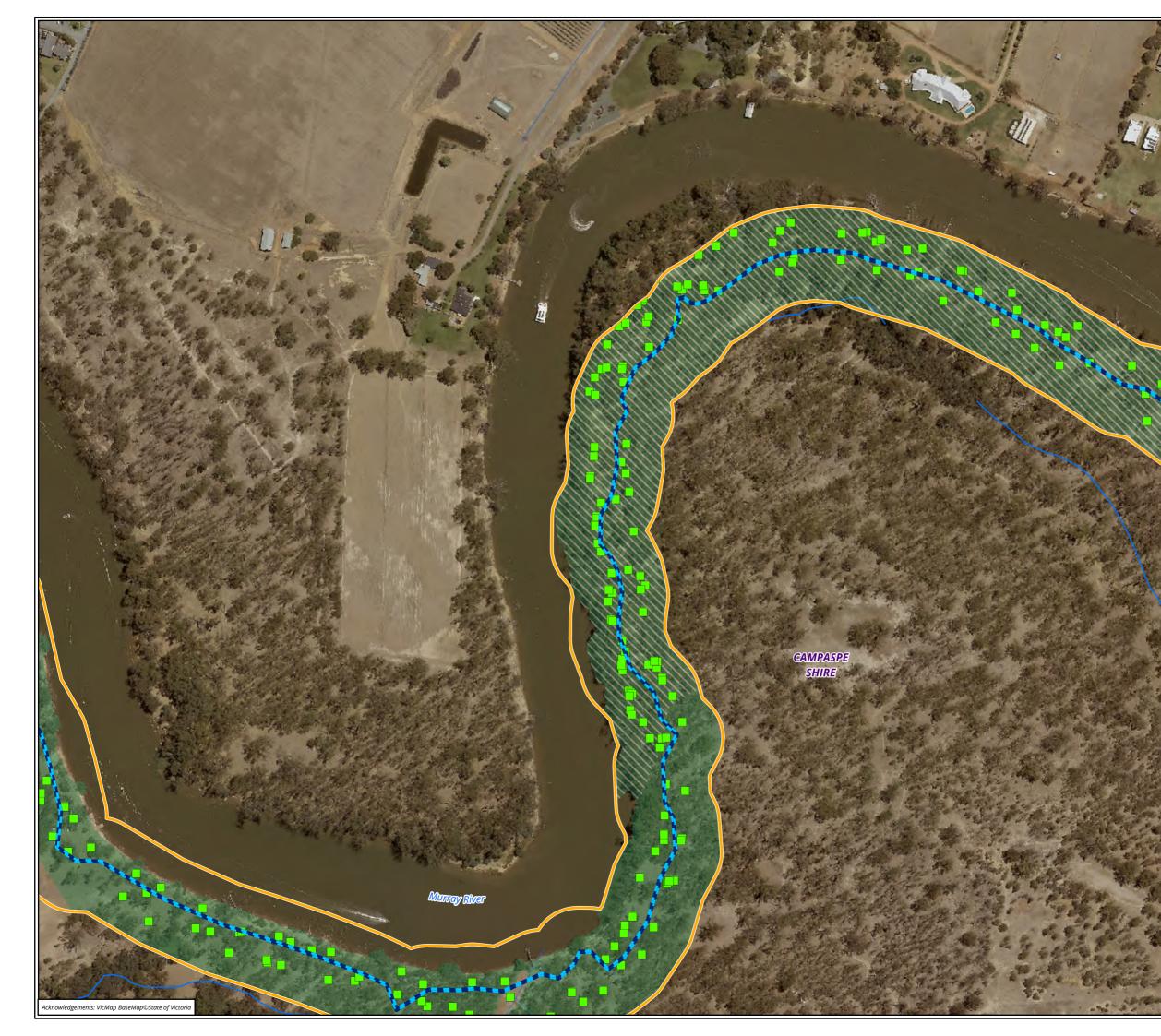


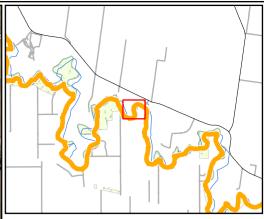
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Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- ---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest
 - (MuF_0295) Riverine Grassy Woodland

Figure 4.54 Vegetation to be removed

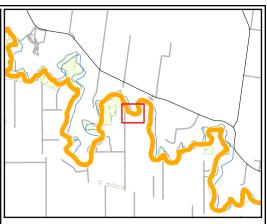
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest
 - (MuF_0295) Riverine Grassy Woodland
 - 🗌 NVR Removal

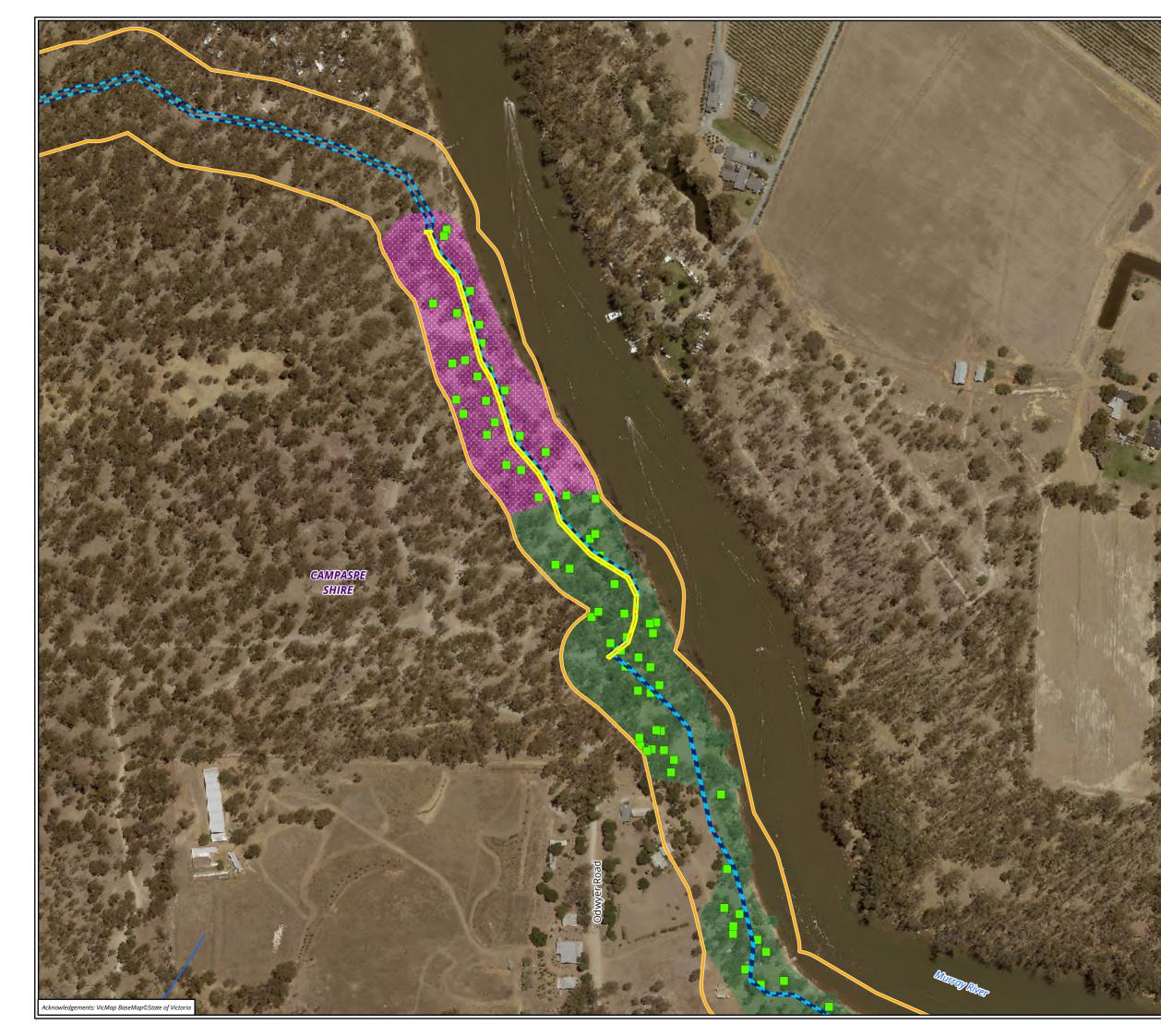
Figure 4.55 Vegetation to be removed

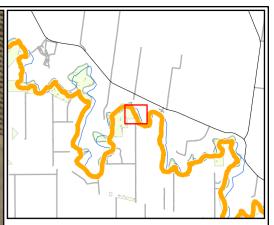
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- ---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- 🔋 (MuF_0803) Plains Woodland
- 🔼 NVR Removal

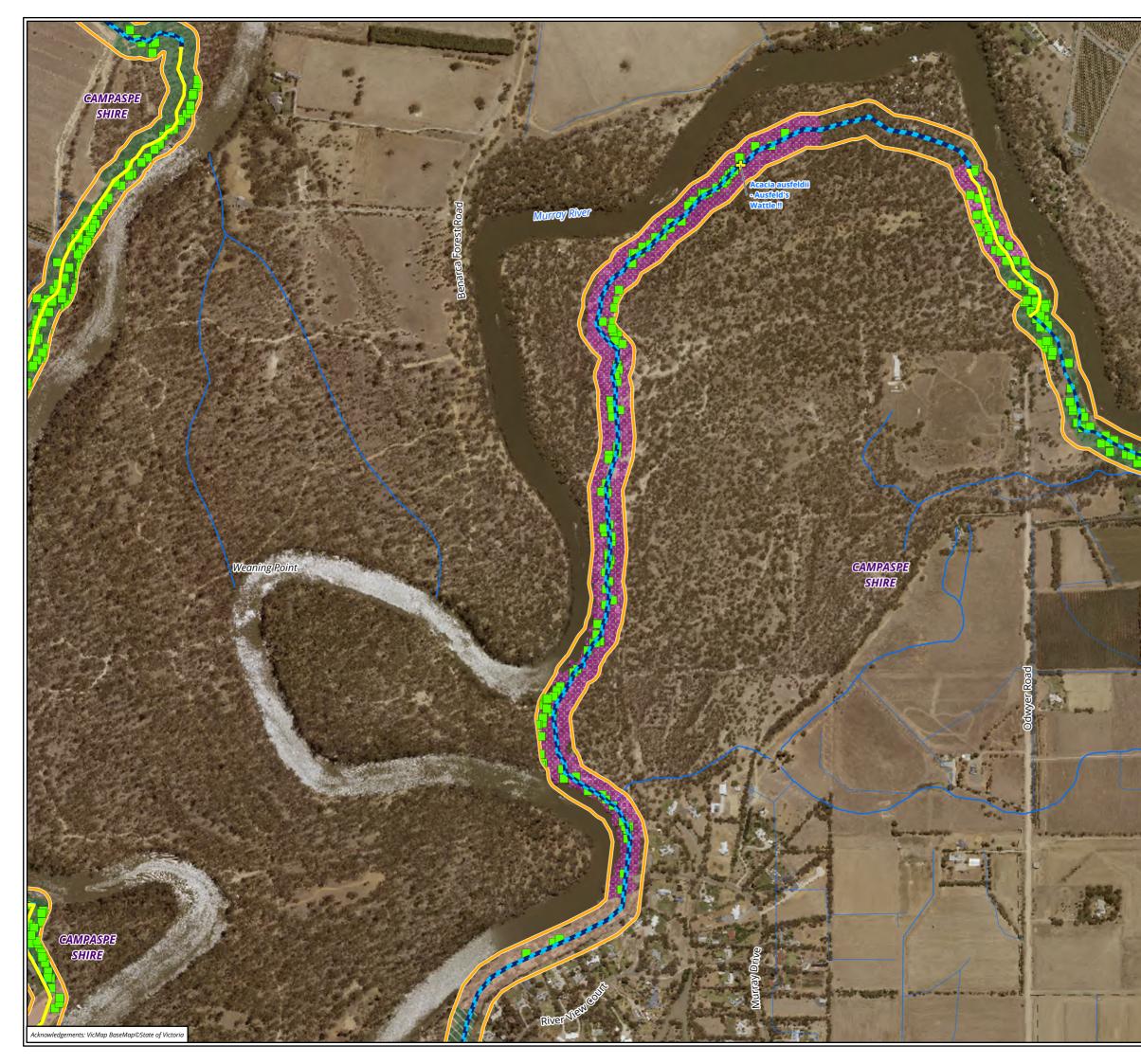
Figure 4.56 Vegetation to be removed

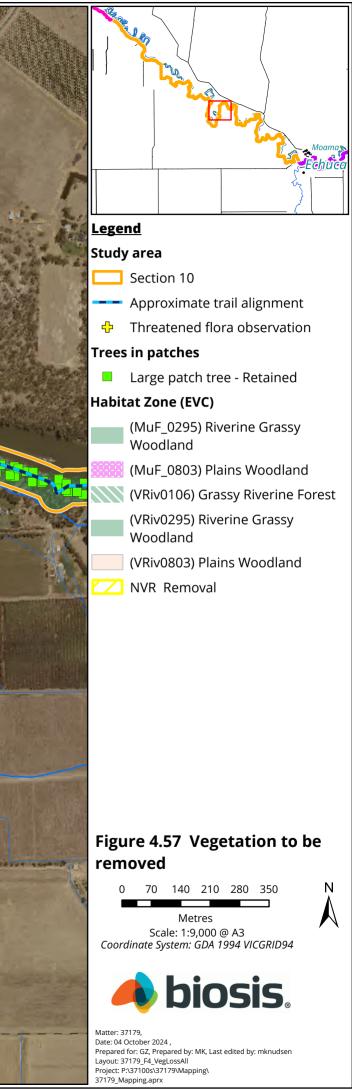
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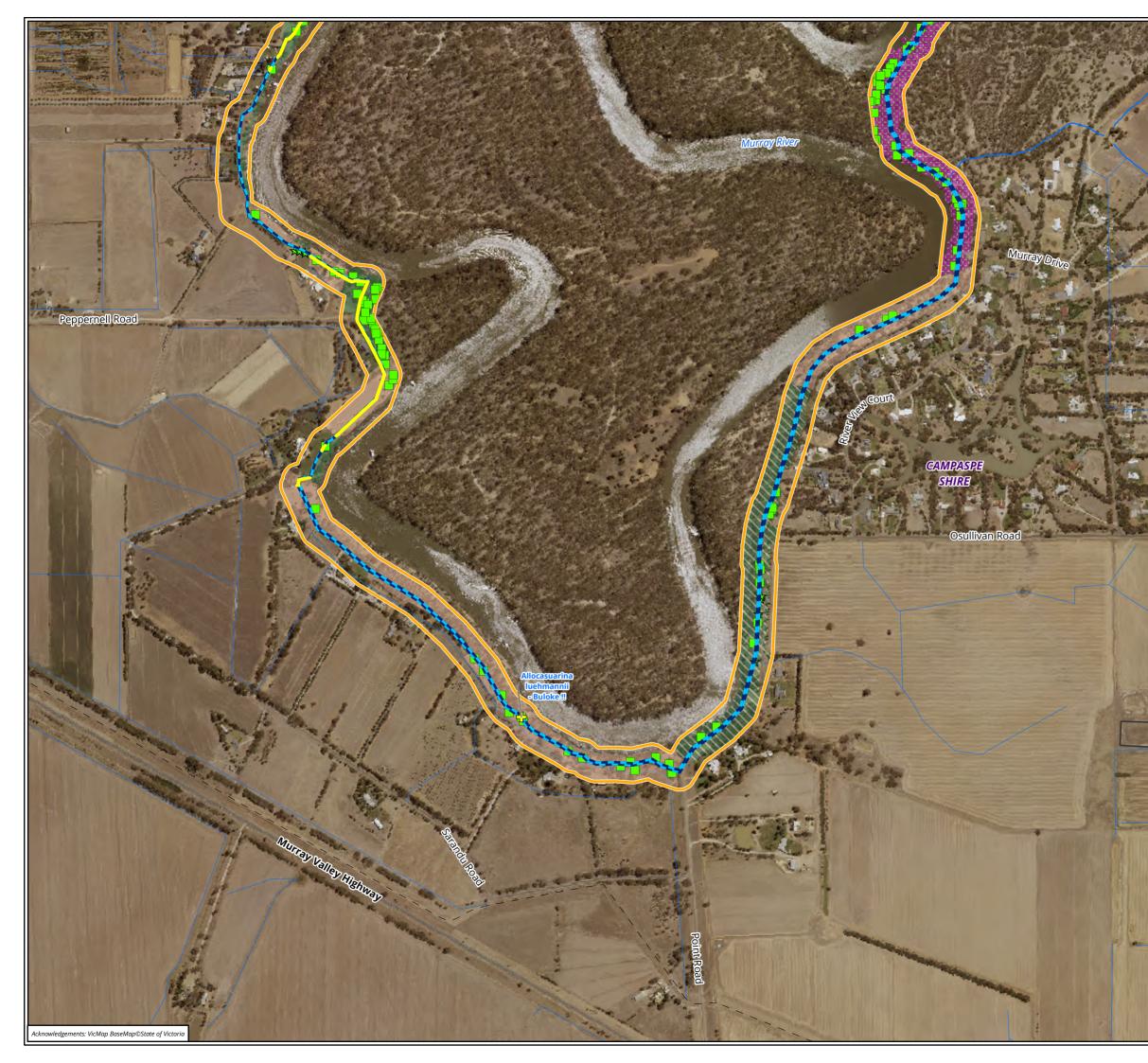


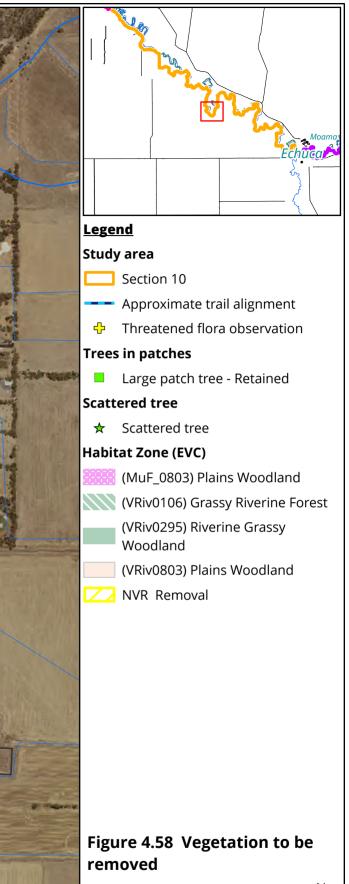
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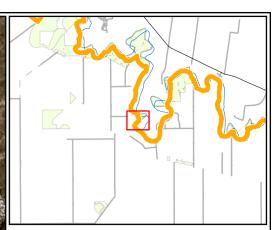
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Scale: 1:9,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

- (VRiv0295) Riverine Grassy Woodland
- (VRiv0803) Plains Woodland
- 🔼 NVR Removal



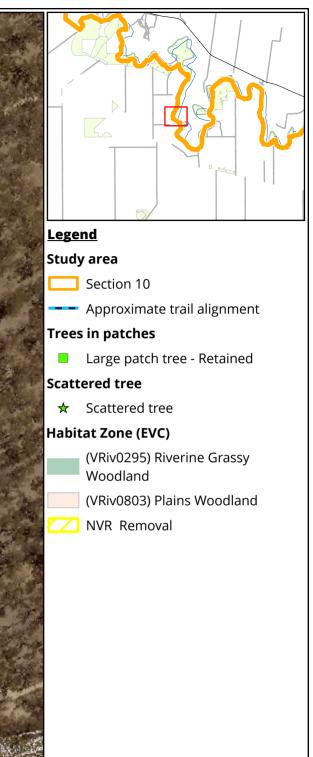
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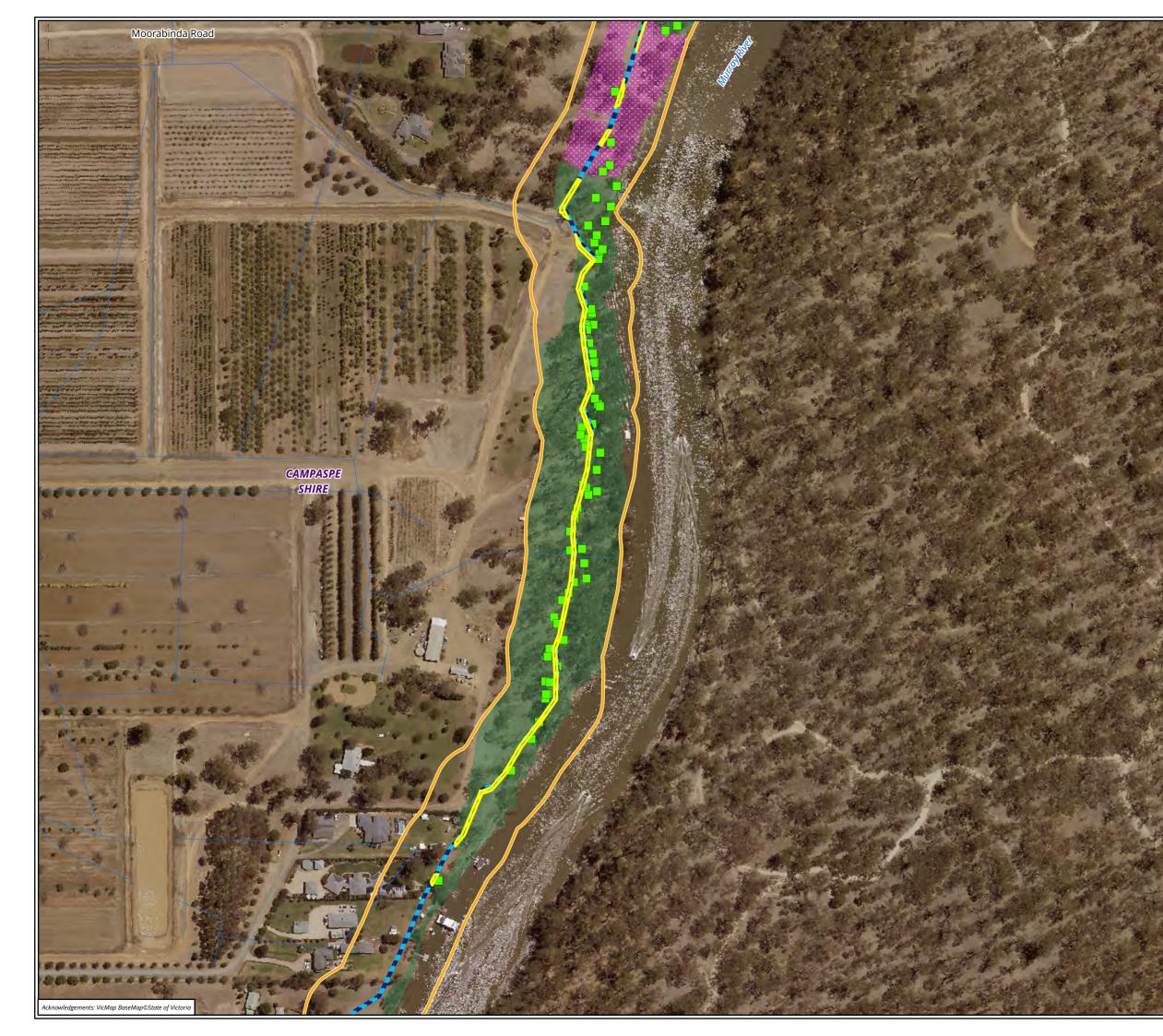


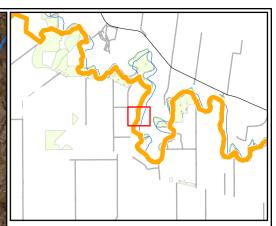
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0295) Riverine Grassy Woodland

(MuF_0803) Plains Woodland

(VRiv0295) Riverine Grassy Woodland





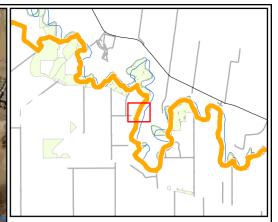
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland
- (VRiv0295) Riverine Grassy Woodland
- AVR Removal



0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0295) Riverine Grassy Woodland
- 🗾 NVR Removal

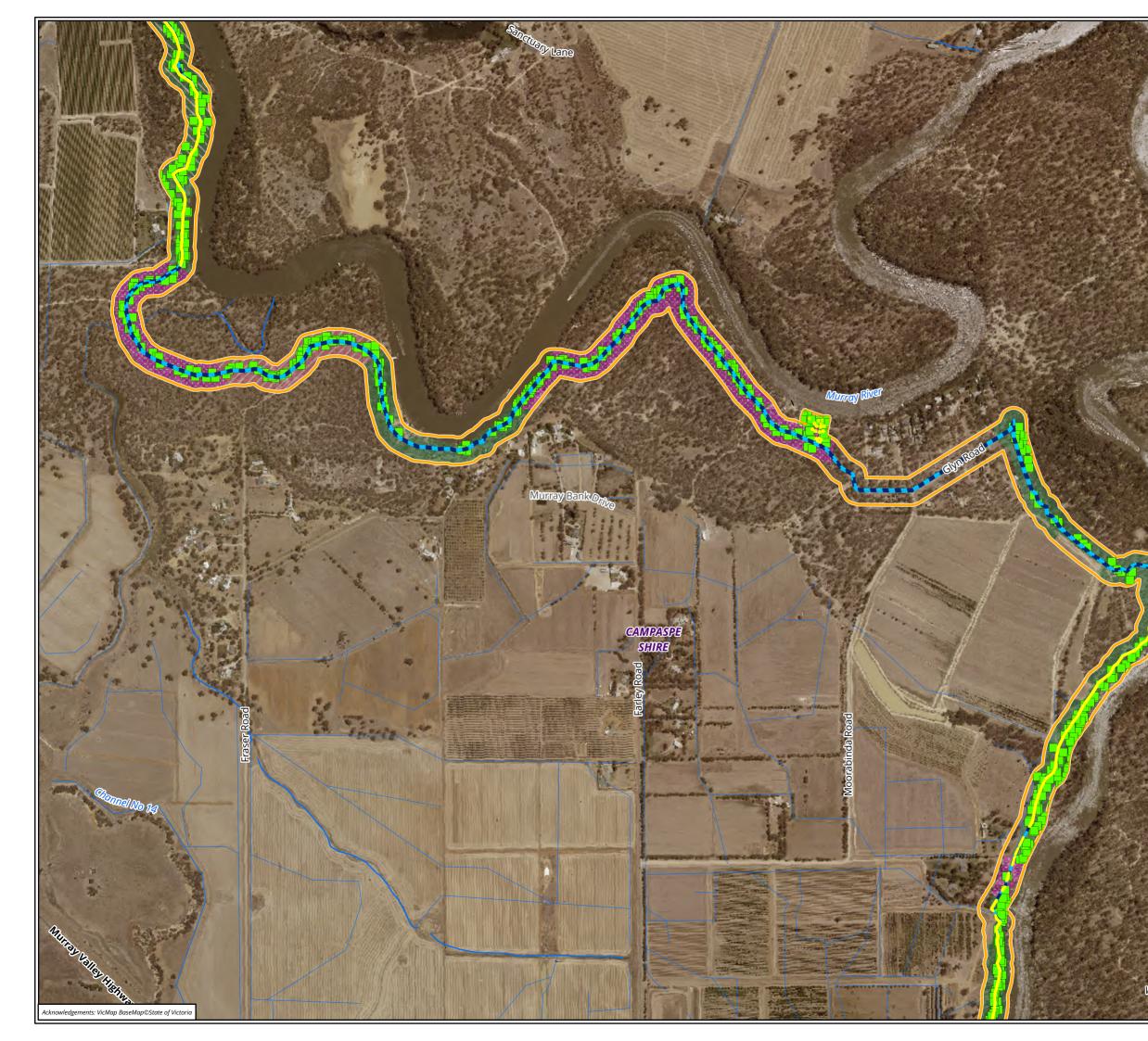


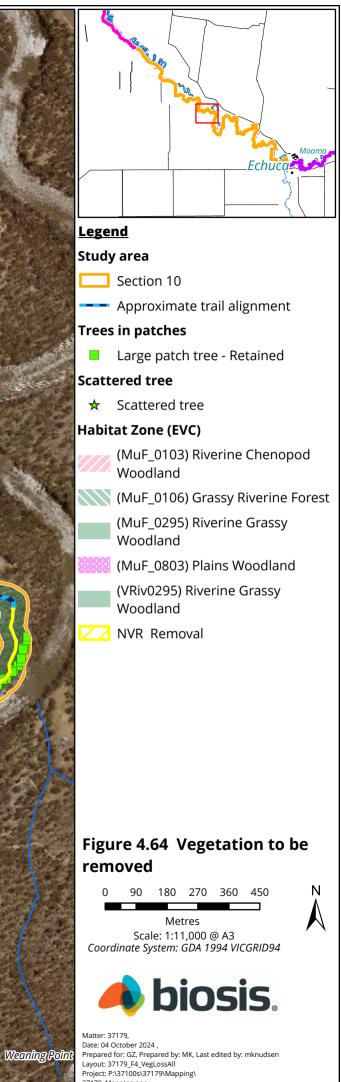
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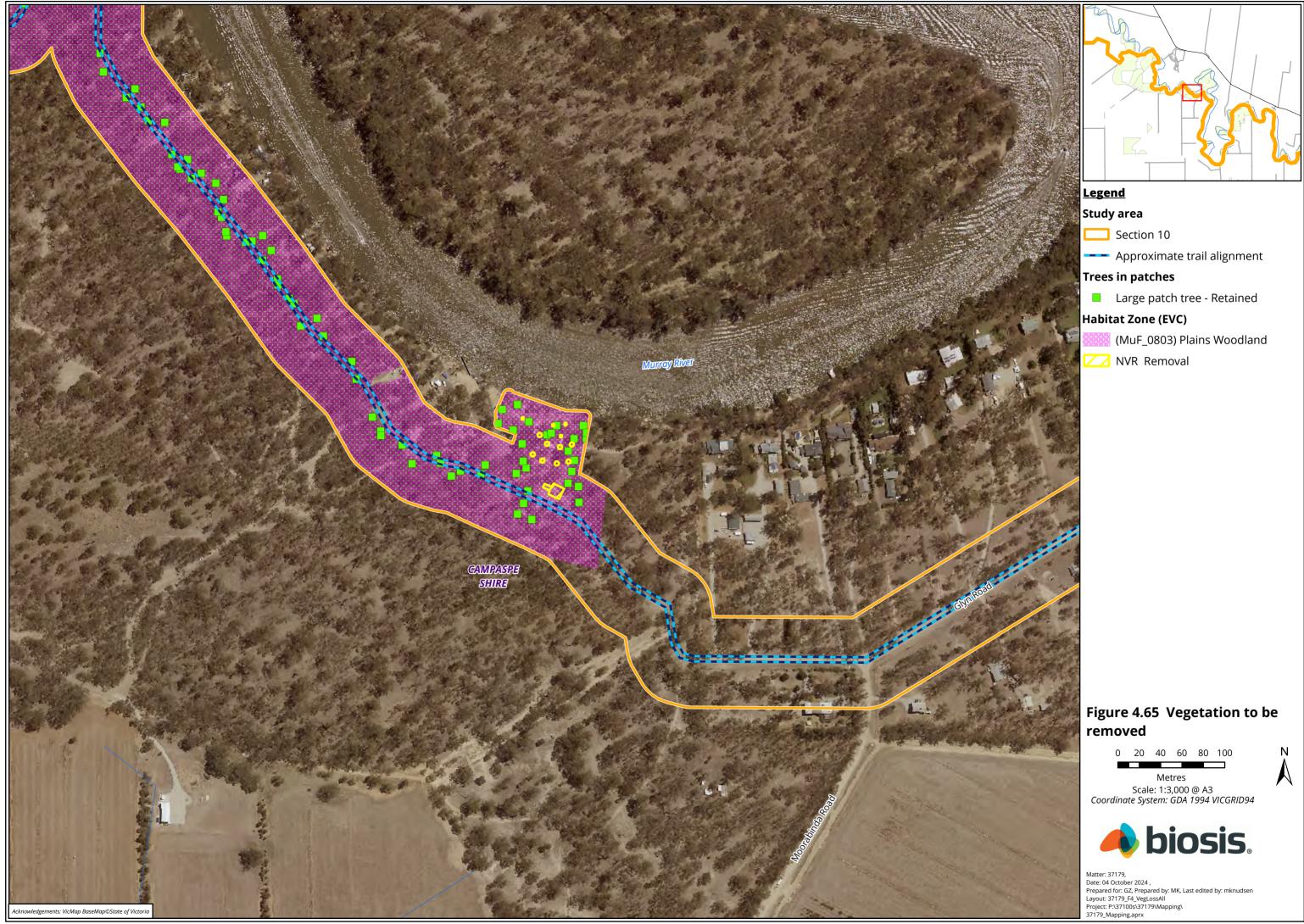
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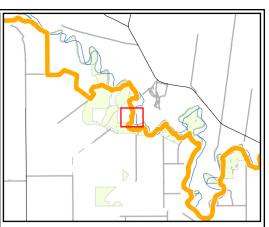




37179_Mapping.aprx







Study area

Section 10

---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0103) Riverine Chenopod Woodland

(MuF_0106) Grassy Riverine Forest

- (MuF_0295) Riverine Grassy Woodland
- (MuF_0803) Plains Woodland
- 🔼 NVR Removal

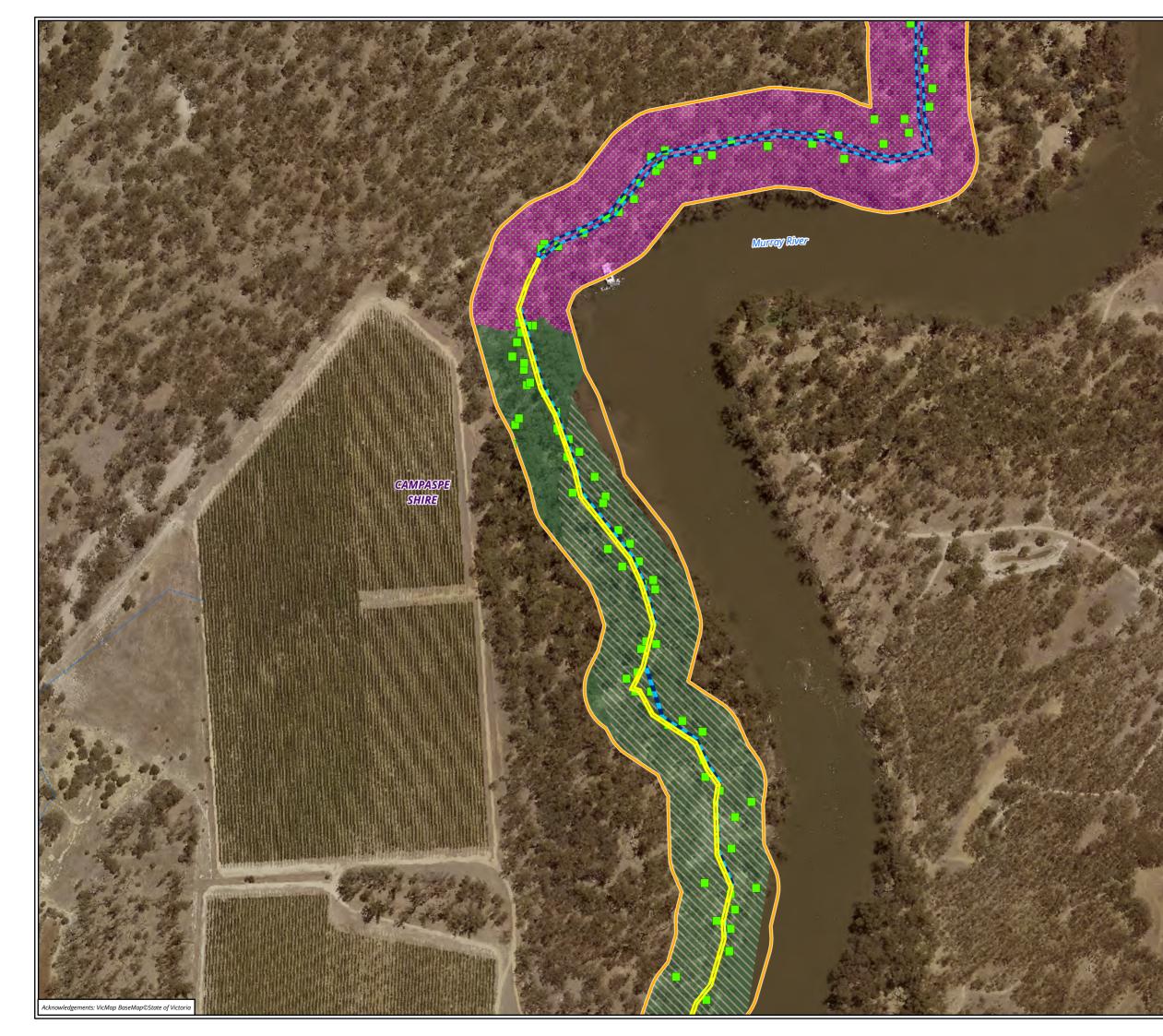
Figure 4.66 Vegetation to be removed

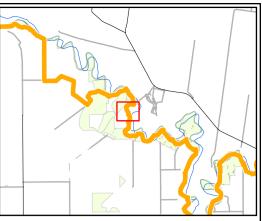
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 10

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest
 - (MuF_0295) Riverine Grassy Woodland
 - (MuF_0803) Plains Woodland
 - NVR Removal

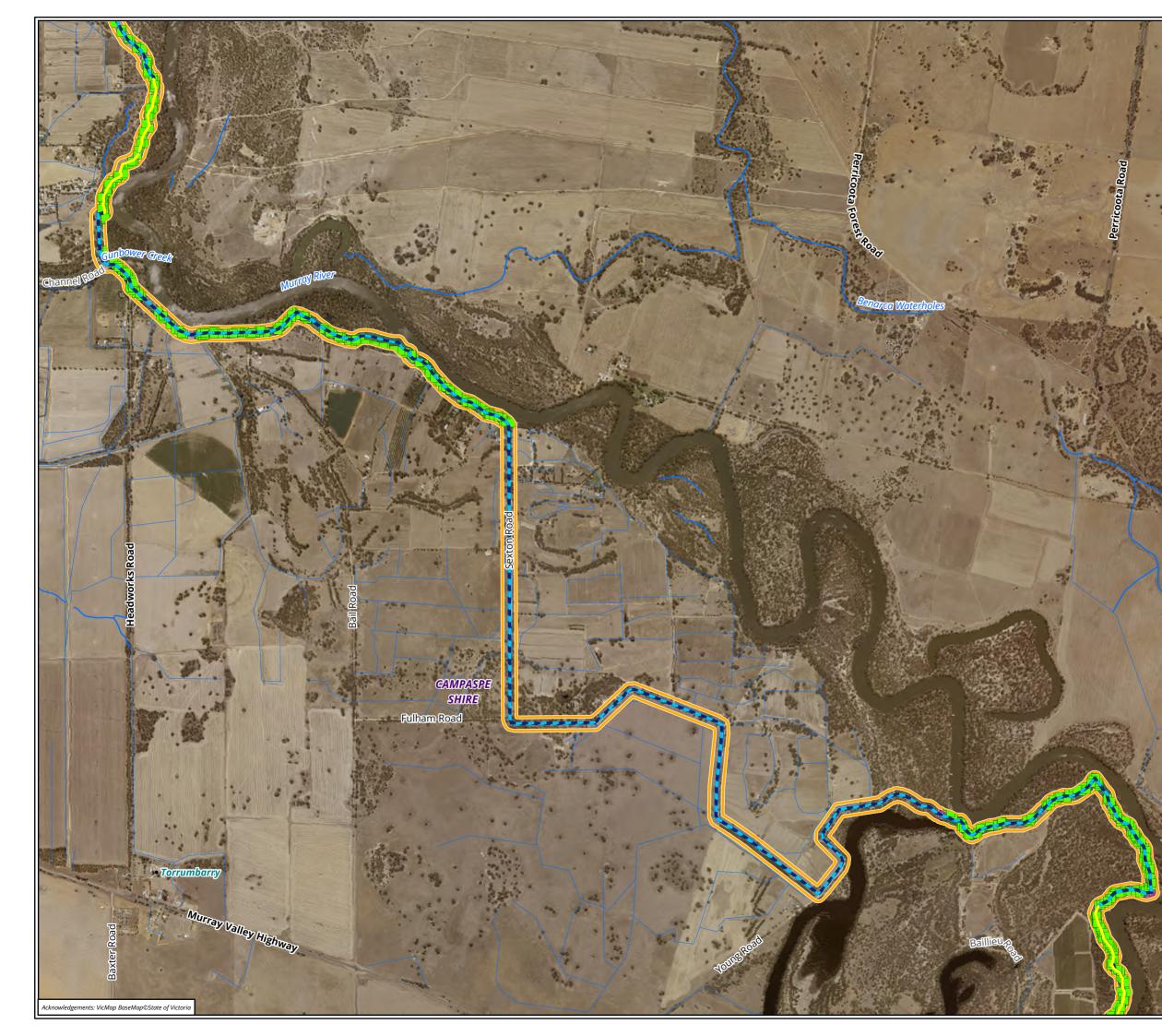


0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

Section 10

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Scattered tree

★ Scattered tree

Habitat Zone (EVC)

- (MuF_0106) Grassy Riverine Forest (MuF_0295) Riverine Grassy Woodland
 - (MuF_0803) Plains Woodland
- (VRiv0106) Grassy Riverine Forest
 - (VRiv0803) Plains Woodland
- 📿 NVR Removal

Figure 4.68 Vegetation to be removed

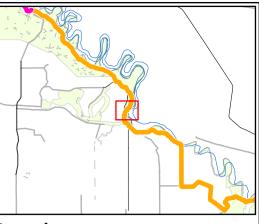
0 180 360 540 720 900



Metres Scale: 1:22,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (VRiv0106) Grassy Riverine Forest
 - (VRiv0803) Plains Woodland
- 🖊 NVR Removal

Figure 4.69 Vegetation to be removed

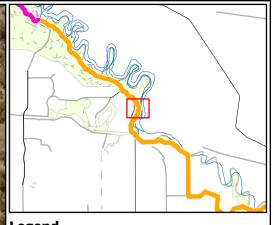
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (VRiv0803) Plains Woodland
- 🔼 NVR Removal

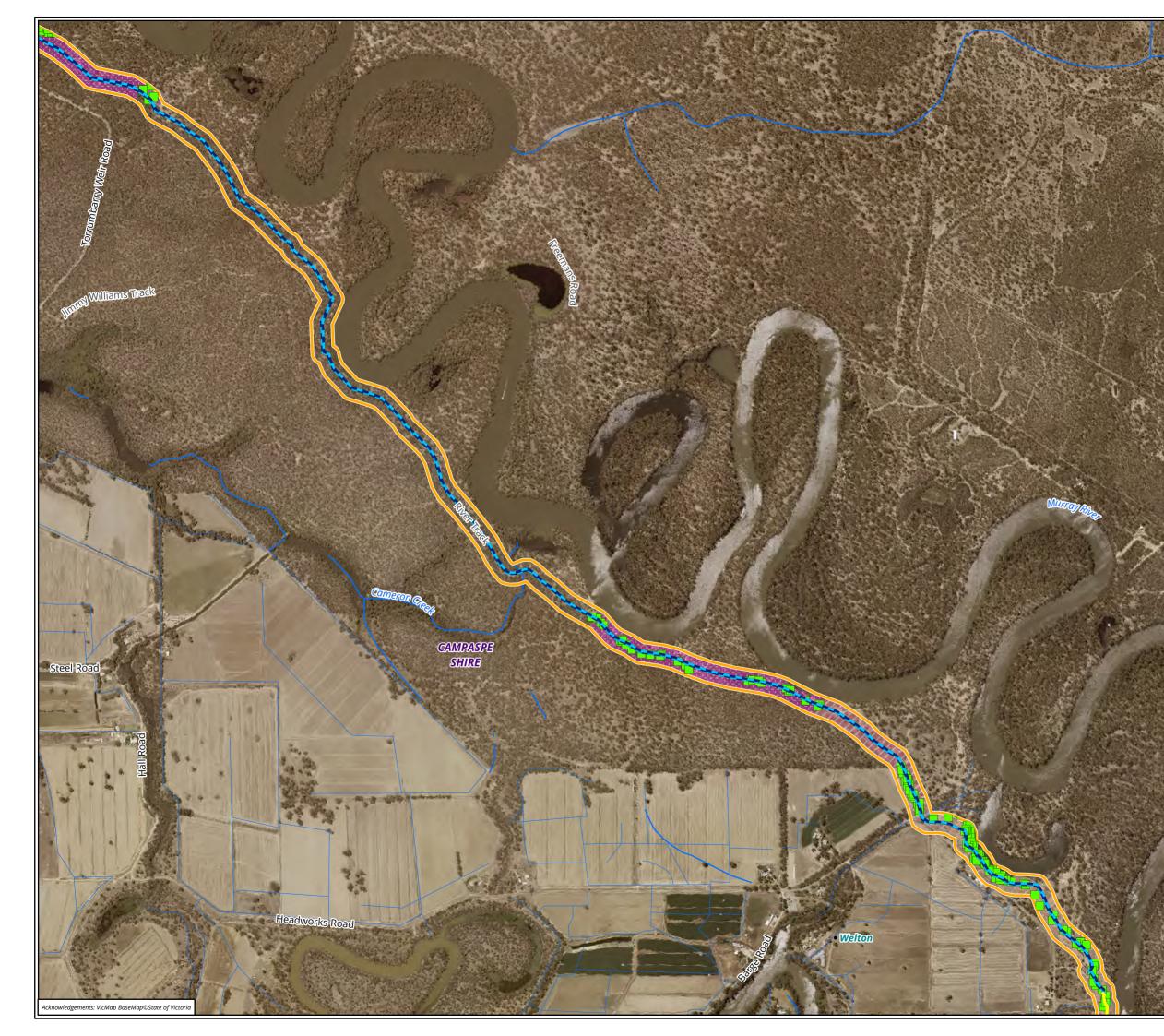


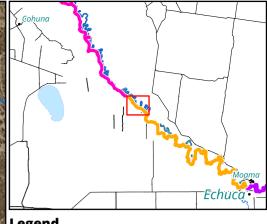
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

- Section 10
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

- (MuF_0103) Riverine Chenopod Woodland
- (MuF_0803) Plains Woodland
- (VRiv0803) Plains Woodland
- 🔁 NVR Removal

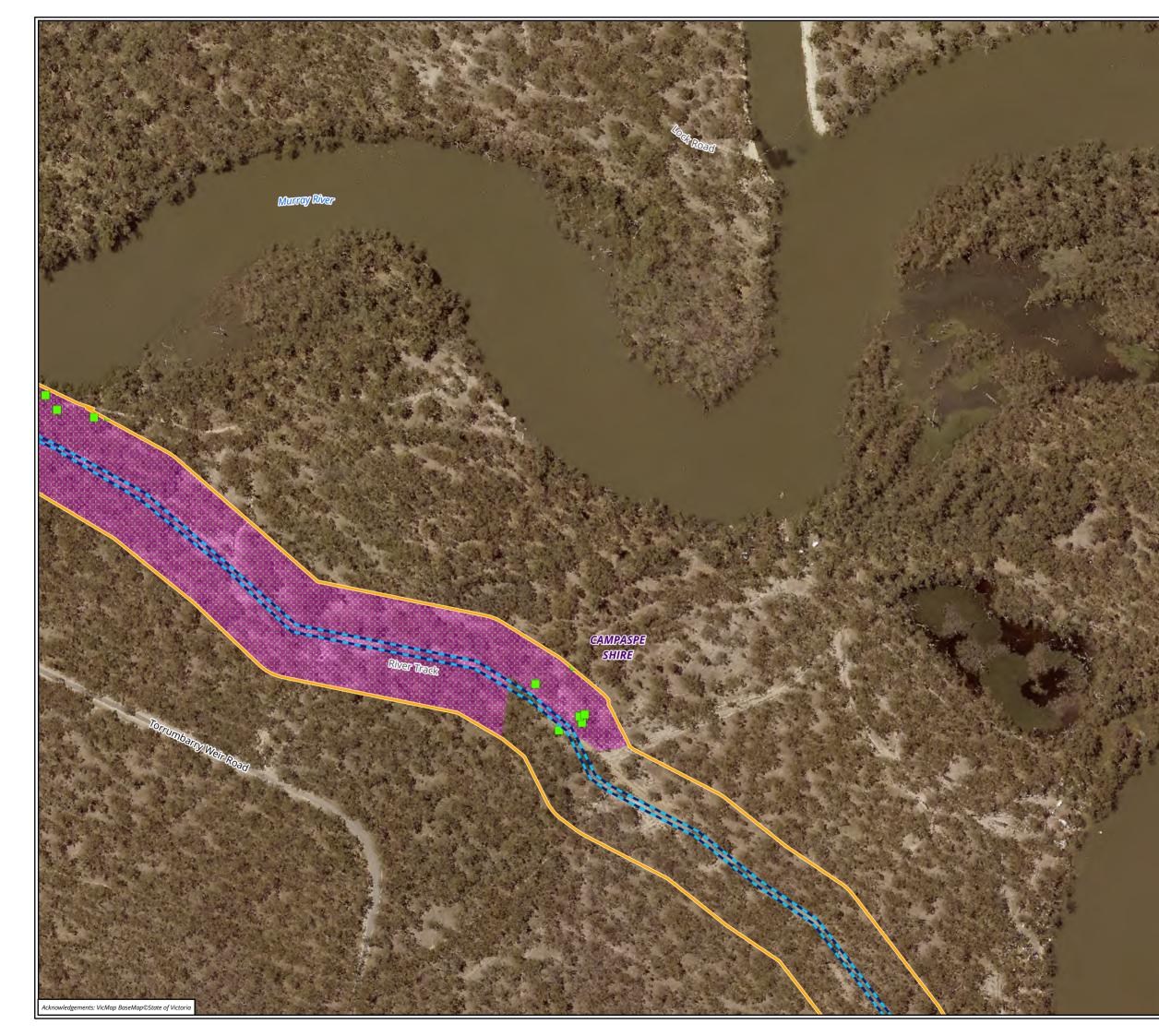


0 110 220 330 440 550



Metres Scale: 1:14,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 10

---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0803) Plains Woodland

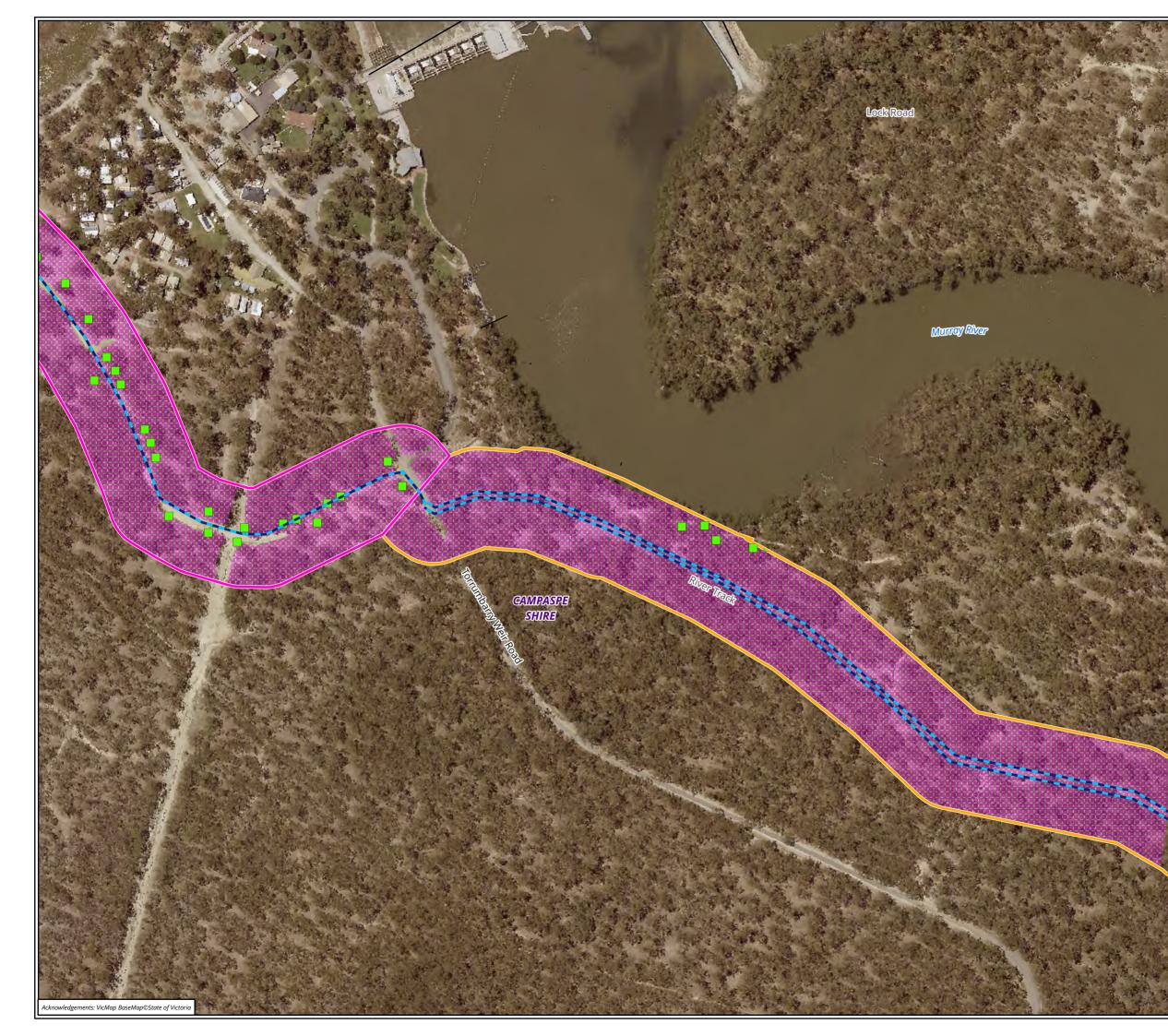


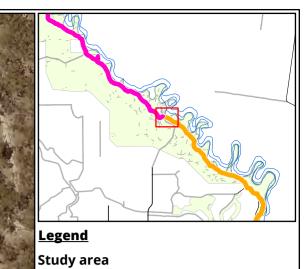
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Section 10

Section 11

--- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0803) Plains Woodland

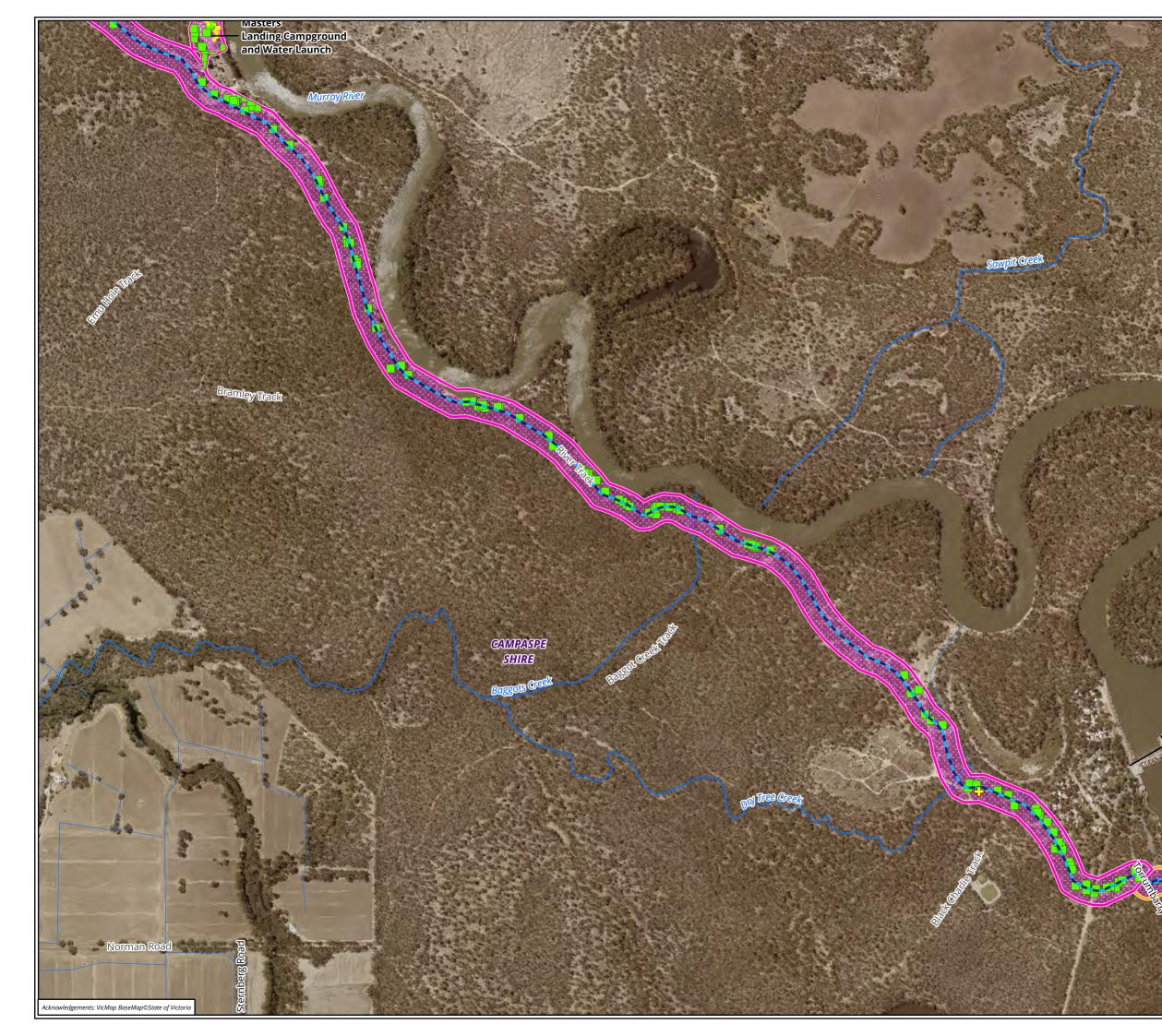


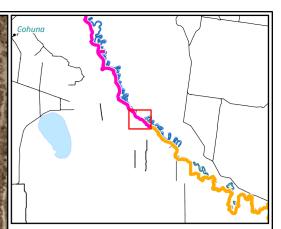
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 11

- --- Approximate trail alignment
- Threatened flora observation

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0803) Plains Woodland
NVR Removal

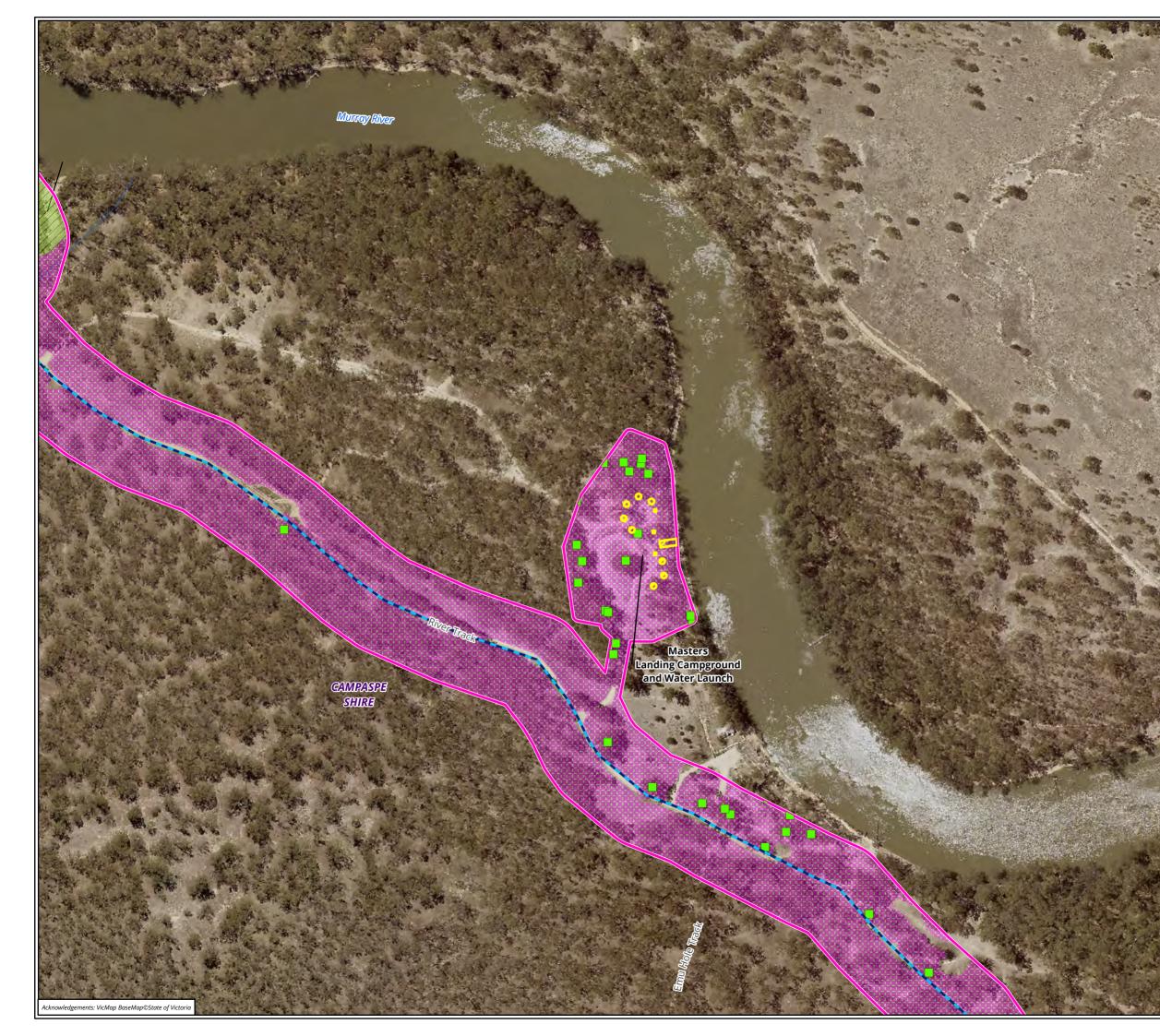


0 90 180 270 360 450



Metres Scale: 1:11,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

- Section 11
- ---- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

MuF_0803) Plains Woodland
 (MuF_0816) Sedgy Riverine Forest
 NVR Removal

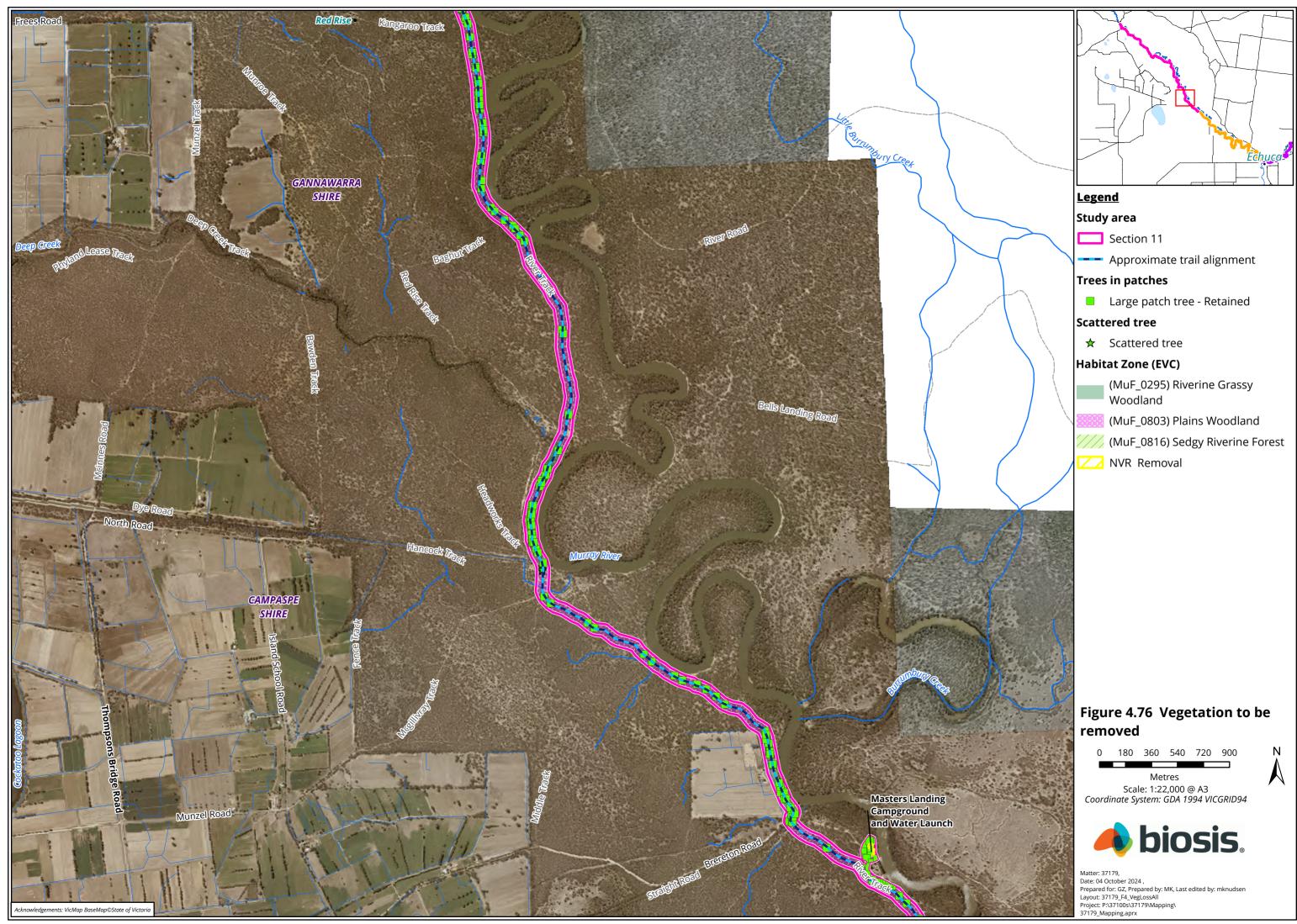
Figure 4.75 Vegetation to be removed

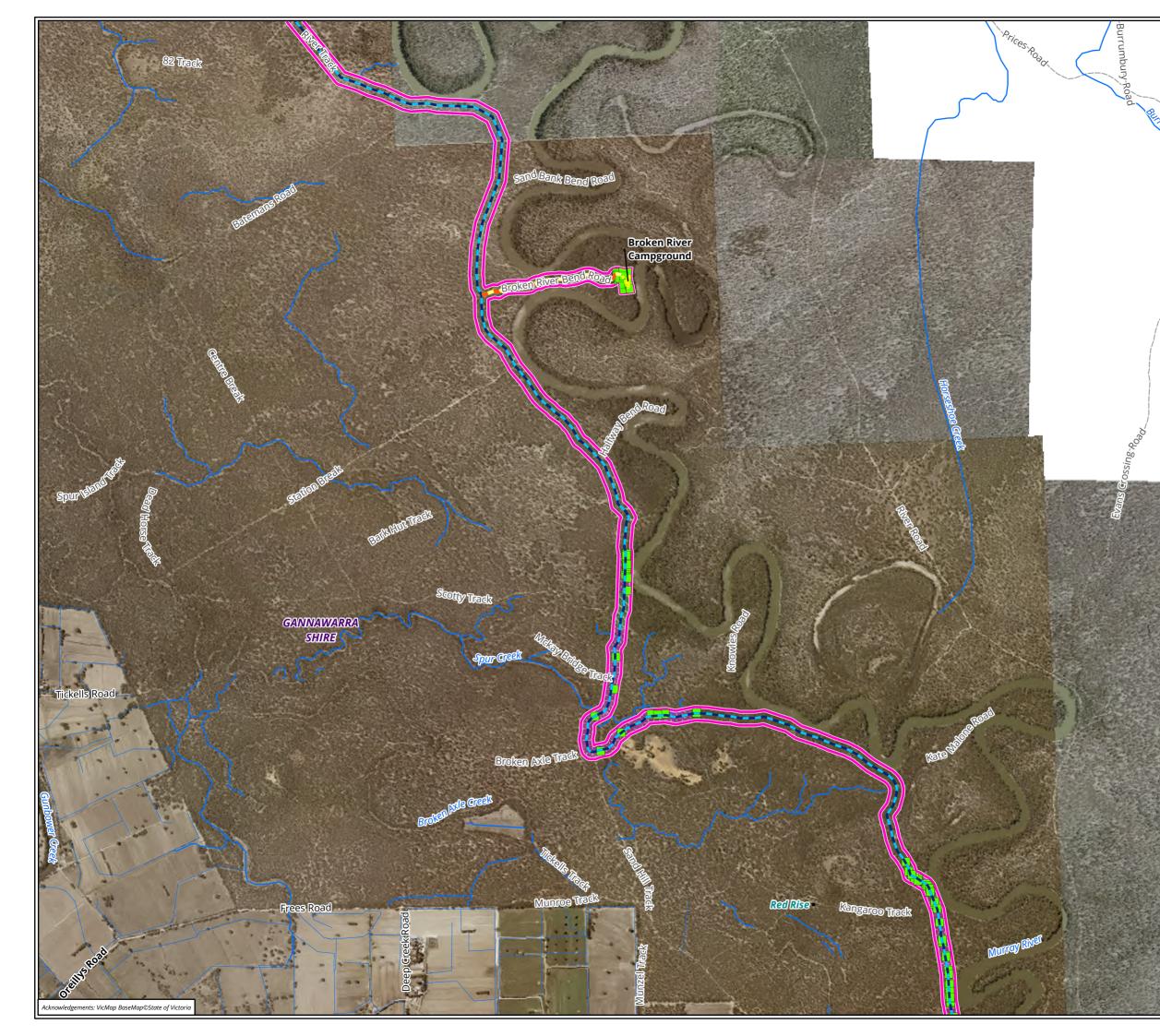
0 20 40 60 80 100



Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94







Study area

Section 11

---- Approximate trail alignment

Echuc

Trailhead_Acess_Roads

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest
 (MuF_0803) Plains Woodland
 (MuF_0816) Sedgy Riverine Forest
 NVR Removal



0 180 360 540 720 900



Metres Scale: 1:22,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

- Section 11
- Trailhead_Acess_Roads

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0816) Sedgy Riverine Forest

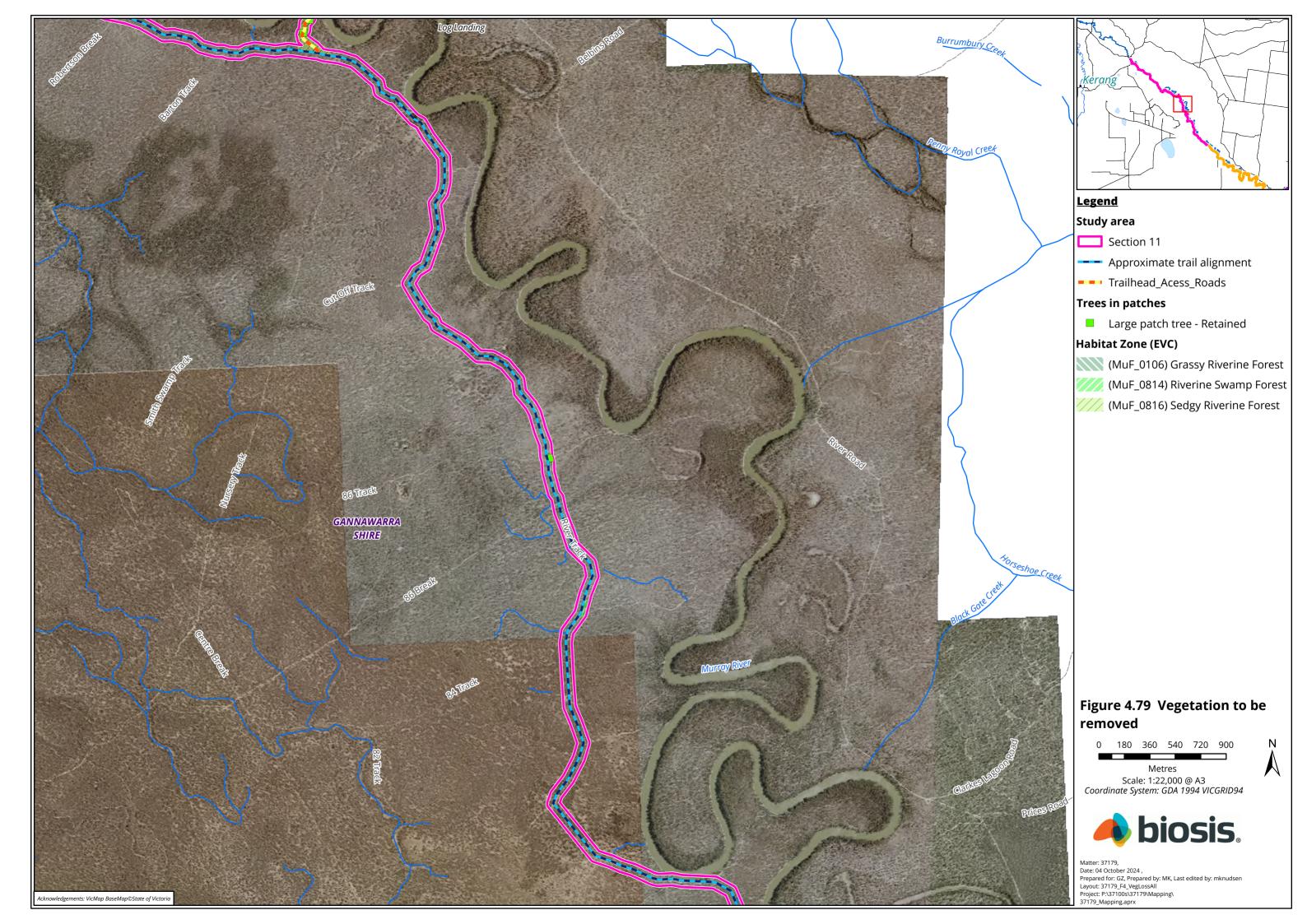


0 20 40 60 80 100

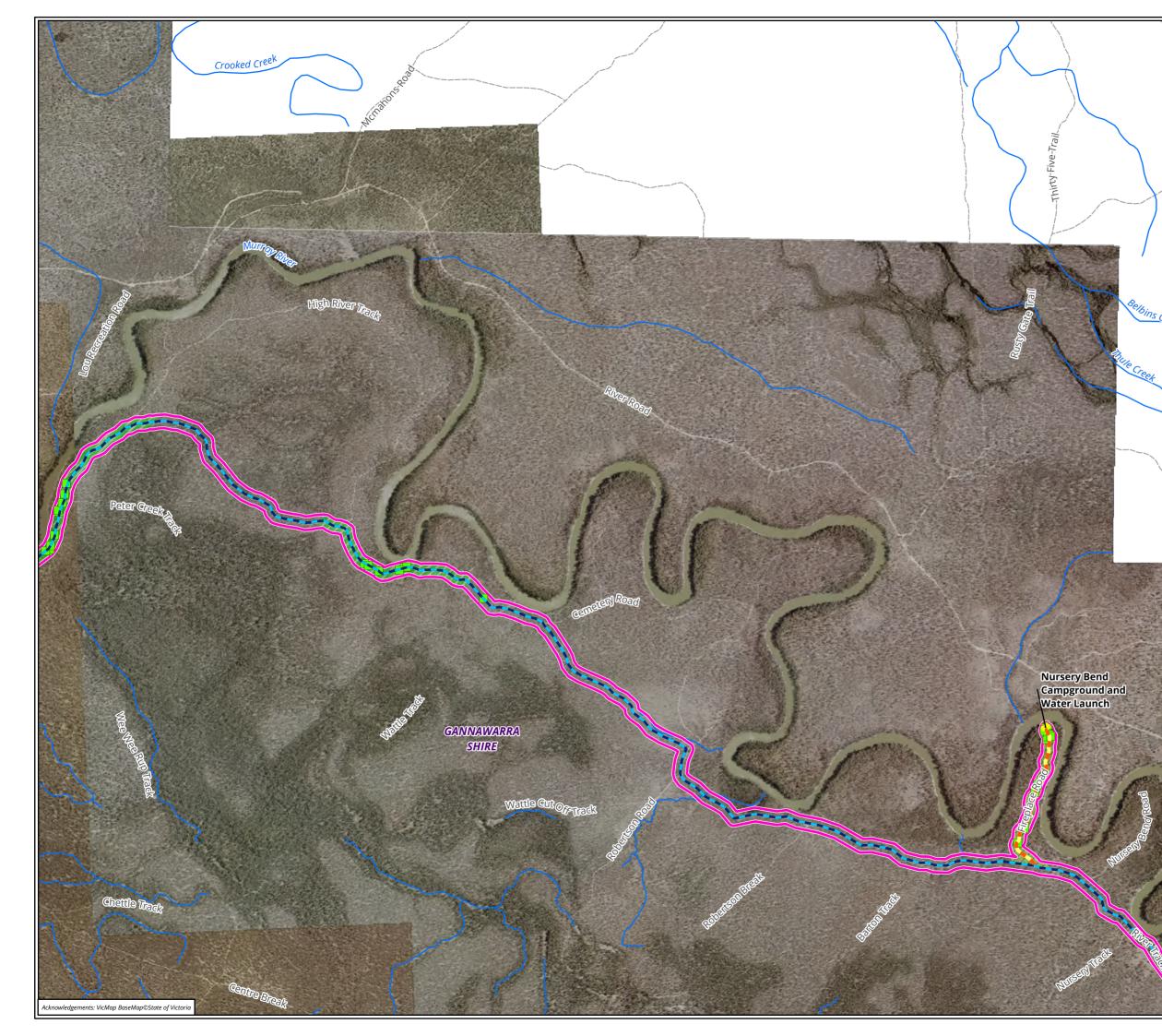


Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94









(era

Study area

Section 11

- --- Approximate trail alignment
- Trailhead_Acess_Roads

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0814) Riverine Swamp Forest (MuF_0816) Sedgy Riverine Forest NVR Removal

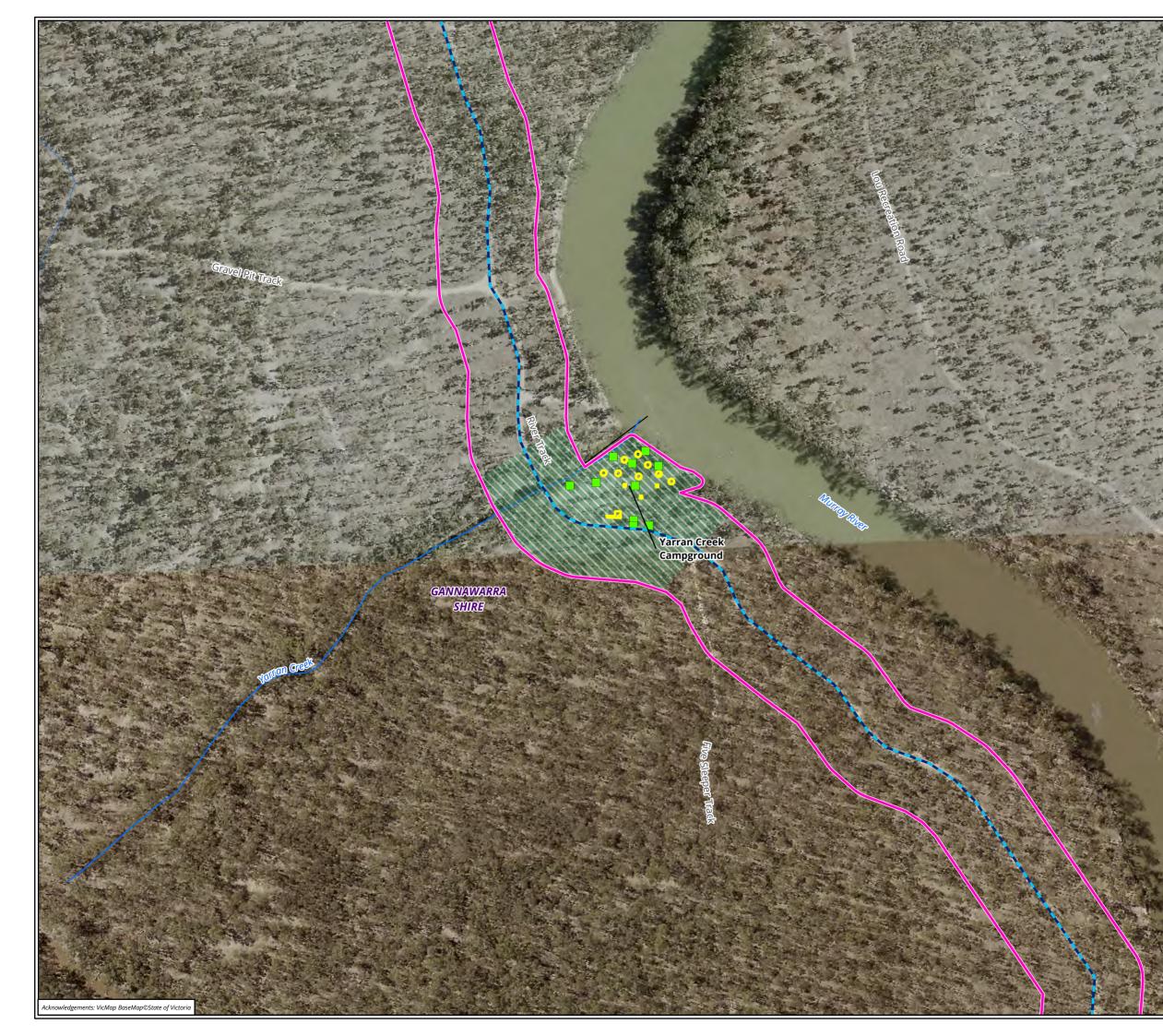
Figure 4.81 Vegetation to be removed

0 180 360 540 720 900



Metres Scale: 1:22,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Study area

- Section 11
- --- Approximate trail alignment

Trees in patches

Large patch tree - Retained

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest

🖊 NVR Removal

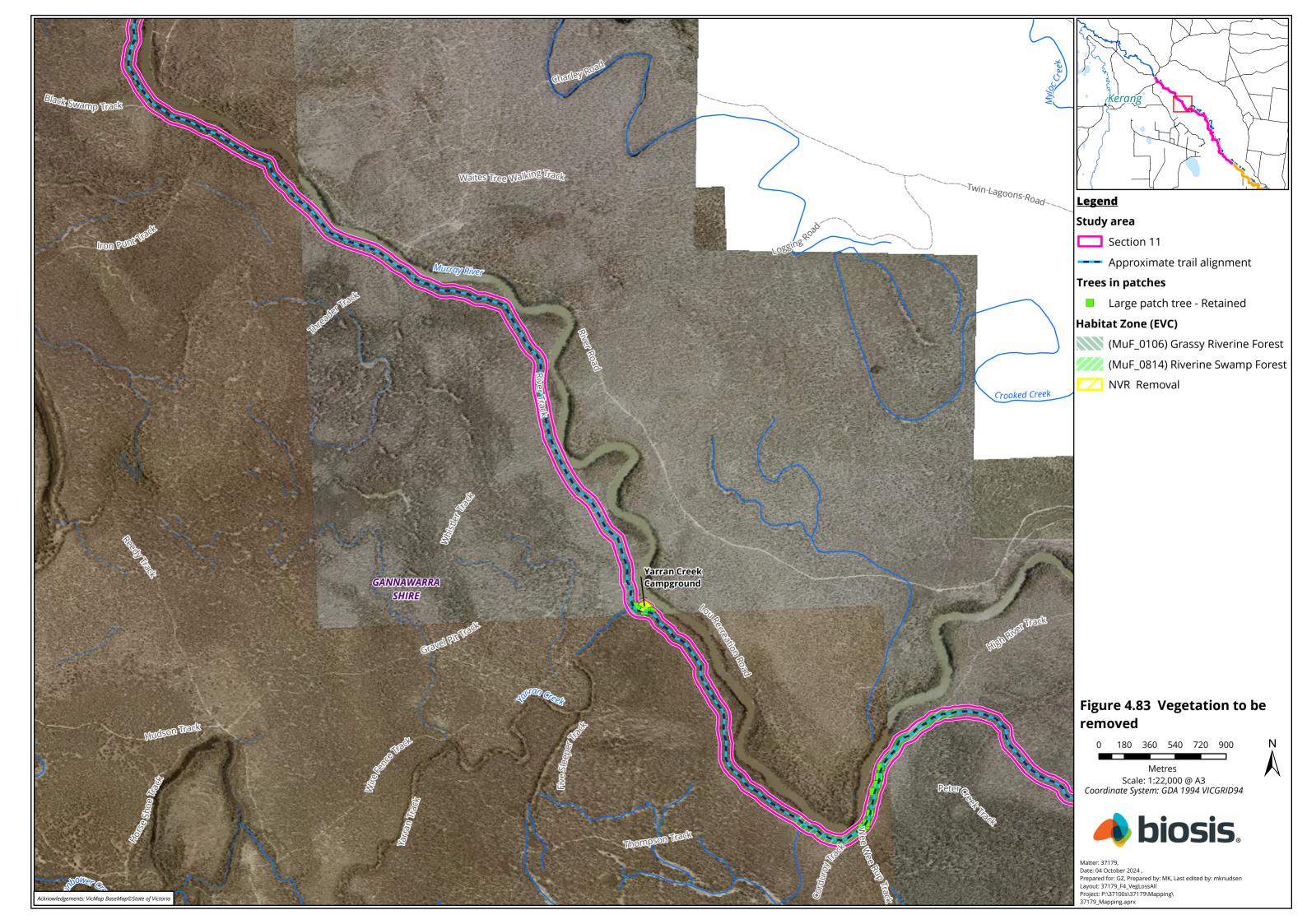


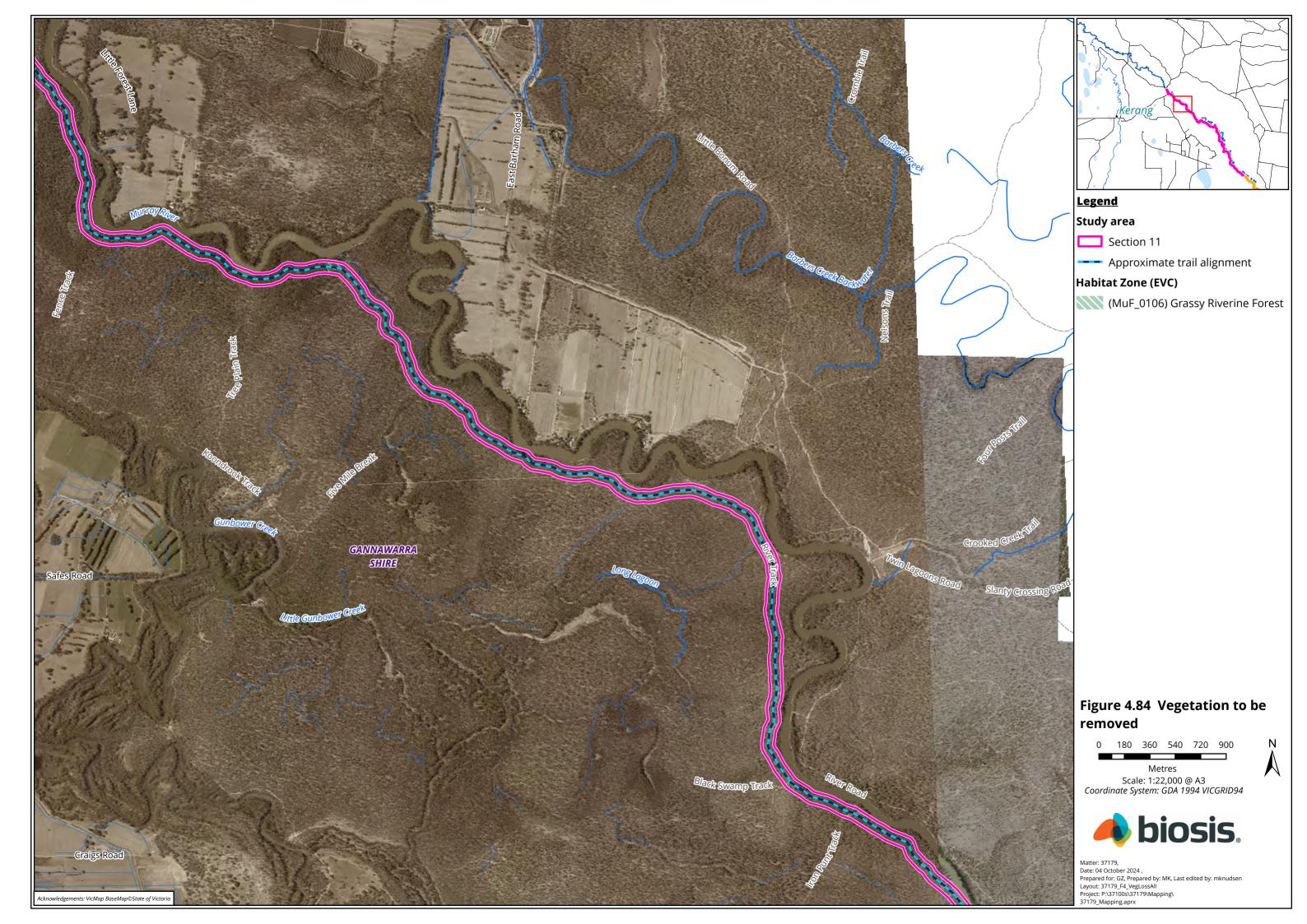
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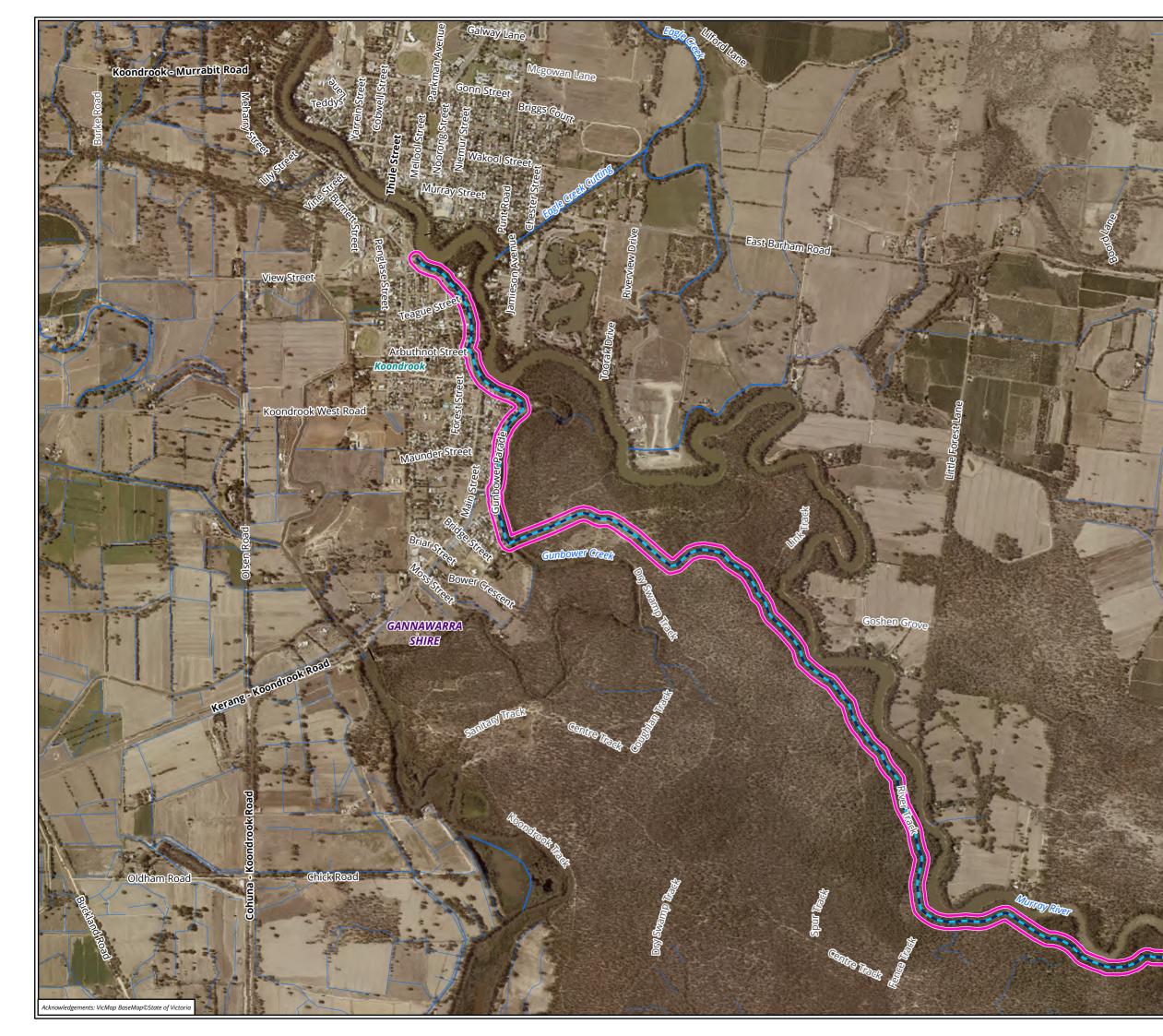


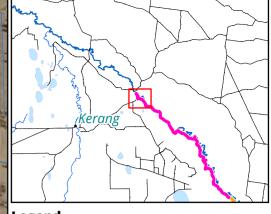
Metres Scale: 1:3,000 @ A3 Coordinate System: GDA 1994 VICGRID94











Study area

Section 11

Approximate trail alignment

Habitat Zone (EVC)

(MuF_0106) Grassy Riverine Forest



0 180 360 540 720 900



Metres Scale: 1:22,000 @ A3 Coordinate System: GDA 1994 VICGRID94





Appendix 2 Targeted survey methods

Appendix 2.1 Terrestrial fauna survey methods

Sloane's Froglet and nocturnal mammals

Potential habitat for the EPBC Act listed Sloane's Froglet was identified along Section 8, 10 and 11 during the August 2022 general fauna assessment. Additional sites were identified using satellite imagery for suitable Sloane's Froglet habitat to assess the search area for potential populations. The targeted survey was undertaken between 22 to 25 August 2022. Suitable Sloane's Froglet habitat was assessed during the day, and survey points were established in habitat to be targeted during nocturnal surveys. Suitable habitat included permanent or semi-permanent pools, lagoons, wetlands and seasonally wet drainage lines adjacent to the trail alignment and in the search area.

Reference populations at the Wangaratta Common Nature Conservation Reserve (122 kilometres south-east of the study area) were visited the week prior to this survey. The species was also noted to be calling at Corowa (NSW) and Rutherglen (Victoria) reference sites during mid to late August 2022. This ensured conditions were considered optimal for survey with male Sloane's Froglet active and calling. Weather conditions on all nights of targeted survey were considered favourable (Table 11).

Survey Night	Date	Section assessed	Start time	Temperature at time of survey	Daily minimum temperature	Daily maximum temperature	Rainfall last 72 hours (mm)	Sunset time
1	22 August 2022	8	1838	4.1°C	5.1°C	17.7ºC	0.4	1752
2	23 August 2022	8	1830	10.2°C	4.1°C	12.6°C	13.0	1753
3	24 August 2022	10	1947	12.8°C	1.8°C	12.7ºC	13.0	1755
4	25 August 2022	10, 11	2036	11.5°C	6.2°C	16.3°C	12.8	1756

Table 11Weather data during Sloane's Froglet survey (Kyabram - station 080091, courtesy of Bureau
of Meteorology)

Survey for Sloane's Froglet included observers listening for calls and scanning the area using torches to detect frogs within the transect area over a period of four hours each night. Call playback was also utilised wherever suitable habitat was encountered and included a quiet listening period followed by call playback in accordance with relevant survey guidelines (e.g. Knight 2013). Call playback and listening locations are located in Figure 3.

The surveys were undertaken in August 2022 in order to coincide with the Sloane's Froglet breeding season when males would be making advertising calls. Two observers surveyed sites identified during the day as suitable habitat along Section 10 and within the search area, such as drains, wetlands, permanent or semi-



permanent pools and soaks (Figure 3). At each location, visual encounter searches (Crump & Scott 1994) were undertaken for frogs perching on in-stream or fringing vegetation, logs, in wet soil cracks and on exposed banks. Nocturnal searches were undertaken using LED headlamps.

Nocturnal listening surveys were also undertaken at each site. At each listening point, two observers spent at least 10 minutes listening for calling frogs. Where no Sloane's Froglet were heard after 10 minutes, call play back was used to elicit a response for a further two minutes.

Measures to reduce the risk of spreading infectious pathogens such as chytrid fungus between sites were implemented where required (DECC 2008).

During the targeted frog survey opportunistic nocturnal spotlighting was also undertaken for arboreal mammals. These surveys were undertaken with LED headtorches and Olights.

All frog and nocturnal surveys were undertaken by Wyn Russell and Jack Fursdon from Biosis.



Appendix 3 Flora

Abbreviations and symbols:

Code	Meaning	Reference
National listi		
EX	Extinct	
CR	Critically endangered	
EN	Endangered	Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
VU	Vulnerable	
PMST	Protected Matters Search Tool	
State listings		
x	Extinct	
cr	Critically endangered	
е	Endangered	
v	Vulnerable	Victorian <i>Flora and Fauna Guarantee Act 1988</i> (FFG Act)
t	Threatened	
Р	Protected (public land only)	
RU	Restricted Use	
Weed status	(CaLP Act)	
SP	State prohibited species	
RP	Regionally prohibited species	Victorian Catchment and Land Protection Act 1994
RC	Regionally controlled species	(CaLP Act)
R	Restricted species	
Other		
#	Native species outside its natural range	Victorian Biodiversity Atlas (VBA)



Examples of criteria for determining the likelihood of occurrence for threatened species as a guide for writing rationales are provided below. Within a likelihood category, at least one criterion must be met for a species to be considered to have that likelihood. Note that likelihood assessments do not apply to unassessed (i.e. as is) areas of the study area

Likelihood of occurrence	Potential criteria for likely occurrence in assessment corridor
Recorded	• Species recorded in the assessment corridor during the field assessment.
High	 Assessment corridor is within species' known distributional range For terrestrial species, sufficient good quality habitat is present within the assessment corridor For aquatic species, sufficient good quality habitat is present in connected waterbodies in close proximity to the assessment corridor Species has been recently recorded within search area (i.e. since 2000).
Medium	 For terrestrial species, suitable habitat is present within the assessment corridor however habitat is somewhat limited in its capacity to support the species due to extent, quality or isolation For aquatic species, some suitable habitat is present in connected waterbodies in close proximity to the assessment corridor, however habitat is limited in its capacity to support the species due to extent, quality or isolation Species has been recorded within search area or from the relevant catchment.
Low	 For obvious woody or perennial species, assessment corridor is within species' known distributional range however the species was not recorded during field assessment Habitat within the assessment corridor is marginal in quality and/or extent.
Negligible	 Assessment corridor is outside species' known distributional range For terrestrial species, suitable habitat for the species is not present in assessment corridor For aquatic species, habitat is not present in connected waterbodies in close proximity to the assessment corridor. Species considered to be extinct at a regional or state level.



Appendix 3.1 Flora species recorded from the assessment corridor

Status	Scientific name	Common name
Indiger	ous species	
RU	Acacia acinacea s.l.	Gold-dust Wattle
e, P, v	Acacia ausfeldii	Ausfeld's Wattle
	Acacia dealbata	Silver Wattle
	Acacia implexa	Lightwood
RU	Acacia montana	Mallee Wattle
cr, P, v	Acacia oswaldii	Umbrella Wattle
RU	Acacia pycnantha	Golden Wattle
RU	Acacia salicina	Willow Wattle
RU	Acacia stenophylla	Eumong
RU	Acacia verniciflua s.l.	Varnish Wattle
	Acaena novae-zelandiae	Bidgee-widgee
cr, P, e	Allocasuarina luehmannii	Buloke
	Alternanthera denticulata s.l.	Lesser Joyweed
	Alternanthera spp.	Joyweed
	Amphibromus nervosus	Common Swamp Wallaby-grass
	Amphibromus spp.	Swamp Wallaby-grass
	Amyema miquelii	Box Mistletoe
	Amyema pendula	Drooping Mistletoe
	Amyema quandang var. quandang	Grey Mistletoe
	Amyema spp.	Mistletoe
	Anthosachne scabra s.l.	Common Wheat-grass
	Aphanes australiana	Australian Piert
	Arthropodium milleflorum s.l.	Pale Vanilla-lily
	Arthropodium spp. (s.s.	Vanilla Lily
	Asperula conferta	Common Woodruff
	Asteraceae spp.	Composite
	Atriplex semibaccata	Berry Saltbush
	Austrostipa bigeniculata	Kneed Spear-grass
	Austrostipa scabra	Rough Spear-grass
	Austrostipa spp.	Spear Grass
RU	Azolla pinnata	Ferny Azolla
RU	Azolla spp.	Azolla
	Boraginaceae spp.	Boragid
	Bothriochloa macra	Red-leg Grass
	Brachychiton populneus subsp. populneus	Kurrajong
RU	Brachyscome lineariloba	Hard-head Daisy
RU	Brachyscome paludicola	Woodland Swamp-daisy
RU	Brachyscome spp.	Daisy

Table 12 Flora species recorded from the assessment corridor (Sections 8-11)



Status	Scientific name	Common name
	<i>Callitriche</i> spp.	Water Starwort
	Calocephalus citreus	Lemon Beauty-heads
	Calocephalus sonderi	Pale Beauty-heads
RU	Calotis scabiosifolia	Rough Burr-daisy
RU	Calotis scapigera	Tufted Burr-daisy
RU	Calotis spp.	Burr Daisy
	Cardamine spp.	Bitter Cress
	Carex appressa	Tall Sedge
	Carex inversa	Knob Sedge
	Carex tereticaulis	Poong'ort
	Cassinia aculeata subsp. aculeata	Common Cassinia
	Cassinia sifton	Drooping Cassinia
	Cassinia spp.	Cassinia
	Centipeda cunninghamii	Common Sneezeweed
	Chenopodiaceae spp.	Chenopod
	Chenopodium desertorum	Frosted Goosefoot
	Chloris truncata	Windmill Grass
RU	Chrysocephalum apiculatum s.l.	Common Everlasting
	Cotula australis	Common Cotula
RU	Craspedia spp.	Billy Buttons
	Crassula decumbens var. decumbens	Spreading Crassula
	Crassula sieberiana s.l.	Sieber Crassula
	Crassula spp.	Crassula
	Cymbonotus preissianus	Austral Bear's-ear
k	Cynodon dactylon var. pulchellus	Native Couch
	Cyperus spp.	Flat Sedge
	Daucus glochidiatus	Australian Carrot
	Dianella revoluta s.l.	Black-anther Flax-lily
v	Dianella sp. aff. longifolia (Riverina)	Pale Flax-lily
	Dianella spp.	Flax Lily
cr, v, P	Dianella tarda	Late-flower Flax-lily
	Dichondra repens	Kidney-weed
	Dillwynia cinerascens s.l.	Grey Parrot-pea
	Dillwynia phylicoides	Small-leaf Parrot-pea
	Dillwynia spp.	Parrot Pea
	Dodonaea viscosa	Sticky Hop-bush
	Duma florulenta	Tangled Lignum
	Dysphania pumilio	Clammy Goosefoot
	Eclipta platyglossa subsp. platyglossa	Yellow Twin-heads
	Einadia hastata	Saloop
	Einadia nutans	Nodding Saltbush



Status	Scientific name	Common name
	Eleocharis acuta	Common Spike-sedge
	Eleocharis spp.	Spike Sedge
	Enchylaena tomentosa var. tomentosa	Ruby Saltbush
	Enteropogon acicularis	Spider Grass
	Eragrostis brownii	Common Love-grass
	Eragrostis spp.	Love Grass
RU	Eremophila deserti	Turkey Bush
RU	Eremophila longifolia	Berrigan
RU	Eremophila spp.	Emu Bush
	Erodium spp.	Heron's Bill
	Eryngium ovinum	Blue Devil
	Eucalyptus camaldulensis	River Red-gum
	Eucalyptus camaldulensis subsp. camaldulensis	River Red-gum
	Eucalyptus largiflorens	Black Box
	Eucalyptus melliodora	Yellow Box
	Eucalyptus microcarpa	Grey Box
	Euchiton japonicus s.l.	Clustered/Creeping Cudweed
	Euchiton spp.	Cudweed
	Euphorbia dallachyana	Flat Spurge
	Eutaxia microphylla	Common Eutaxia
	Eutaxia microphylla var. microphylla	Common Eutaxia
	Exocarpos aphyllus	Leafless Ballart
	Exocarpos cupressiformis	Cherry Ballart
	Exocarpos strictus	Pale-fruit Ballart
	Geranium spp.	Crane's Bill
	Glycine clandestina	Twining Glycine
	Goodenia gracilis	Slender Goodenia
	Goodenia spp.	Goodenia
	Hackelia suaveolens	Sweet Hound's-tongue
	Haloragis heterophylla	Varied Raspwort
	Juncus australis	Austral Rush
	Juncus bufonius	Toad Rush
	Juncus flavidus	Gold Rush
	Juncus ingens	Giant Rush
	Juncus spp.	Rush
	Juncus subsecundus	Finger Rush
	Lagenophora gunniana	Coarse Bottle-daisy
	Lagenophora spp.	Bottle Daisy
	Laphangium luteoalbum	Jersey Cudweed
	<i>Lepidium</i> spp.	Peppercress
	Leptorhynchos spp.	Buttons



Status	Scientific name	Common name
	Leptorhynchos squamatus	Scaly Buttons
	Linum marginale	Native Flax
	Lobelia concolor	Poison Pratia
	Lobelia pratioides	Poison Lobelia
	Lomandra filiformis	Wattle Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
	<i>Lycium</i> spp.	Box Thorn
	Lythrum hyssopifolia	Small Loosestrife
	<i>Lythrum</i> spp.	Loosestrife
	Maireana decalvans s.l.	Black Cotton-bush
	Maireana enchylaenoides	Wingless Bluebush
	Maireana spp.	Bluebush
RU	Marsilea costulifera	Narrow-leaf Nardoo
RU	Marsilea drummondii	Common Nardoo
RU	Marsilea spp.	Nardoo
	Melaleuca decussata	Totem-poles
	<i>Melaleuca</i> spp.	Honey-myrtle
	Mentha australis	River Mint
	<i>Mentha</i> spp.	Mint
	Microlaena stipoides var. stipoides	Weeping Grass
	Muehlenbeckia spp.	Lignum
	Muellerina eucalyptoides	Creeping Mistletoe
	Myoporum insulare	Common Boobialla
e, P, r	Myoporum montanum	Waterbush
	<i>Myoporum</i> spp.	Myoporum
	<i>Myosotis</i> spp.	Forget-me-not
	<i>Myriophyllum</i> spp.	Water Milfoil
RU	Olearia pimeleoides	Pimelea Daisy-bush
RU	Olearia spp.	Daisy Bush
	Oxalis perennans	Grassland Wood-sorrel
	Parietaria debilis s.l.	Shade Pellitory
	Paspalidium jubiflorum	Warrego Summer-grass
	Paspalidium spp.	Panic Grass
	Persicaria decipiens	Slender Knotweed
	Persicaria prostrata	Creeping Knotweed
	Phragmites australis	Common Reed
	Pimelea curviflora s.l.	Curved Rice-flower
	Pittosporum undulatum	Sweet Pittosporum
	Plantago spp.	Plantain
	Plantago varia	Variable Plantain
	Poa fordeana	Forde Poa



Status	Scientific name	Common name
	Poa labillardierei	Common Tussock-grass
	Pultenaea spp.	Bush-pea
	Ranunculus pumilio	Ferny Small-flower Buttercup
	Ranunculus sessiliflorus	Annual Buttercup
	Ranunculus spp.	Buttercup
	Rhagodia spinescens	Hedge Saltbush
RU	Rhodanthe corymbiflora	Paper Sunray
	Rorippa spp.	Bitter Cress
	Rumex brownii	Slender Dock
	Rumex spp.	Dock
	Rytidosperma carphoides	Short Wallaby-grass
	Rytidosperma duttonianum	Brown-back Wallaby-grass
	Rytidosperma fulvum	Copper-awned Wallaby-grass
	Rytidosperma racemosum var. racemosum	Slender Wallaby-grass
	Rytidosperma setaceum	Bristly Wallaby-grass
	Rytidosperma spp.	Wallaby Grass
	Salsola tragus	Prickly Saltwort
	Sclerolaena diacantha	Grey Copperburr
	Sclerolaena muricata	Black Roly-poly
k	Sclerolaena muricata var. muricata	Black Roly-poly
	Sclerolaena muricata var. villosa	Grey Roly-poly
	Sclerolaena spp.	Copperburr
	Senecio glossanthus s.l.	Slender Groundsel
e, P, v	Senecio longicollaris	Riverina Fireweed
	Senecio phelleus	Stony Fireweed
	Senecio quadridentatus	Cotton Fireweed
	Senecio runcinifolius	Tall Fireweed
	Senecio spp.	Groundsel
	Senna artemisioides s.l.	Desert Cassia
	Senna spp.	Cassia
	Sida corrugata	Variable Sida
	Sigesbeckia orientalis subsp. orientalis	Indian Weed
	Solanum laciniatum	Large Kangaroo Apple
	Solenogyne dominii	Smooth Solenogyne
	Solenogyne gunnii	Hairy Solenogyne
	Solenogyne spp.	Solenogyne
	Spergularia spp.	Sand Spurrey
	Sporobolus spp.	Rat-tail Grass
	Stackhousia monogyna s.l.	Creamy Stackhousia
	Stellaria angustifolia s.l.	Swamp starwort
	Teucrium racemosum s.l.	Grey Germander



Statu	s Scientific name	Common name
Jucu	Tricoryne elatior	Yellow Rush-lily
	Typha orientalis	Broad-leaf Cumbungi
	Typha spp.	Bulrush
	Vittadinia cuneata	Fuzzy New Holland Daisy
	Vittadinia gracilis	Woolly New Holland Daisy
	Vittadinia spp.	New Holland Daisy
	Wahlenbergia fluminalis	River Bluebell
	Wahlenbergia spp.	Bluebell
RU	Xerochrysum bracteatum	Golden Everlasting
RU	Xerochrysum viscosum	Shiny Everlasting
	duced species	
merot	Acacia baileyana	Cootamundra Wattle
	Acacia podalyriifolia	Queensland Silver Wattle
	Acetosella vulgaris	Sheep Sorrel
	Agapanthus praecox	Agapanthus
	Aira elegantissima	Delicate Hair-grass
	Aizoon pubescens	Galenia
	Aloe spp.	Aloe
RC	Amsinckia intermedia	Common Fiddle-neck
inc.	Arctotheca calendula	Cape Weed
R	Asparagus asparagoides	Bridal Creeper
R	Asparagus spp.	Asparagus
IX	Avena barbata	Bearded Oat
	Avena fatua	Wild Oat
	Avena spp.	Oat
	Brassica X napus	Rape
	Bromus catharticus	Prairie Grass
	Bromus diandrus	Great Brome
	Bromus hordeaceus	Soft Brome
	Capsella bursa-pastoris	Shepherd's Purse
	Cenchrus clandestinus	Kikuyu
	Cerastium glomeratum s.l.	Common Mouse-ear Chickweed
	Cerastium spp.	Mouse-ear Chickweed
	Cerastium vulgare	Common Mouse-ear Chickweed
	Chenopodium album	Fat Hen
	Chrysanthemoides monilifera subsp. monilifera	African Boneseed
R	Cirsium vulgare	Spear Thistle
R	Conium maculatum	Hemlock
	Cotoneaster spp.	Cotoneaster
	Cotula bipinnata	Ferny Cotula
	Cucumis myriocarpus subsp. myriocarpus	Paddy Melon
		r uuuy meion



Status	Scientific name	Common name
	Cyperus eragrostis	Drain Flat-sedge
	Dactylis glomerata	Cocksfoot
	Dimorphotheca spp.	Cape Marigold
RC	Echium plantagineum	Paterson's Curse
	Echium spp.	Bugloss
	Ehrharta erecta	Panic Veldt-grass
	Ehrharta longiflora	Annual Veldt-grass
	Erigeron bonariensis	Flaxleaf Fleabane
	Erodium botrys	Big Heron's-bill
	Eucalyptus cladocalyx	Sugar Gum
	Fraxinus angustifolia	Desert Ash
	Fumaria bastardii	Bastard's Fumitory
	Fumaria capreolata	White Fumitory
	Fumaria parviflora var. parviflora	Small-flower Fumitory
	Galium aparine	Cleavers
	Gamochaeta spp.	American Cudweed
	Gazania spp.	Gazania
R	Genista monspessulana	Montpellier Broom
	Grevillea robusta	Silky Oak
	Helminthotheca echioides	Ox-tongue
	Hordeum spp.	Barley Grass
RC	Hypericum perforatum subsp. veronense	St John's Wort
	Hypochaeris glabra	Smooth Cat's-ear
	Hypochaeris radicata	Flatweed
	Lactuca serriola	Prickly Lettuce
	Lepidium africanum	Common Peppercress
	Leucanthemum spp.	Daisy
	Lolium rigidum	Wimmera Rye-grass
	Lotus uliginosus	Greater Bird's-foot Trefoil
RC	Lycium ferocissimum	African Box-thorn
	Malva parviflora	Small-flower Mallow
RC	Marrubium vulgare	Horehound
	Medicago polymorpha	Burr Medic
	Medicago spp.	Medic
	Mentha pulegium	Pennyroyal
	Mesembryanthemum nodiflorum	Small Ice-plant
	Modiola caroliniana	Red-flower Mallow
	Olea europaea	Olive
	Olea europaea subsp. cuspidata	African Olive
R	<i>Opuntia</i> spp.	Prickly Pear
R	Oxalis pes-caprae	Soursob



Status	Scientific name	Common name
	Parietaria judaica	Wall Pellitory
	Paspalum distichum	Water Couch
	Phalaris aquatica	Toowoomba Canary-grass
	Phoenix canariensis	Canary Island Date-palm
	Phoenix spp.	Date Palm
	Phyla nodiflora var. minor	Fog-fruit
	Pinus radiata	Radiata Pine
	Plantago lanceolata	Ribwort
	Poa annua s.l.	Annual Meadow-grass
	Poa bulbosa	Bulbous Meadow-grass
	Polygonum aviculare s.l.	Prostrate Knotweed
	Romulea rosea	Onion Grass
	Rorippa palustris	Marsh Yellow-cress
RC	Rubus anglocandicans	Common Blackberry
	Rumex conglomeratus	Clustered Dock
	Rumex crispus	Curled Dock
	Salvia verbenaca	Wild Sage
	Schinus molle	Pepper Tree
R	Silybum marianum	Variegated Thistle
	Sisymbrium erysimoides	Smooth Mustard
	Sisymbrium spp.	Mustard
	Solanum nigrum s.l.	Black Nightshade
	Solanum nigrum s.s.	Black Nightshade
	Solanum pseudocapsicum	Madeira Winter-cherry
	Sonchus asper s.s.	Rough Sow-thistle
	Sonchus oleraceus	Common Sow-thistle
	Stellaria media	Chickweed
	Trifolium angustifolium var. angustifolium	Narrow-leaf Clover
	Trifolium arvense var. arvense	Hare's-foot Clover
	Trifolium dubium	Suckling Clover
	Trifolium ornithopodioides	Birdsfoot Clover
	Trifolium repens var. repens	White Clover
	Trifolium subterraneum	Subterranean Clover
	Urtica urens	Small Nettle
	Verbena bonariensis s.l.	Purple-top Verbena
	Verbena bonariensis var. conglomerata	Purple Top
	Vicia sativa	Common Vetch
	<i>Vicia</i> spp.	Vetch
	Vinca major	Blue Periwinkle
	Vulpia bromoides	Squirrel-tail Fescue
RC	Xanthium spinosum	Bathurst Burr



Appendix 3.2 Listed flora species

The following table includes threatened flora species that have potential to occur within the study area, sourced from the VBA and PMST (accessed on 20 March 2024). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST predicts the species has potential to occur. Some flora habitat descriptions are reproduced from the Royal Botanic Gardens Victoria (RBGV 2024) with permission.

Scientific name	Common name	Conservation status		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
National significance								
Amphibromus fluitans	River Swamp Wallaby- grass	VU		2018	PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	High	Previous records in the search area including near the Dharnya Centre, multiple records throughout Barmah National Park, a record from 2015 in Gunbower State Forest and in Pericoota State Forest in 2019. There is extensive suitable habitat in the assessment corridor for this species, particularly in seasonally inundated depressions and channels.

Table 13 Threatened flora species recorded or predicted to occur within 5 km of the study area



Scientific name	Common name	Conservation status		Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Austrostipa metatoris	Austrostipa metatoris	VU			PMST	Grows in sandy areas of the Murray Valley with sandhills, sandridges, undulating plains and flat open mallee country, with red to red- brown clay-loam to sandy- loam soils.	Negligible	There are no previous records for this species in the search area. There is no suitable habitat for this species in the assessment corridor. The distribution of this species is mainly north-west of Swan Hill, north of the study area in NSW.
Austrostipa wakoolica	Austrostipa wakoolica	EN			PMST	Confined to the floodplains of the Murray River tributaries.	Low	Species not known from Victoria.
Brachyscome muelleroides	Mueller Daisy	VU	e	1979	PMST	Floodplains of the Murray River and its tributaries.	Medium	Extensive suitable habitat within the assessment corridor, however records for this species generally occur further east in tributaries of the Murray River. Previously recorded on Sand Ridge Track near the Dharnya Centre (1979), however this record has low accuracy (4km). This species could occur in River Red-gum dominated forests and woodlands.
Lepidium aschersonii	Spiny Peppercress	VU	е		PMST	Heavy clay soils near salt lakes on the volcanic plains; disjunct records near Lake Omeo.	Negligible	No previous records within the search area. There is no suitable salt lake habitat within the assessment corridor. The distribution for this species



Scientific name	Common name	Conservation status		Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
								is mostly further to the south in Victoria.
Lepidium monoplocoides	Winged Peppercress	EN	e	2015	PMST	A variety of grassland, wetland and floodplain communities on finely textured soils; sometimes in exposed, sparsely vegetated sites, on dry and eroded clay scolds.	Medium	There are previous records for this species in the search area, including in Gunbower State Forest to the west of the study area and also Barmah National Park. This species could occur within areas of floodplain habitat, derived grasslands and sparsely vegetated habitats within the assessment corridor. However some areas with suitable habitat have been degraded by weed invasion and disturbance.
Maireana cheelii	Chariot Wheels	VU	e		PMST	Sparsely vegetated chenopod shrubland and grassland communities, often on heavy clay soils subject to winter waterlogging.	Low	No previous records within the search area. While clay soils subject to waterlogging are extensive within some sections of the assessment corridor, there is no sparsely vegetated chenopod shrubland or grassland in the study area, meaning limited suitable habitat for this species.



Scientific name	Common name	Conservat	tion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Myriophyllum porcatum	Ridged Water-milfoil	VU	cr	2010	PMST	Ephemeral wetlands, rock pools, farm dams and watercourse shallows.	Medium	Suitable habitat in smaller tributaries of the Murray River and adjacent floodplain wetlands along some sections of the study area.
Pimelea spinescens subsp. spinescens	Spiny Rice- flower	CR	cr	2019	PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	Low	This species has no previous records in the search area. There is limited derived grassland habitat for this species within the assessment corridor, and the distribution for this species is mostly south of the study area in Torrumbarry area.
Pterostylis cheraphila	Floodplain Rustyhood	VU	e	2015	PMST	Bare, open ground in floodplain Black Box Black Box woodlands.	Medium	This species is rare and its distribution largely is further south-west of the study area. However, there are records in the search area from 2015 that occur in the Gunbower State Forest adjacent to the study area. There is extensive tracts of Chenopod Woodland, with canopy dominated by Black Box in the study area. In some areas this woodland has low litter cover and areas of bare



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	ccurrence ranking
		EPBC	FFG	database record			in study area	
								ground where this species could grow.
Pterostylis despectans	Lowly Greenhood	EN	e		PMST	Eucalypt woodlands or open forests with sparse ground cover and litter layer, in flat or undulating areas near Maryborough.	Low	Extensive tracts of suitable Grey Box eucalypt woodland habitat in some sections of the assessment corridor, however there are no previous records and the species known distribution is further south in Bendigo-Ballarat- Horsham area.
Sclerolaena napiformis	Turnip Copperburr	EN	cr	2018	PMST	Native grassland and Box/Buloke woodlands, on clay-loam soil, that are infrequently grazed or cultivated.	Medium	This species has recent previous records within the search area of Section 9, and part of the distribution of this species is south of the study area in the Echuca region. There is some suitable habitat for the species within moderate to high quality Plains Woodland EVC 803 in Sections 9 and 10.



Scientific name	Common name	Conserva	tion status		occurrence	Rationale for likelihood ranking		
		EPBC	FFG	database record			in study area	
Senecio behrianus	Stiff Groundsel	EN	cr	2008	PMST	Specific habitat requirements of this species are poorly understood, but they are known to occur in seasonally inundated habitats on clay soils.	Medium	This species has previous records within the search area including records near Koondrook, Barham and Gunbower. There is extensive habitat for this species in the form of heavy, winter-wet and inundated clay soils across Sections 10 and 11, but this habitat is limited in Sections 8 and 9. This species is rare in Victoria, however the distribution of the species is known for Barham and Gunbower area, adjacent to the study area.
Senecio macrocarpus	Large- headed Fireweed	VU	cr		PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	Low	Some suitable habitat is present in the assessment corridor in the form of woodlands with heavy soils subject to seasonal inundation. However, no records within or in close proximity to the study area.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking This species has previous records within the search area, although they are not recent. This species could co-occur with other Swainsona species in the derived grasslands and suitable seasonally inundated habitat along some sections of the assessment corridor in Section 10. This species has previous records within the search area of Section 9 and is known from Echuca area.
		EPBC	FFG	database record			in study area	
Swainsona murrayana	Slender Darling-pea	VU	e	1999	PMST	Around lakes and on flats that are subject to seasonal inundation.	Medium	records within the search area, although they are not recent. This species could co-occur with other Swainsona species in the derived grasslands and suitable seasonally inundated habitat along some sections of the assessment corridor in
Swainsona plagiotropis	Red Swainson- pea	VU	е	2014	PMST	Northern Plains Grassland communities on clay loam and clay soils, typically in areas that are seasonally inundated.	Medium	records within the search area of Section 9 and is



Scientific name	Common name	Conserva	tion status	Most recent database	Other records	occurrence ranking	Rationale for likelihood ranking	
		EPBC	FFG	record			in study area	
State significance		_			,			
Acacia ausfeldii	Ausfeld's Wattle		е	2002		Dry forest and Mallee communities in north- central Victoria.	Recorded	The species was recorded during the site assessment of Section 10. There is some suitable dry Plains Woodland EVC 803 habitat in the assessment corridor of Section 9, however it is an obvious shrubby species that was not recorded during the site assessment in that Section.
Acacia homalophylla	Yarran Wattle		cr	1990		Belah Casuarina pauper, Rosewood Alectryon spp. and Box communities occurring on solonized brown earths.	Low	This species has previous records in the search area, and has suitable habitat in Plains Woodland EVC 803 and Chenopod Woodland EVC 103 communities, however is an obvious shrubby species that was not recorded during the site assessments.
Acacia oswaldii	Umbrella Wattle		cr	2008		Mainly in calcareous sands or loam.	Recorded	This species was recorded during the site assessment in Section 11. This species has previous records in the search area. There is suitable habitat within the Plains Woodland EVC 803 and in the northern end of Section 10 near Torrumbarry and Gunbower.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	urrence ranking
		EPBC	FFG	database record			in study area	
Acacia pendula	Weeping Myall		cr	2011		Floodplains on fertile alluvial clay and red earth soils.	Low	This species has previous records in the search area, including north-west of Echuca. This species has suitable floodplain and clay soil habitat within the assessment corridor, however is an obvious shrubby species that was not recorded during the site assessment.
Allocasuarina luehmannii	Buloke		cr	2018		Non-calcareous soils in drier areas on slopes and plains; often in woodlands associated with Grey Box.	Recorded	This species was recorded in the Section 9 and 10 site assessments and has suitable habitat within the study area in drier areas of EVC 803 Plains Woodland, dominated by Grey Box. However, it is an obvious woody species that was not recorded in Section 8 or 11 during the site assessment.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	This species has previous records in the search area near Echuca from 1971. There is some suitable floodplain habitat for this species along the assessment corridor, particularly in Section 10. However, this species has a low likelihood of occurrence due to minimal records within the search area and these records and those in Kerang are isolated from the greater landscape. Records in Barmah National Park and one record close proximity to the study area from 2017.
		EPBC	FFG	database record			in study area	
Amaranthus macrocarpus var. macrocarpus	Dwarf Amaranth		e	1971		Primarily on the floodplains of the Murray River downstream of Echuca, with an isolated record near Kerang.	Low	records in the search area near Echuca from 1971. There is some suitable floodplain habitat for this species along the assessment corridor, particularly in Section 10. However, this species has a low likelihood of occurrence due to minimal records within the search area and these records and those in Kerang are isolated from the greater
Ammannia multiflora	Jerry-jerry		е	2001		Heavy soils in wet areas of north west Victoria; sometimes growing in water.	Medium	National Park and one record close proximity to
<i>Amyema linophylla</i> subsp. <i>orientalis</i>	Buloke Mistletoe		cr	2005		Likely to occur anywhere where its host plant Buloke Allocasuarina leuhmannii is present.	High	This species has previous records in the search area, including records near Echuca. Its host plant was recorded during the site assessment in Section 9 and 10 but not in Section 8 or 11.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Austrostipa trichophylla	Spear-grass		е	2010		Scattered sites throughout VIC in Mallee and woodland formations.	Low	This species has a singular previous record in the search area for Section 10, near Gunbower. This species has some suitable habitat in the woodlands of this section's assessment corridor, however study area is not within the species core distribution.
Brachyscome chrysoglossa	Yellow- tongue Daisy		е	1999		Clay soils that are typically subject to inundation.	Medium	This species has previous records in the search area, mainly two records south of Echuca from 1992 and 1999. There is suitable inundated clay habitat in the assessment corridor, mostly within Section 10.
Callitriche umbonata	Winged Water- starwort		e	2007		Damp, periodically waterlogged sites; swamps and shallow freshwater ponds.	Medium	Records in Barmah National Park and few records in the study area. Suitable habitat in seasonally inundated and swampy areas throughout Section 8 assessment corridor.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Calotis anthemoides	Cut-leaf Burr-daisy		cr	2017		Scattered north and west of Melbourne (e.g. Sunshine, Camperdown, Moyston, Dunkeld, Numurkah regions) on heavy soils prone to waterlogging, but now rather rare due to habitat depletion.	Medium	This species has previous records in the search area, including records near Echuca and south of Gunbower. There is suitable heavy soils habitat that is seasonally inundated and prone to flooding in the assessment corridor, where this species could grow. This species may occur in less disturbed areas where habitats are more intact.
Calotis cuneifolia	Blue Burr- daisy		e	2011		Dry, rocky sites in the east, near Melbourne in open woodland, and on fertile, loam or clay soils in the north and north-west of the State.	Medium	This species has previous records in the search area including records in Gunbower National Park, near Echuca and the southern edge of the study area. This species has suitable habitat in EVC 803 Plains Woodland in the assessment corridor.
Cardamine moirensis	Riverina Bitter-cress		е	2018		Low-lying, seasonally wet areas near streams and swamps.	High	There are recent previous records of this species in the search area, including in Koondrook and Gunbower State Forest. This species has suitable habitat in the assessment corridor in the form of inundated and seasonally wet and swampy areas.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Centipeda nidiformis	Cotton Sneezeweed		e	2013		Scattered throughout the Murray Basin and around the Grampians along the margins of watercourses on clay or clay-loam soils.	Medium	There are previous records of this species in the search area, the latest from 2013. Previous records are in Gunbower State Forest and Barmah National Park. This species has suitable habitat within the assessment corridor along margins of dams, creeks and river crossings along Section 8 and 11.
Coronidium gunnianum	Pale Swamp Everlasting		cr	2018		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	High	Records in Barmah National Park and within the study area. Extensive areas of suitable habitat in the Section 8 assessment corridor, previously recorded in the vicinity of the banks of the Murray River within Barmah National Park.
Cullen parvum	Small Scurf- pea		е	2008		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	Medium	This species has recent records in the search area near Echuca at the southern end of Section 10. This species has suitable grasslands and disturbed grassy areas that it could grow in. However, Section 8 and 9 lack suitable habitat.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Cymbonotus Iawsonianus	Bear's-ear		е	2005		Woodland communities.	Medium	Species known from River Red-gum dominated forests on the Murray River, suitable habitat for this species is extensive throughout the assessment corridor of Section 8.
Cyperus bifax	Downs Nutgrass		cr	1994		Typically on heavy clay soils of floodplains; includes areas subject to heavy grazing.	Medium	Suitable habitat for this species occurs within seasonally inundated areas within the assessment corridor of Section 8.
Cyperus flaccidus	Lax Flat- sedge		е	1979		Occurring in seasonally wet sites (e.g. lake and river margins), recorded only from Mildura, Dimboola, Goroke and Cobram areas.	Medium	Although this species is rare in Victoria, suitable habitat occurs within seasonally inundated areas within the assessment corridor of Section 8.
Cyperus leptocarpus	Button Rush		е	1993		Open, damp places such as sandy stream-banks or drying lake margins.	Medium	Suitable habitat for this species occurs within seasonally inundated areas within the assessment corridor of Section 8.
Dianella tarda	Late-flower Flax-lily		cr	2011		Heavy soils in grassy woodland environments dominated by River Red- gum <i>Eucalyptus</i> <i>camaldulensis</i> and Yellow Box <i>E. melliodora</i> .	Recorded	Recorded during site assessment of Section 9. Extensive suitable habitat within the study area within River Red-gum dominated woodlands.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Digitaria ammophila	Silky Umbrella- grass		e	2000		Scattered through northern and north-western Victoria, chiefly along the Murray River floodplain.	Medium	Latest record in Barmah is from 2000, however this species is known for the Murray Floodplains in Barmah and there is extensive suitable habitat for this species in the assessment corridor of Section 8. May occur in Section 9 but species distribution is generally further west.
Digitaria divaricatissima var. divaricatissima	Umbrella Grass		e	2010		Mostly on heavier soils prone to occasional flooding.	Medium	There are previous records for this species in the search area, including records south-east of Gunbower. There is habitat that is prone to flooding and inundation in the assessment corridor of Section 10 that this species could grow in.
Enneapogon gracilis	Slender Bottle- washers		v	2010		Dry, sandy soils in the vicinity of the upper reaches of the Snowy River and its tributaries, with an isolated record near Patho in northern Victoria.	Low	This species has a previous record from 2010 in the search area. This record is however isolated from the species' distribution, which is further east. Due to this and minimal suitable habitat in the assessment corridor of Section 10, this species has a low likelihood of occurrence.



	Common name	Conserva	tion status	Most recent	Other records	Habitat description	occurrence ranking	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Eragrostis exigua	Slender Love-grass		e	2001		Extremely rare in Victoria, known by a few recent collections, e.g. from Barmah Forest and Karadoc near Red Cliffs. All specimens appear to have been collected from stream banks, a habitat consistent with its occurrences in northern parts of Australia where locally common.	Medium	Previous records in Barmah township and Barmah National Park. Suitable habitat for this species occurs within seasonally inundated areas within the assessment corridor of Section 8.
Eriochlamys squamata	Scaly Mantle		e	1998		Woodlands on clay soils.	Medium	This species has a previous record in the search area that occurs to the west of Section 10. This species has suitable habitat in the drier Grey Box woodlands in the assessment corridor of Section 10. The previous record for this species is part of a large westward population scattered throughout Terrick Terrick National Park. Section 9 has limited suitable habitat.



Scientific name			Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking		
		EPBC	FFG	database record			in study area	
Eryngium paludosum	Long Eryngium		e	1998		Heavy soils of river floodplains and lake margins.	Medium	This species has previous records from the search area; east of Gunbower adjacent to the Murray River in Gunbower National Park, near Torrumbarry Weir, South of Barmah and south-east of Echuca. This species has suitable river floodplain habitat along Section 10 and 11 and could grow on the margins of watercourses within these sections. However, the Section 9 alignment generally follows the high bank of the Murray River. As such, there is minimal suitable habitat for this species in Section 9.
Eucalyptus sideroxylon subsp. sideroxylon	Mugga		e	2005		Typically found on poor, shallow soils, including sands, gravels, ironstones and clays.	Negligible	Assessment corridor outside species' area of distribution. Database record is likely a planted individual.



Scientific name	Common name	Conservat	tion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Eucalyptus X oxypoma	Deniliquin Box		e	2005		Recorded from floodplains in northern and western Victoria.	Low	There are some records in Barmah National Park to the north and east of the study area including some in close proximity to the Sand-ridge Track in Section 8. As a hybrid between River Red-gum and Black Box it could have been overlooked during the site assessment. However, no Black Box was recorded within the Section 8 assessment corridor during the site assessment and as a rare species, it is considered to have a low likelihood of occurrence within the study area.
Gratiola pumilo	Dwarf Brooklime		e	2011		Seasonally inundated depressions, typically river flats and lake margins, on alluvial soils.	Medium	This species has previous records in Barmah National Park, Koondrook and Gunbower State Forest. This species could grow in inundated depressions, river flats and on the margins of watercourses in the assessment corridors of Section 8, 10 and 11.



Scientific name	Common name	Conservat	ion status	Most recent database	Other records	Habitat description	Likely occurrence	the assessment corridor of Section 9 however, its distribution in Victoria is generally restricted to the Mildura area. There are previous records of this species from 2005, west of Echuca. A relatively common species in central
		EPBC	FFG	record			in study area	
Leiocarpa leptolepis	Pale Plover- daisy		е	1994		Grasslands and grassy woodlands, often in disturbed areas. In Victoria, confined to one known population approximately 4km east of Mildura.	Low	grassy woodland habitat in the assessment corridor of Section 9 however, its distribution in Victoria is generally restricted to the
Maireana microphylla	Small-leaf Bluebush		e	2005		Remnant native vegetation on loamy soils in far north- central Victoria.	Medium	west of Echuca. A relatively common species in central NSW however distribution in Victoria is restricted. Extensive suitable habitat



Scientific name	Scientific name Common name		ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Minuria integerrima	Smooth Minuria		V	2013		Heavy clay and alluvial silty soils on the Murray River floodplains.	Medium	This species has multiple records in the search area, the majority of these are in Gunbower State Forest and National Park. Other less recent records are located on the southern boundaries of Barmah National Park. This species has suitable habitat in the assessment corridor in areas of the Murray River floodplains. However, in areas that lack River Red- gum floodplain forests such as Section 9, suitable habitat is more limited.
Myoporum montanum	Waterbush		е	2008		Mallee and riparian woodlands, and rocky gorges.	Recorded	This species was recorded in the study area during the site assessment of Section 11. This species has previous recent records in that search area. However, the obvious shrubby species was not recorded in other sections.
Najas tenuifolia	Water Nymph		е	2008		Billabongs or tributaries of the Murray River, in still or slow-moving waters.	Medium	This species could occur in any slow-moving or still waters including dams, inundated areas and Murray River tributaries. This species has previous records in the search area, including records in



Scientific name	ific name Common Conservation statu name	ion status	recent	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking	
		EPBC	FFG	database record			area	
								Gunbower State Forest adjacent to Section 11.



Scientific name	Common name			Most Other recent records database		Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
Nymphoides crenata	Wavy Marshwort		e	2015		Occurs in fresh, still to slow- flowing water to 1.5 m deep in swamps, lagoons, irrigation channels and streams, also frequent in temporarily inundated depressions.	High	Previous records within the search area include those throughout Barmah National Park, near Torrumbarry, Gunbower State Forest and National Park, as well as near Koondrook township. This species could occur in any slow-moving or still waters including dams, inundated areas and Murray River tributaries along the length of the assessment corridor. Some areas are less disturbed and of higher quality to accommodate this species.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Panicum laevinode	Pepper Grass		V	2008		Semi-arid shrub woodlands, acacia shrublands, arid tussock grasslands, and arid hummock grasslands.	Low	This species has been known to occur in River Red-gum forests and grassland habitat available within the study area, however there is limited suitable habitat in the study area.
Picris squarrosa	Squat Picris		e	2008		Usually found on coastal sand-dunes or in alluvial soils on river banks and floodplains, mainly at low altitudes.	Medium	This species has one previous record in the search area in Gunbower State Forest. This species' Victorian distribution is primarily along the lower Murray River and its tributaries. This species therefore has extensive tracts of suitable habitat in Section 11.
Podolepis linearifolia	Basalt Podolepis		e	1992		Grasslands and grassy woodlands.	Medium	This species has previous records in the search area and there is suitable habitat for this species across Section 9 and 10 in the form of grasslands, derived grasslands and Plains Woodland habitat.
<i>Ptilotus erubescens</i>	Hairy Tails		cr	1992		Grasslands and woodlands on relatively fertile soils.	Medium	There are minimal previous records for this species in the search area however there are extensive tracts of suitable derived grassland and



Scientific name	Common name	Conservat	ion status	Most recent database	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	record			in study area	
								woodland habitat in Section 9 and 10.
Rhodanthe stricta	Slender Sunray		e	1978		Known in Victoria from recent collections in the north-west where recorded from chenopod-dominated shrublands on the Murray River floodplain at Neds Corner Station.	Low	Two records in Barmah National Park, approximately 2 kilometres from the study area. The assessment corridor of Section 8 is dominated by River Red-gum dominated EVCs and the species is rare unless the Murray has recently flooded, therefore this species is unlikely to occur in the assessment corridor.
Rorippa eustylis	Dwarf Bitter- cress		e	2013		Restricted to scattered swamps and flood-plains near the Murray River.	Medium	This species has previous records from 2013 in the search area in Gunbower State Forest. There is suitable swamp and floodplain areas in the assessment corridor of Section 11 adjacent to the Murray River. In Section 8 and 9 suitable habitat is present however, there are no recent records and much of the vegetation is degraded by weed invasion and disturbance.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Santalum lanceolatum	Northern Sandalwood		cr	2010		Known with certainty from only 4 small populations-in dry, rocky country at Springhurst and the Warby Ranges, and near the Murray River at Boundary Bend and Torumbarry.	Low	This species has previous records in the search area and is known from the Murray River Boundary Bend and Torrumbarry. Suitable habitat occurs in the study area near these areas on drier soils, however it is an obvious shrubby species that was not recorded during the site assessment.
Senecio campylocarpus	Floodplain Fireweed		e	2008		Clay loam soils in forests and woodlands, typically in areas that are seasonally inundated.	Medium	There is suitable habitat for this species in forests, woodlands and inundated areas of the assessment corridor in Section 11, however these is a paucity of previous records.
Senecio cunninghamii var. cunninghamii	Branching Groundsel		е	2008		Heavy soils that are sometimes winter-wet, or dry rocky soils; often on embankments or escarpments.	Medium	There are records of this species within the search area. It is known to grow widely within floodplain environs and so has extensive suitable habitat within the Section 11 assessment corridor.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Senecio longicollaris	Riverina Fireweed		е	2007		Central Victoria from Porepunkah west to Barmah Forest. Grows on floodplains and by water in forest, woodland, and shrubland.	Recorded	Recorded in Section 11. This species has previous records within the search area which occur mainly around Koondrook at the northern end of the study area. There are extensive tracts of suitable floodplain, forest, woodland and shrubland habitat for this species to grow in.
Sida intricata	Twiggy Sida		e	1986		Moderately common in open areas of the far north and north-west, usually on heavier loam and clay loam soils not far from the Murray River.	Low	The distribution of this species is further north- west of the study area, and there are no recent records in the search area. There is some suitable habitat for this species in Section 11. However, the distribution for this species mostly occurs in north- west Victoria.
Swainsona adenophylla	Violet Swainson- pea		cr	1979		Known only from the Barmah Forest near Echuca where extremely rare.	Low	Two records in Barmah National Park close to the study area, however, this species is extremely rare and therefore unlikely to be in the assessment corridor.



Scientific name	Common name	Conservat	ion status	Most recent	Other records	Habitat description	Likely occurrence	Rationale for likelihood ranking
		EPBC	FFG	database record			in study area	
Swainsona behriana	Southern Swainson- pea		е	1991		Grasslands and grassy woodlands.	Medium	There is a previous record for this species in the search area south of Echuca. Suitable grassy woodland habitat in the assessment corridor of Section 10. However, less suitable woodland habitat available in Section 9 due to historic disturbance and weed invasion.
Swainsona microphylla	Small-leaf Swainson- pea		е	1903		Predominately on light soils of sandhills and sandplains.	Low	This species has previous records in the search area from 1903 near Echuca. The species occurs in sandhills and sandplain, habitat which is not present in the assessment corridor.
Swainsona phacoides	Dwarf Swainson- pea		е	1770		Scattered in seasonally inundated habitats along the Murray Valley downstream from Echuca.	Low	This species has a single previous record from 1770 from the search area, south-east of Koondrook. Its distribution is mainly in north-west Victoria and only scattered records occur in the search area.



Scientific name	Common name	Conservat EPBC	tion status	Most recent database	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
Swainsona sericea	Silky Swainson- pea		e	record 2008		Grasslands and grassy woodlands.	area Medium	There are records for this species in the search area. The latest record from 2008 is just south of Echuca. This species could occur in the derived grasslands and open Plains Woodland of the assessment corridor, particularly in Section 10. In Section 9 suitable habitat is more degraded due to previous disturbance and weed invasion and as such, is less likely to support this species.
Tripogonella loliiformis	Rye Beetle- grass		е	1979		Dry sites in association with escarpments and rocky outcrops.	Negligible	No suitable habitat for this species in the assessment corridor as the species prefers drier sites and there is a lack of rocky outcrops and escarpments.
Viola betonicifolia subsp. novaguineensis	Floodplain Violet		е	2018		Norfolk Is. Uncommon in open, grassy woodland. Also occurring in Australia (central-eastern Qld) and Papua New Guinea [Flora of Australia #49]. Records also in NSW and VIC [Australia's Virtual Herbarium and FIS].	Medium	This species may occur amongst suitable floodplain communities in the assessment corridor in Section 8. There are a number of species records in the search area from 2015.



Scientific name	Common name	me l		Most Other recent records	Habitat description	Likely occurrence	Rationale for likelihood ranking	
		EPBC	FFG	database record			in study area	
Vittadinia cuneata var. hirsuta	Fuzzy New Holland Daisy		е	2018		Grasslands and woodlands on heavy clay, to clay loams and sandy loam soils.	Medium	Recent records within search area for section 9 and 10. Extensive suitable woodland habitat for this species in the assessment corridor.
Vittadinia cuneata var. morrisii	Fuzzy New Holland Daisy		е	1997		Grasslands and woodlands, often in areas of disturbance.	Medium	Extensive suitable woodland habitat for this species in the assessment corridor, however previous records are scarce and not recent.
Wahlenbergia tumidifructa	Mallee Annual- bluebell		e	2013		Sandy flats and shallow depressions, and on the black soils of the Murray River floodplain.	Low	This species is known from black-soil floodplain areas along the Murray River between Barmah and Strathmerton which is further east of the study area. This species has a previous record from the search area from 2013, which occurs in Gunbower National Park on Gunbower Island. Due to the majority of the species distribution occuring further north and east of the study area, limited black soils present across the study area, as well as limited records in the



Scientific name	Common name	name ı		Most Other recent records	Habitat description	Likely occurrence	Rationale for likelihood ranking	
			database record			in study area		
								search area, this species has a low likelihood of occurrence.



Appendix 3.3 Threatened ecological communities

The following table includes threatened ecological communities that have potential to occur within the project area, compiled with reference to characteristics of FFG Act threatened communities (DEECA 2023) and predictive output from the PMST (accessed on 20 March 2024).

Table 14	Threatened ecological	l communities predicted to occur within 5 km of the project area.
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Community Name	Conservation status	Rationale
National significance		
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Buloke not dominant within the study area.
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Recorded within the assessment corridor during the site assessment (Figure 2)
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Vegetation within the assessment corridor is not consistent with the description of this community.
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions	Critically Endangered	Key requisite species for this community not present within the assessment corridor.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Vegetation within the assessment corridor is not consistent with the description of this community.
Weeping Myall Woodlands	Endangered	Key requisite species for this community not present within the assessment corridor.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Key requisite species for this community not present within the assessment corridor.
State significance		
Northern Plains Grassland Community	Threatened	Vegetation within the study area is dominated by River Red-gum, Grey Box or Black Box and is not consistent with the description of this community
Semi-arid Shrubby Pine - Buloke Woodland Community	Threatened	Vegetation within the study area is dominated by River Red-gum, Grey Box or Black Box and is not consistent with the description of this community



Community Name	Conservation status	Rationale
Victorian Temperate Woodland Bird Community	Threatened	Suitable habitat for the bird species that make up this community is present within the study area
Lowland Riverine Fish Community	Threatened	Suitable habitat for the aquatic species that make up this community is present within the study area



Appendix 4 Fauna

Abbreviations and symbols:

Code	Meaning	Reference				
National						
EX	Extinct	Commonwealth Environment Protection and				
CR	Critically endangered	Biodiversity Conservation Act 1999 (EPBC Act)				
EN	Endangered					
VU	Vulnerable					
CD	Conservation dependent					
PMST	Protected Matters Search Tool					
State list	ings					
x	Extinct	Victorian Flora and Fauna Guarantee Act 1988				
cr	Critically endangered	(FFG Act)				
е	Endangered					
v	Vulnerable					
t	Threatened					
Р	Protected (fish only)					
Pest anir	nal status					
PS	Declared pest animal	Victorian <i>Catchment and Land Protection Act 1994</i> (CaLP Act)				
N	Declared noxious aquatic species	Victorian Fisheries Act 1995				
Other						
*	Introduced species	Victorian Biodiversity Atlas (VBA) (DELWP 2020)				
‡ ‡	New record of aquatic species for catchment					
D	Diadromous species (migrates between freshwater and saltwater during lifecycle)					
E	Euryhaline species (capable of occurring in marine and freshwater environments)					
Р	Present but abundance not recorded					



Examples of criteria for determining the likelihood of occurrence for threatened species as a guide for writing rationales have been listed below. Within a likelihood category, at least one criterion must be met for a species to be considered to have that likelihood. Note that likelihood assessments do not apply to unassessed (i.e. as is) areas of the study area.

Likelihood of occurrence	Potential criteria for likely occurrence in assessment corridor
Recorded	• Species recorded in assessment corridor during field assessment.
High	 Assessment corridor is within species' known distributional range For terrestrial species, sufficient good quality habitat is present within the assessment corridor For aquatic species, sufficient good quality habitat is present in connected waterbodies in close proximity to the assessment corridor Species has been recently recorded within search area or from the relevant catchment (i.e. since 2000).
Medium	 For terrestrial species, suitable habitat is present within the assessment corridor however habitat is somewhat limited in its capacity to support the species due to extent, quality or isolation For aquatic species, suitable habitat is present in connected waterbodies in close proximity to the assessment corridor however habitat is limited in its capacity to support the species due to extent, quality or isolation Species has been recorded within search area or from the relevant catchment.
Low	 Habitat within the assessment corridor is marginal in quality and/or extent (e.g. patches are too small or fragmented to support a viable population) No previous records within search area.
Negligible	 For terrestrial species, habitat not present in assessment corridor For aquatic species, habitat not present in connected waterbodies in close proximity to the assessment corridor Species considered to be extinct at a regional or state level No previous records within search area.
Migratory/ Nomadic	• Migratory or nomadic fauna species/individuals that may occur in the assessment corridor from time to time, but are not considered resident.



Appendix 4.1 Fauna species recorded from the assessment corridor

Table 15 Vertebrate fauna recorded from the assessment corridor (Sections 8–11)

Status	Scientific name	Common name
Indigenous species		
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill
	Acanthiza nana	Yellow Thornbill
	Acanthiza pusilla	Brown Thornbill
	Acanthiza reguloides	Buff-rumped Thornbill
	Accipiter cirrocephalus	Collared Sparrowhawk
	Accipiter fasciatus	Brown Goshawk
	Acrocephalus australis	Reed-Warbler
	Anas superciliosa	Pacific Black Duck
	Anthochaera carunculata	Red Wattlebird
	Anura spp.	unidentified frog or toad
	Artamus cinereus	Black-faced Woodswallow
	Cacatua galerita	Sulphur-crested Cockatoo
	Cacatua sanguinea	Little Corella
	Cacatua tenuirostris	Long-billed Corella
	Cacomantis flabelliformis	Fan-tailed Cuckoo
	Cacomantis pallidus	Pallid Cuckoo
	Ceyx azureus	Azure Kingfisher
	Chenonetta jubata	Australian Wood Duck
	Cincloramphus cruralis	Brown Songlark
	Circus approximans	Swamp Harrier
VU	Climacteris picumnus	Brown Treecreeper
	Colluricincla harmonica	Grey Shrike-thrush
	Coracina novaehollandiae	Black-faced Cuckoo-shrike
	Corcorax melanorhamphos	White-winged Chough
	Cormobates leucophaea	White-throated Treecreeper
	Corvus coronoides	Australian Raven
	Corvus mellori	Little Raven
	Cracticus nigrogularis	Pied Butcherbird
	Crinia parinsignifera	Eastern Sign-bearing Froglet
	Crinia signifera	Common Froglet
	Dacelo novaeguineae	Laughing Kookaburra
	Dicaeum hirundinaceum	Mistletoebird
	Dromaius novaehollandiae	Emu
	Eolophus roseicapilla	Galah
	Falcunculus frontatus	Eastern Shrike-tit
	Gallinula tenebrosa	Dusky Moorhen



Status	Scientific name	Common name
	Geopelia placida	Peaceful Dove
	Gerygone fusca	Western Gerygone
	Glossopsitta concinna	Musk Lorikeet
	Grallina cyanoleuca	Magpie-lark
	Gymnorhina tibicen	Australian Magpie
	Haliastur sphenurus	Whistling Kite
	Hirundo neoxena	Welcome Swallow
	Limnodynastes dumerilii dumerilii	Pobblebonk Frog
	Limnodynastes tasmaniensis	Spotted Marsh Frog (race unknown)
	Limnodynastes tasmaniensis NCR	Spotted Marsh Frog NCR
	Macropus giganteus	Eastern Grey Kangaroo
	Malurus cyaneus	Superb Fairy-wren
	Manorina melanocephala	Noisy Miner
	Melithreptus lunatus	White-naped Honeyeater
	Microcarbo melanoleucos	Little Pied Cormorant
	Microeca fascinans	Jacky Winter
	Milvus migrans	Black Kite
	Myiagra rubecula	Leaden Flycatcher
	Neobatrachus sudellae	Common Spadefoot Toad
	Neochmia temporalis	Red-browed Finch
	Ninox boobook	Southern Boobook
	Ocyphaps lophotes	Crested Pigeon
	Pachycephala pectoralis	Golden Whistler
	Pachycephala rufiventris	Rufous Whistler
	Pardalotus punctatus	Spotted Pardalote
	Pardalotus striatus	Striated Pardalote
	Petroica goodenovii	Red-capped Robin
	Petroica phoenicea	Flame Robin
	Phalacrocorax sulcirostris	Little Black Cormorant
	Phalacrocorax varius	Pied Cormorant
	Phaps chalcoptera	Common Bronzewing
	Phaps elegans	Brush Bronzewing
	Philemon citreogularis	Little Friarbird
	Philemon corniculatus	Noisy Friarbird
	Platycercus elegans	Crimson Rosella
	Platycercus elegans flaveolus	Yellow Rosella
	Platycercus eximius	Eastern Rosella
	Pomatostomus superciliosus	White-browed Babbler
	Porphyrio melanotus	Australasian Swamphen
	Psephotus haematonotus	Red-rumped Parrot



Status	Scientific name	Common name			
	Pseudocheirus peregrinus	Eastern Ring-tailed Possum			
	Ptilotula penicillata	White-plumed Honeyeater			
	Rhipidura albiscapa	Grey Fantail			
	Rhipidura leucophrys	Willie Wagtail			
	Sericornis frontalis	White-browed Scrubwren			
	Smicrornis brevirostris	Weebill			
VU, v	Stagonopleura guttata	Diamond Firetail			
	Strepera graculina	Pied Currawong			
	Synoicus ypsilophorus	Brown Quail			
	Tadorna tadornoides	Australian Shelduck			
	Threskiornis molucca	Australian White Ibis			
	Threskiornis spinicollis	Straw-necked Ibis			
	Trichoglossus moluccanus	Rainbow Lorikeet			
	Trichosurus vulpecula	Common Brush-tailed Possum			
	Wallabia bicolor	Black-tailed Wallaby			
Introduced species					
Ν	Cyprinus carpio	European Carp			
PS	Felis catus	Domestic Cat (feral)			
PS	Lepus europaeus	European Brown Hare			
	Sturnus vulgaris	Common Starling			
PS	Vulpes vulpes	Red Fox			



Appendix 4.2 Listed fauna species

The following table includes a list of threatened fauna species that have potential to occur within the study area, sourced from the VBA and PMST (accessed on 3 March 2024). Where years are specified for the most recent database records, these refer to records from the VBA unless otherwise specified. Where no year is specified, the PMST predicts the species has potential to occur.

Scientific name	Common name		rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking		
		EPBC	FFG				area			
National significance	National significance									
Leipoa ocellata	Malleefowl	VU	v		PMST	Low woodlands dominated by Mallee eucalypts, Callitris spp. woodlands and heathlands.	Negligible	No suitable habitat.		
Pedionomus torquatus	Plains-wanderer	CR	cr	2015	PMST	Native grassland with a sparse, open structure.	Negligible	No suitable habitat.		
Gallinago hardwickii	Latham's Snipe	VU		2004	PMST	A migrant to Australia from July to April occurring in a wide variety of permanent and ephemeral wetlands. Prefers open freshwater wetlands with nearby cover, but also recorded on the edges of creeks and rivers, river-pools and floodplains. Forages in soft mud at edge of wetlands and roosts in a variety of vegetation around wetlands including tussock grasslands, reeds and	Low	Scattered records of the species in the local area, however there is limited suitable cover within the study area. May use study area on occasion for foraging.		

 Table 16
 Threatened fauna species recorded or predicted to occur within 5 km of the study area



Scientific name	Common name	Conservation status		Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG	recoru			area	
						rushes, tea-tree scrub, woodlands and forests.		
Rostratula australis	Australian Painted-snipe	EN	cr	1975	PMST	Shallows of well-vegetated freshwater wetlands.	Low	Breeding occurs within the Murray-Darling Basin, although species prefers wetlands with robust fringing vegetation which are generally lacking across the assessment corridor. More likely to utilise larger wetland/lake systems such as Moira and Barmah lakes to the north of Section 8.
Botaurus poiciloptilus	Australasian Bittern	EN	cr	2018	PMST	Shallow freshwater and brackish wetlands with abundant emergent aquatic vegetation.	Low	Numerous records of this species from Moira and Barmah lakes to the north of Section 8, similarly to Australian Painted Snipe in that this species is more likely to be attracted to those larger, well vegetated waterbodies than the smaller riparian waterbodies in and adjacent to assessment corridor.



Scientific name	Common name		rvation itus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood rankingRare species which occurs more commonly in semi-arid and arid environments to the north.More commonly associated with semi-arid vegetation to the north and west of the study area.Known to occupy Red-gum forests within the Section 8 and 11. Given abundance of River Red-gum forest across assessment corridor, suitable habitat to support this species is present.Limited amount of suitable habitat in study area, and records from over 20 years ago scattered along the Murray River. Species may infrequently occur within the
		EPBC	FFG				area	
Falco hypoleucos	Grey Falcon	VU	V	1951	PMST	Lightly timbered plains and Acacia scrub.	Negligible	more commonly in semi-arid and arid environments to
Lophochroa leadbeateri	Major Mitchell's Cockatoo	EN	cr	1976	PMST	Mallee, mulga, treed farmland, cereal crops and Callitris woodland.	Low	with semi-arid vegetation to the north and west of the
Polytelis swainsonii	Superb Parrot	VU	е	2018	PMST	Red-gum and box-dominated forests and woodlands.	High	forests within the Section 8 and 11. Given abundance of River Red-gum forest across assessment corridor, suitable habitat to support
Neophema chrysostoma	Blue-winged Parrot	VU		1999	PMST	A range of coastal, sub- coastal and semi-arid regions throughout south-eastern Australia. Nests in tree hollows in coastal eucalypt forests and woodlands. Feeds on seeds of a range of native grasses and herbs.	Low	habitat in study area, and records from over 20 years ago scattered along the Murray River. Species may infrequently occur within the
Lathamus discolor	Swift Parrot	CR	Cr	2018	PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well-treed urban areas.	Medium	One recent known record in Echuca immediately adjacent to western boundary of Section 9, with records commonly associated with the drier forests of central



Scientific name	ientific name Common name		vation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG	Tecord			area	
								Victoria. May visit the area occasionally.
Pezoporus occidentalis	Night Parrot	EN			PMST	Low vegetation in arid and semi-arid areas dominated by <i>Triodia</i> spp., chenopod, and samphire shrublands.	Negligible	No suitable habitat, presumed regionally extinct in Victoria.
Hirundapus caudacutus	White-throated Needletail	VU	V	2001	PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	Migratory	May fly in the airspace above the study area on rare occasion but almost exclusively aerial and unlikely to be present within vegetation within assessment corridor across study area.
Pluvialis squatarola	Grey Plover	VU	V	1971		Mudflats, saltmarsh, tidal reefs and estuaries.	Low	Species more commonly associated with coastal areas.
Tringa nebularia	Common Greenshank	EN	е	2006	PMST	A variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands.	Low	More commonly associated with inland wetlands.
Calidris ferruginea	Curlew Sandpiper	CR	cr		PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	Low	Species more commonly associated with coastal areas. Can be found inland but more likely to be present in lake or wetland systems.



Scientific name Co	Common name	Consei sta	rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG				area	
Calidris acuminata	Sharp-tailed Sandpiper	VU			PMST	Prefers muddy edges of shallow fresh or brackish wetlands with inundated or emergent low vegetation. Occasionally use flooded paddocks and other ephemeral wetlands.	Low	Species more commonly associated with coastal areas. Can be found inland but more likely to be present in lake or wetland systems.
Melanodryas cucullata	Hooded Robin	EN	V	2019	PMST	Woodlands of eucalypt, Mallee, semi-cleared farmland.	Medium	Species may occasionally forage in riparian vegetation or utilise areas of Plains Woodland present throughout Section 9 to 11, though more commonly associated with Grey Box and Black Box woodlands on the outer floodplains.
Aphelocephala leucopsis	Southern Whiteface	VU		1999	PMST	Occurs in a wide range of open woodlands and shrublands, favouring sparsely treed areas with an herbaceous understorey containing grasses and/or shrubs.	Low	Species more commonly associated with drier woodland habitats. Scattered records throughout the local landscape, but most recent record is 1999.
Grantiella picta	Painted Honeyeater	VU	V	1999	PMST	Dry open woodlands and forests. Typically forages for fruit and nectar in mistletoes and in tree canopies.	Low	Patchy distribution and typically associated with drier woodland habitat in central Victoria. Low abundance of preferred food source, mistletoe, within



Scientific name Common nam			rvation itus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG	record			area	
								assessment corridor of study area.
Anthochaera phrygia	Regent Honeyeater	CR	cr	1961	PMST	A range of dry woodlands and forests dominated by nectar-producing tree species.	Low	Species distribution is highly restricted and unlikely to occur within the study area.
Stagonopleura guttata	Diamond Firetail	VU	V	2019	PMST	Open forests and woodlands with a grassy ground layer.	Recorded	Recorded in Section 9. Suitable habitat present throughout assessment corridor.
Climacteris picumnus	Brown Treecreeper	VU		2019	PMST	Open eucalypt forests, woodlands and Mallee, often where there are stands of dead trees.	Recorded	Recorded numerous times in small flocks in the study area during fauna assessments. Suitable habitat present throughout the study area.
<i>Phascolarctos cinereus</i> (combined populations of Qld, NSW and the ACT)	Koala	VU			PMST	Found in a range of habitats, from coastal islands and tall eucalypt forests to low inland woodlands.	N/A	Not EPBC or FFG Act listed in Victoria.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	V		PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	Medium	Wide ranging species may forage within the tree canopy or fly over the assessment corridor on occasion.
Nyctophilus corbeni	South-eastern Long-eared Bat	VU	e		PMST	Woodlands including those dominated by Mallee, Belah, Black Box and River Red- gum.	Low	This species has a broad habitat specificity. More commonly associated with semi arid areas north of the



Scientific name	Common name		rvation itus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG	record			area	
								study area. One record from Deniliquin and Moama.
Aprasia parapulchella	Pink-tailed Worm-Lizard	VU	e		PMST	Woodland and grassland with partially buried rocks.	Negligible	Species has highly restricted range and habitat requirements. No suitable habitat in study area and no records in the local area.
Crinia sloanei	Sloane's Froglet	EN	е	1993	PMST	Adults are most common in woodlands, floodplains, grasslands, and open and disturbed areas.	Low	Limited suitable habitat in shallow, inundated ephemeral and permanent waterbodies adjacent to study area. Species was not recorded during targeted surveys within Section 8, 10 and 11.
Litoria raniformis	Growling Grass Frog	VU	V	1982	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	Low	No longer recorded around the Murray River and thought to be extinct from inland areas, with the exception of stretches of the Murrumbidgee River.
Galaxias rostratus	Flat-headed Galaxias	CR	V	1990	PMST	Still or slow-moving waters of rivers, billabongs, lakes and swamps.	Low	If present in the broader area more likely to be present in the permanent slow moving water associated with the Moira and Barmah Lakes.



Scientific name	Common name		rvation tus	Most recent database record	Other records	Habitat description	Likely Rationale for likelihood occurrence ranking in study	
		EPBC	FFG				area	
Craterocephalus fluviatilis	Murray Hardyhead	EN	cr		PMST	Margins of lakes, wetlands, backwaters and billabongs.	Low	Recorded in Kerang Wetlands and other lake systems in the north-west of Victoria. Unlikely to be present in the study area.
Maccullochella macquariensis	Trout Cod	EN	e	2020	PMST	Streams characterised by a high abundance of large woody debris.	High	Likely to be present in the Murray River and Broken Creek.
Maccullochella peelii	Murray Cod	VU	е	2022	PMST	A diverse range of stream habitats in the Murray- Darling basin; principally the main channels of rivers and their major tributaries.	High	Likely to be present in the Murray River and Broken Creek.
Macquaria australasica	Macquarie Perch	EN	е	1970	PMST	Streams with clear water and deep, rocky holes with abundant cover.	Low	Limited distribution within the Murray-Darling Basin system with habitat preference of high cover of aquatic vegetation overhanging banks limited across assessment corridor. Furthermore, the species is no longer likely to be present within the Murray River adjacent to study area, with records found in tributaries south of Murray River.



Scientific name	Common name		rvation itus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood rankingLikely to occur in the Murray River. In particular, recorded regularly from the Murray and Broken Creek upstream and downstream of the Section 8 area.No recent records. Observations more commonly found in
		EPBC	FFG	record			area	
Bidyanus bidyanus	Silver Perch	CR	е	2022	PMST	Lowland streams within the Murray-Darling Basin.	High	River. In particular, recorded regularly from the Murray and Broken Creek upstream and downstream of the
Nannoperca australis (Murray-Darling lineage)	Southern Pygmy Perch (Murray- Darling lineage)	ΥU	V	1997		Well-vegetated, slow-flowing or still waters including streams, lakes, billabongs and other types of wetlands. The species is found in populations upstream of the Avoca River, and recently been discovered in tributaries of the upper Lachlan and upper Murray River catchments.	Low	
Synemon plana	Golden Sun Moth	VU	V	2014	PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean needle grass.	Negligible	No suitable habitat.
State significance								
Turnix pyrrhothorax	Red-chested Button-quail		е	2000		Grassland, grassy woodland and crops.	Low	Known from four records over 20 years ago, with species more common in northern areas of Australia.



Scientific name	Common name		rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG				area	
Geopelia cuneata	Diamond Dove		V	2011		Drier woodlands and scrub, spinifex and mulga.	Medium	May occasionally occur within woodland areas, particularly during drought in the interior when individuals disperse away from more regular habitats.
Lewinia pectoralis	Lewin's Rail		V	1999		Swamps, dense riparian vegetation and saltmarsh.	Low	If present in the broader area more likely to be present in the well vegetated wetlands associated with the Moira and Barmah Lakes.
Peltohyas australis	Inland Dotterel		V	2007		Inhabit dry, flat, open landscapes, such as stony gibber plains, claypans and gravel flats, usually with some sparse, stunted saltbush or bluebush. In these harsh environments they forage for seeds by day and insects at night.	Low	Occasional records in the broader area. No suitable habitat within the study area.
Burhinus grallarius	Bush Stone- curlew		cr	2006		Open woodland, treed farmland.	Medium	Main distribution in Victoria is within the Northern Plains, with scattered populations in north-central Victoria and Mallee. Some suitable habitat present along Section 9 to 11; in areas of grassy woodland of Grey Box



Scientific name C	Common name		rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG	Tecoru			area	
								and River Red-gum remnants.
Ardeotis australis	Australian Bustard		cr	1941		Grassland, open dry woodlands of Mallee and mulga, arid heathland saltbush and bluebush.	Low	Once widespread in Victoria, now rare in south-eastern Australia. Known, isolated population in southern parts of the Big Desert and adjacent farmland.
Grus rubicunda	Brolga		е	2010		Shallow freshwater and brackish wetlands, crops, grassland and pasture. [NOTE: Due to recent taxonomic changes; genus <i>Antigone</i> has changed to <i>Grus</i> . Formally recognised by birdlife Australia]	Medium	May occasionally utilise flooded riparian habitats in Section 8 and 11, however no suitable habitat within Section 9 or 10.
Egretta garzetta	Little Egret		e	2017		Swamps, billabongs, floodplain pools, mudflats, mangroves and channels; breeds in trees standing in water.	Medium	May utilise the edges of river or flooded vegetation for foraging, although limited fringing vegetation across assessment corridor.
Ardea intermedia plumifera	Plumed Egret		Cr	2017		Densely-vegetated freshwater wetlands including lakes, swamps and billabongs. Breeds in trees standing in water.	Medium	May occasionally use the edges of river or flooded vegetation for foraging, although limited fringing vegetation across assessment corridor. Nearby sites in Barmah have been



Scientific name	Common name	Consei sta	rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG				area	
								known to support breeding colonies during flood events.
Ardea alba modesta	Eastern Great Egret		V	2019		Flooded crops, pasture, swamps, lagoons, saltmarsh, sewage ponds, estuaries, dams, roadside ditches. Breeds in trees standing in water.	Medium	May utilise the edges of river or flooded vegetation for foraging, although limited fringing vegetation across assessment corridor.
Ixobrychus dubius	Australian Little Bittern		e	2018		Freshwater swamps, lakes and rivers with dense reedbeds, saltmarsh and coastal lagoons.	Low	More likely to be present in the well vegetated wetlands associated with the Moira and Barmah Lakes.
Spatula rhynchotis	Australasian Shoveler		V	2018		Variety of wetlands, with a preferance for large, parmanent, freshwater lakes/swamps with dense fringing vegetation.	Low	Recent record within the Baillieu Lagoon Wildlife Reserve. More commonly associated with large lakes and wetlands with abundant vegetation, especially Kerang Wetlands.
Stictonetta naevosa	Freckled Duck		е	2017		Large freshwater wetlands, generally with dense vegetation.	Low	More likely to be present in the well vegetated wetlands associated with the Moira and Barmah Lakes near Section 8 and Kerang Wetlands near Section 11.



Scientific name Common na		Consei sta	rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG				area	
Aythya australis	Hardhead		V	2019		Deep freshwater swamps and wetlands, with abundant aquatic and terrestrial vegetation for roosting. Can occur in sheltered estuaries.	Low	Known records in nearby swamps and flooded areas. May visit the Murray River adjacent to the study area, although unlikely to use terrestrial habitat within the study area.
Oxyura australis	Blue-billed Duck		v	1999		Open or densely vegetated wetlands.	Low	May occasionally utilise flooded riparian habitats in local area, although unlikely to use terrestrial habitat within the study area.
Biziura lobata	Musk Duck		V	2018		Deep, permanent freshwater wetlands with areas of open water and patches of dense aquatic vegetation.	Low	May occasionally utilise flooded riparian habitats, although unlikely to utilise the terrestrial habitat of the study area.
Accipiter novaehollandiae	Grey Goshawk		e	1999		Rainforest, gallery forest, tall wet forest and woodland. Also partially cleared agricultural land.	Low	Prefers dense, wet forest habitat with known records concentrated in southern environments.
Hieraaetus morphnoides	Little Eagle		V	2006		Woodland and open areas. Rabbits are a key component of their diet. Nesting occurs in mature trees in open woodland or riparian vegetation.	Medium	May roost in riparian vegetation before dispersing to more open areas to forage.



Scientific name	Common name	Consei sta	vation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood rankingLikely to be present within riparian vegetation and suitable foraging and breeding habitat is present.May roost, breed and hunt within the assessment corridor of Section 11. Section 8 contains limited suitable open habitat for this species.Likely to utilise surrounding areas for hunting and roosting. Recently recorded within close proximity to Section 9.Species occurs in riparian River Red-gum habitats and
		EPBC	FFG				area	
Haliaeetus leucogaster	White-bellied Sea-Eagle		е	2020		Coastal areas such as beaches and estuaries, inland wetlands and major inland streams.	High	riparian vegetation and suitable foraging and
Lophoictinia isura	Square-tailed Kite		V	2018		Eucalypt woodlands, open forest and partially cleared farmland.	Medium	within the assessment corridor of Section 11. Section 8 contains limited suitable open habitat for this
Falco subniger	Black Falcon		cr	2017		Woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Primarily occurs in arid and semi-arid zones in the north, north- west and west of Victoria.	High	areas for hunting and roosting. Recently recorded within close proximity to
Ninox connivens	Barking Owl		cr	1999		Eucalypt forests and woodlands.	Medium	
Ninox strenua	Powerful Owl		v	2015		Eucalypt forests and woodlands, well-treed urban areas.	Medium	May forage within riparian vegetation along the assessment corridor of Section 8 on occasion.



Scientific name	ntific name Common name		rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG	record			area	
Tyto novaehollandiae	Masked Owl		cr	1999		A variety of lowland forests and woodlands.	Low	Recorded sporadically around Section 8 and occurs irregularly within the region.
Neophema pulchella	Turquoise Parrot		V	1986		Woodlands and associated grasslands.	Low	Restricted range, with known records more commonly in north-eastern Victoria. Some suitable habitat in surrounding area of eucalypt woodland adjoining cleared farmland.
Gelochelidon macrotarsa	Australian Gull- billed Tern		e	2006		Floodplains, saltmarsh, claypans and flooded pasture.	Low	May occasionally utilise surrounding floodplains, however unlikely to utilise terrestrial habitat of the study area.
Hydroprogne caspia	Caspian Tern		v	2017		Estuaries, inlets, bays, lagoons, inland lakes, flooded pasture, sewage ponds.	Low	Known records concentrated within the Kerang Wetlands, south of Section 9 and 10. Unlikely to utilise the study area.
Actitis hypoleucos	Common Sandpiper		V	1977	PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March.	Low	Historic record within Kerang Wetlands. If present would be more likely to utilise the Moira and Barmah lakes to the north of Section 8, then the smaller fast moving riparian waterbodies in and adjacent to assessment corridor of study area.



Scientific name	Common name		rvation tus	Most recent database record	Other records			Rationale for likelihood ranking
		EPBC	FFG				in study area	
Coracina maxima	Ground Cuckoo- shrike		е	1978		Open woodland, farmland, mulga, spinifex with scattered trees.	Low	More commonly recorded in semi-arid habitat in north- west Victoria.
Pomatostomus temporalis	Grey-crowned Babbler		V	2019		Open forests and woodlands.	Medium	More commonly associated with Grey Box and Black Box woodlands on the outer floodplains but may occasionally forage in riparian vegetation.
Pyrrholaemus sagittatus	Speckled Warbler		е	1977		Eucalypt woodland with rocky gullies, ridges, tussock grasses and a sparse shrub understorey.	Low	Records are concentrated on and inland of the Great Dividing Range, species is unlikely to utilise the study area.
Struthidea cinerea	Apostlebird		V	1999		A variety of drier woodlands, never far from water.	Low	Suitable habitat present along Section 11, however species has not been recorded in the broader area since 1999. Study area may be at the southern limit of range. Species likely to be observed if present in area due to gregarious behaviour and often in large groups.
Phascogale tapoatafa	Brush-tailed Phascogale		V	1981		Drier sclerophyll forests and woodlands.	Low	No recent records and not generally associated with riparian Red-gum vegetation. Species more commonly



Scientific name	Common name	Conser sta		Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG				area	
								found in drier woodlands in central and southern Victoria
Sminthopsis crassicaudata	Fat-tailed Dunnart		V	2013		Inhabits sparse grasslands and open shrubland habitats, usually where there is a significant component of bare ground and suitable refuge sites such as surface rocks or logs where it constructs nests of grass or other dried plant material.	Negligible	No suitable habitat in study area.
Petaurus norfolcensis	Squirrel Glider		V	2015		Drier woodlands, riverine woodland and coastal forest.	Medium	Commonly associated with riparian woodlands and suitable habitat throughout assessment corridor.
Aepyprymnus rufescens	Rufous Bettong		x	1857		Formally occurred in the Riverina and northern slopes of the central Midlands but is now considered extinct in Victoria. Preferred habitat includes open eucalypt forest or woodland lacking with a dense cover of tall native grasses.	Negligible	Extinct in Victoria and very limited, patchy distribution in north-east NSW.
Ornithorhynchus anatinus	Platypus		V	2021		A variety of freshwater waterbodies, particularly those with stable banks suitable for burrows, and shallow waters for foraging.	High	Suitable habitat within the Murray River and Broken Creek systems. Recorded in the study area near Wharparilla by the Australian



Scientific name	Common name		vation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG	record			area	
								Platypus Conservancy in 2018.
Pogona barbata	Bearded Dragon		V	1992		Woodlands, forests and heathlands with abundant cover of course woody debris.	Medium	May occur in Black Box dominated woodlands throughout Section 9 and 11.
Varanus varius	Lace Monitor		e	2015		A variety of wooded habitats, including woodlands; shelters in hollow trunks, limbs and logs.	High	Suitable habitat and recent records from the local area. Likely to be present within riparian habitats.
Vermicella annulata	Bandy Bandy		e	1951		Grassy woodland, Mallee and spinifex-covered sandhills.	Low	Historic records in Echuca. Largely fossorial and rarely encountered. Often associated in areas in semi- arid environments.
Chelodina expansa	Broad-shelled Turtle		е	2018		Typically found in turbid water at the bottom of rivers and permanent streams and waterholes, lying concealed among debris or among root-mats.	Medium	May be present within the Murray River and surrounding river systems (e.g. Broken Creek, north of Section 8) and associated flooded woodlands and forests.
Emydura macquarii	Murray River Turtle		cr	2018		A medium sized freshwater turtle that inhabits inland river systems including the Murray-Darling catchment.	Medium	May be present within the Murray River and surrounding river systems (e.g. Broken Creek, north of Section 8) and associated flooded woodlands and forests.



Scientific name	Common name		rvation tus	Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG				area	
Morelia spilota metcalfei	Carpet Python		e	1999		Riverine and granitic woodlands, occasionally Mallee and Callitris spp. woodlands.	Medium	May be present within riparian habitats.
Limnodynastes interioris	Giant Bullfrog		е	2000		Semi-arid woodlands and shrublands.	Low	Suitable habitat in floodplains and woodlands along Section 11. Species has not been recorded for over 20 years, despite monitoring effort since 2014 in Gunbower (Sim & Bennetts 2014).
Pseudophryne bibronii	Brown Toadlet		е	1982		A wide variety of woodland, forest and grassland habitats, where it shelters under leaf litter and other debris in moist soaks and depressions. Breeds in swamps and inundated habitats, and along creek lines.	Low	Species has not been recorded since 1982, despite monitoring efforts since 2014 (Sim & Bennetts 2014). Suitable habitat within woodlands adjacent to floodplains.
Melanotaenia fluviatilis	Murray-Darling Rainbowfish		e	2020		Rivers and streams of the Murray-Darling basin.	High	Recorded throughout the Murray River and also Broken Creek systems which is just north of Section 8,



Scientific name	Common name	Conser sta		Most recent database record	Other records	Habitat description	Likely occurrence in study	Rationale for likelihood ranking
		EPBC	FFG				area	
Tandanus tandanus	Freshwater Catfish		е	2012		Rivers, creeks and billabongs of the Murray-Darling river system.	Medium	Occasional records along Murray River, with higher concentration of records near Mildura. Recent records in billabongs off Gunbower Creek. Appears to be more regularly recorded in tributaries to the west of the study area and throughout eastern NSW.
Euastacus armatus	Murray Spiny Crayfish		t	1935		Large and small flowing, cool- water streams in pasture and sclerophyll forest.	Medium	Likely to occur within Murray River and utilising riverbanks.



Appendix 4.3 Migratory species (EPBC Act listed)

Table 17Migratory fauna species recorded or predicted to occur within 5 km of the study area

Scientific name	Common name	Most recent record
Gallinago hardwickii	Latham's Snipe	2004
Plegadis falcinellus	Glossy Ibis	2017
Hirundapus caudacutus	White-throated Needletail	2001
Apus pacificus	Fork-tailed Swift	2003
Pandion haliaetus	Osprey	PMST
Hydroprogne caspia	Caspian Tern	2017
Pluvialis squatarola	Grey Plover	1971
Actitis hypoleucos	Common Sandpiper	1977
Tringa nebularia	Common Greenshank	2006
Calidris ferruginea	Curlew Sandpiper	PMST
Calidris ruficollis	Red-necked Stint	1932
Calidris acuminata	Sharp-tailed Sandpiper	PMST
Calidris melanotos	Pectoral Sandpiper	PMST
Motacilla flava	Yellow Wagtail	PMST
Rhipidura rufifrons	Rufous Fantail	2011
Myiagra cyanoleuca	Satin Flycatcher	1987



Appendix 5 Photos of the assessment corridor

Appendix 5.1 Section 8



Photo 1 Example of Riverine Swamp Forest EVC 814 within the assessment corridor. Photo taken 28 July 2022.



Photo 2 Example of Riverine Swamp Forest EVC 814 within the assessment corridor. Photo taken 25 July 2022.





Photo 3 Example of Grassy Riverine Forest EVC 106 within the assessment corridor. Photo taken 25 July 2022.



Photo 4 Example of Grassy Riverine Forest EVC 106 within the assessment corridor. Photo taken 25 July 2022.





Photo 5 Example of Riverine Grassy Woodland EVC 295 within the assessment corridor. Photo taken 28 July 2022.



Photo 6 Example of Riverine Grassy Woodland EVC 295 within the assessment corridor. Photo taken 25 July 2022.



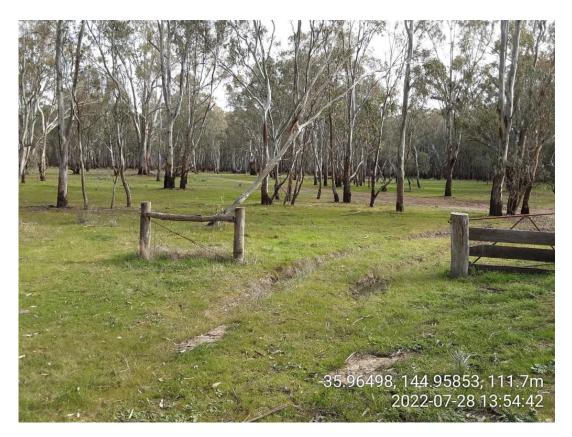


Photo 7 Predominately introduced vegetation within the assessment corridor in the foreground. Photo taken 28 July 2022.



Photo 8 Crossing Broken Creek (Rice's Bridge) will utilise the existing road. Photo taken 28 July 2022.



Appendix 5.2 Section 9



Photo 9 Plains Woodland EVC 803 within the assessment corridor. Photo taken 26 July 2022.



Photo 10 Floodplain Riparian Woodland EVC 56 within the assessment corridor. Photo taken 26 July 2022.





Photo 11 Riverine Chenopod Woodland EVC 103 within the assessment corridor. Photo taken 26 July 2022.



Photo 12 Riverine Grassy Woodland EVC 295 within the assessment corridor. Photo taken 27 July 2022.





Photo 13 Grassy Riverine Forest EVC 106 within the assessment corridor. Photo taken 26 July 2022.



Photo 14 Riverine Swamp Forest EVC 814 within the assessment corridor. Photo taken 27 July 2022.





Photo 15 Riverine Swampy Woodland EVC 815 within the assessment corridor. Photo taken 28 July 2022.



Photo 16 Predominantly introduced vegetation within the assessment corridor. Photo taken 28 July 2022.



Appendix 5.3 Section 10



Photo 17 Example of Riverine Chenopod Woodland EVC 103 within the assessment corridor. Photo taken 24 August 2022.



Photo 18 Example of Riverine Chenopod Woodland EVC 103 within the assessment corridor. Photo taken 23 August 2022.



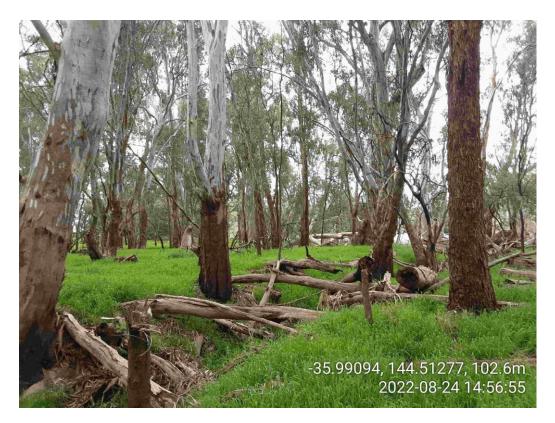


Photo 19 Example of Grassy Riverine Forest EVC 106 within the assessment corridor. Photo taken 24 August 2022.

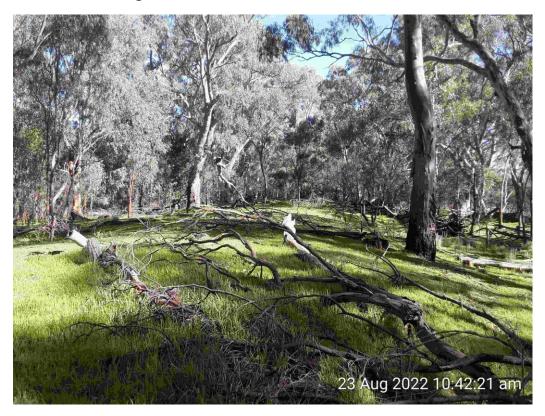


Photo 20 Example of Grassy Riverine Forest EVC 106 within the assessment corridor. Photo taken 23 August 2022.



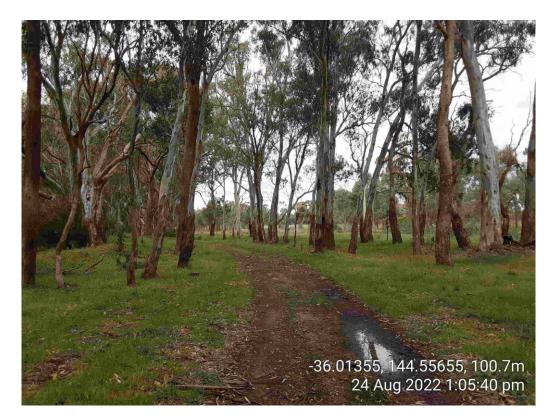


Photo 21 Example of Riverine Grassy Woodland EVC 295 within the assessment corridor. Photo taken 24 August 2022.



Photo 22 Example of Riverine Grassy Woodland EVC 295 within the assessment corridor. Photo taken 24 August 2022.





Photo 23 Example of Plains Woodland EVC 803 within the assessment corridor. Photo taken 24 August 2022.



Photo 24 Example of Plains Woodland EVC 803 within the assessment corridor. Photo taken 24 August 2022.





Photo 25 Example of Sedgy Riverine Forest EVC 816 within the assessment corridor. Photo taken 24 August 2022.

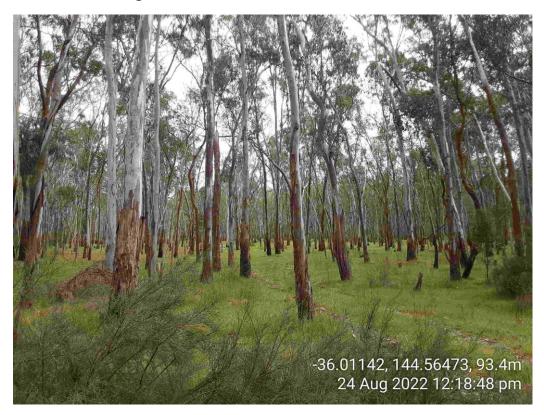


Photo 26 Example of Sedgy Riverine Forest EVC 816 within the assessment corridor. Photo taken 24 August 2022.





Photo 27 Example of Floodplain Riparian Woodland EVC 56 within the assessment corridor. Photo taken 28 July 2022.



Photo 28 Predominantly introduced vegetation within the assessment corridor in the foreground. Photo taken 24 August 2022.



Appendix 5.4 Section 11



Photo 29 Example of Riverine Swamp Forest EVC 814 within the assessment corridor. Photo taken 25 August 2022.



Photo 30 Example of Riverine Swamp Forest EVC 814 within the assessment corridor. Photo taken 25 August 2022.





Photo 31 Example of Grassy Riverine Forest EVC 106 within the assessment corridor. Photo taken 25 August 2022.



Photo 32 Example of Grassy Riverine Forest EVC 106 within the assessment corridor. Photo taken 25 August 2022.





Photo 33 Example of Plains Woodland EVC 803 within the assessment corridor. Photo taken 25 August 2022.

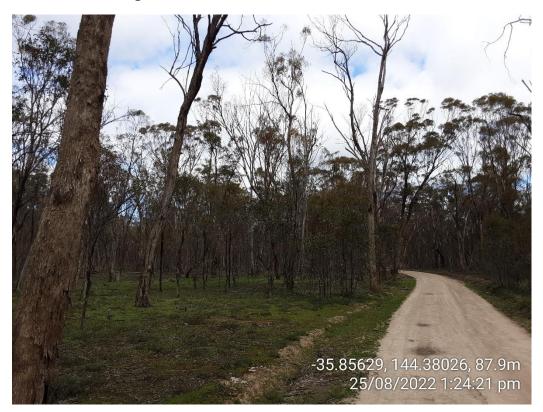


Photo 34 Example of Plains Woodland EVC 803 within the assessment corridor. Photo taken 25 August 2022.





Photo 35 Example of Sedgy Riverine Forest EVC 816 within the assessment corridor. Photo taken 25 August 2022.



Photo 36 Example of Sedgy Riverine Forest EVC 816 within the assessment corridor. Photo taken 25 August 2022.





Photo 37 Example of Riverine Grassy Woodland EVC 295 within the assessment corridor. Photo taken 25 August 2022.



Photo 38 Example of Riverine Grassy Woodland EVC 295 within the assessment corridor. Photo taken 25 August 2022.





Photo 39 Predominantly introduced vegetation within the assessment corridor in the foreground. Photo taken 25 August 2022.



Appendix 6 Significant Impact Criteria assessments

Appendix 6.1 Flora

Turnip Copperburr Scerolaena napiformis (Endangered)

Turnip Copperburr was not recorded during the vegetation surveys for the project. While the species remains detectable throughout the year due to its persistent fruit, it is cryptic and easily overlooked. There is a known population south of Echuca in the vicinity of the Echuca airport and the species has been recorded extensively along the Cobb Highway north of Moama in NSW. Within Victoria, database records generally occur within Plains Grassland EVC 132, which was not recorded within the assessment corridor. However, some suitable habitat was identified within higher-quality and open or derived areas of Plains Woodland EVC 803 within Section 10.

Table 18Turnip Copperburr Scerolaena napiformis – assessment against Significant Impact Criteria
(DoE 2013)

Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely	No plants were recorded along the trail alignment. The proposed trail construction will impact up to 0.46 hectares of Plains Woodland EVC 803 habitat within Section 10, however this is considered an over- estimation of suitable habitat as much of these areas are too densely treed to support the species (which typically occurs in grasslands). It is not anticipated that any significant numbers of plants or populations will be destroyed that could lead to a decline in the size of a population, if one were present within the project's impact footprint.
Reduce the area of occupancy of the species	Unlikely	The species is has known populations to the north and south of the proposed MRAT. Construction of the trail will not affect the species' area of occupancy.
Fragment an existing population into two or more populations	Unlikely	No plants were recorded on the proposed trail alignment. Any existing known populations will not be fragmented by the trail and any resultant disturbance will be a permeable narrow barrier that will not affect physical or functional connectivity between undiscovered populations, if present within the impact footprint.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been declared for Turnip Copperburr. As the species is generally a grassland a grassland species, and much of the proposed impacts are within moderately dense to densely treed areas, the project is unlikely to affect habitat critical to the survival of the species.



Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Disrupt the breeding cycle of a population	Unlikely	The trails and any resultant disturbance will be a permeable narrow barrier in a discrete location that is unlikely to affect pollination, seed dispersal, gene flow or vegetative reproduction.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The availability and quality of habitat will not decline significantly as a result of the works. Impacts on habitat are likely to be restricted to the trail edge, providing that weeds, diseases, and pathogens are managed appropriately. Therefore, Turnip Copperburr is not likely to decline due to the reduction in extent or quality of habitat caused by the operation or construction of the trail network.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	Soil disturbance and subsequent weed invasion will be minimised through construction management and follow up weed control. The project CEMP will specifically deal with controlling the introduction and spread of weed species, especially those species associated with walking track edges. Ongoing monitoring will be required to manage the establishment of weeds once the trails are operational.
Introduce disease that may cause the species to decline	Unlikely	The project is unlikely to introduce diseases to the project area providing hygiene protocols are adhered to in the CEMP.
Interfere with the recovery of a species	Unlikely	There are no known recovery programs operational within the MRAT study area. The trail is therefore unlikely to interfere with the recovery of Turnip Copperburr.



Stiff Groundsel Senecio behrianus (Endangered)

Stiff Groundsel was not recorded during field assessments. The inaccuracy of previous local records (between 1 and 4 kilometres) and generally poorly understanding of the habitat requirements for this species makes it difficult to restrict habitat impacts for this species to any particular EVCs. Therefore, consistent with a conservative approach the impact assessment below considers all vegetation removal within Sections 10 and 11 (where the species is assessed as having medium likelihood of occurrence) as habitat removal for this species.

Table 19	Stiff Groundsel Senecio behrianus – assessment against Significant Impact Criteria (DoE
	2013)

Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely	No plants were recorded along the trail alignment. The proposed trail construction may impact up to 3.05 hectares of potential habitat within Section 10 and 11. It is not anticipated that any significant numbers of plants or populations will be destroyed that could lead to a decline in the size of a population, if one were present within the project's construction footprint.
Reduce the area of occupancy of the species	Unlikely	There are no known populations of this species within the search area. Construction of the trail will not affect the species' area of occupancy.
Fragment an existing population into two or more populations	Unlikely	No plants were recorded on the proposed trail alignment. Any existing known populations will not be fragmented by the trail and any resultant disturbance will be a permeable narrow barrier that will not affect physical or functional connectivity between undiscovered populations, if present within the impact footprint.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been declared for Stiff Groundsel. Considering the scale of proposed habitat removal (up to 3.05 hectares) in the context of the extent of similar habitat in the surrounding landscape which will remain unaffected by the proposed works, the project is unlikely to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	Unlikely	The trails and any resultant disturbance will be a permeable narrow barrier in a discrete location that is unlikely to affect pollination, seed dispersal, gene flow or vegetative reproduction.



Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The availability and quality of habitat will not decline significantly as a result of the works. Impacts on habitat are likely to be restricted to the trail edge, providing that weeds, diseases, and pathogens are managed appropriately. Therefore, Stiff Groundsel is not likely to decline due to the reduction in extent or quality of habitat caused by the operation or construction of the trail network.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	Soil disturbance and subsequent weed invasion will be minimised through construction management and follow up weed control. The project CEMP will specifically deal with controlling the introduction and spread of weed species, especially those species associated with walking track edges. Ongoing monitoring will be required to manage the establishment of weeds once the trails are operational.
Introduce disease that may cause the species to decline	Unlikely	The project is unlikely to introduce diseases to the project area providing hygiene protocols are adhered to in the CEMP.
Interfere with the recovery of a species	Unlikely	There are no known recovery programs operational within the MRAT study area. The trail is therefore unlikely to interfere with the recovery of Stiff Groundsel.



River Swamp Wallaby-grass Amphibromus fluitans (Vulnerable)

River Swamp Wallaby-grass was not recorded during field assessments, however the timing of the surveys did not correspond with an appropriate detection period for this species (i.e. Summer). Barmah National Park supports a stronghold population of this species. Whilst suitable habitat for this species is widespread across the landscape surrounding the MRAT alignment (particularly within Sections 8 and 11), the project intends to utilise existing tracks and trails throughout the majority of this suitable habitat (including through Riverine Swamp Forest habitat within Sections 9 and 11). Impacts on areas of suitable habitat are considered to be relatively restricted and include periodically inundated drainage channels areas east of Echuca in Section 9 and Mullers Creek (Section 10). Its likelihood of occurrence within proposed campsite locations in Section 8 and 11 is considered low given the existing disturbed nature of these sites. A significant impact criteria assessment is completed below.

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	No plants were recorded on the proposed trail alignment. It is not anticipated that any significant numbers of plants or populations will be destroyed that could lead to a long-term decline in the size of an important population.
Reduce the area of occupancy of an important population	Unlikely	No plants were recorded on the proposed trail alignment, therefore, it is not anticipated that any significant numbers of plants or populations will be destroyed, or that habitat or area of occupancy will be reduced significantly.
Fragment an existing important population into two or more populations	Unlikely	No plants were recorded on the proposed trail alignment. Resultant disturbance post-trail construction will be a permeable narrow barrier that will not affect physical or functional connectivity between populations.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been defined for the species (DEWHA 2008). The trail alignment has been designed to avoid periodically inundated areas and thus generally avoids suitable habitat for this species. Impacts on suitable habitat are likely to be restricted to the trail edge, providing that weeds are managed appropriately. Soil disturbance and subsequent weed invasion will be minimised through strict hygiene protocol during construction. The project CEMP will specifically deal with controlling the introduction and spread of weed species, especially those species associated with walking track edges. Ongoing monitoring will be required to manage the establishment of weeds once the trail is operational.
Disrupt the breeding cycle of an important population	Unlikely	The trails and any resultant disturbance will be a permeable narrow barrier in a discrete location that is unlikely to affect pollination, seed dispersal, gene flow or vegetative reproduction.
Modify, destroy, remove, isolate or decrease the availability or quality of	Unlikely	The availability and quality of habitat will not decline significantly as a result of the proposed trail construction works. Impacts on habitat are likely to be restricted to the trail edge, providing that

Table 20River Swamp Wallaby-grass Amphibromus fluitans – assessment against Significant Impact
Criteria (DoE 2013)



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
habitat to the extent that the species is likely to decline		weeds, diseases, and pathogens are managed appropriately. Therefore, River Swamp Wallaby-grass (if present within or adjacent to the trail) is not likely to decline due to the reduction in extent or quality of habitat caused by the operation or construction of the trail.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	Soil disturbance and subsequent weed invasion will be minimised through strict hygiene protocol during construction. The project CEMP will specifically deal with controlling the introduction and spread of weed species, especially those species associated with walking track edges. Ongoing monitoring will be required to manage the establishment of weeds once the trails are operational, and a trail management plan will be developed to address this.
Introduce disease that may cause the species to decline	Unlikely	The project is unlikely to introduce diseases that would affect this species providing hygiene protocols are adhered to in the CEMP.
Interfere substantially with the recovery of a species	Unlikely	There are no known recovery programs operational within the project area. The trail is therefore unlikely to interfere with the recovery of River Swamp Wallaby-grass.

Conclusion for River Swamp Wallaby-grass

Habitat for River Swamp Wallaby Grass is widespread throughout the vicinity of the proposed MRAT, however the proposed impact areas generally do not intersect with suitable habitat for this species. Construction of the proposed MRAT is considered unlikely to significant impact on this species, if present within the construction impact area.



Slender Darling-pea *Swainsona murrayana* and Red Swainson-pea *Swainsona plagiotropis* (Vulnerable)

These two *Swainsona* species have been assessed together against significant impact criteria as they are likely to be supported by similar habitat types and they are both listed as Vulnerable species under the EPBC Act. Neither of them was recorded during the vegetation surveys as the timing of the surveys did not correspond with flowering time (i.e. late spring). Database records indicate nearby records at the following locations:

- Slender Darling Pea: at Echuca airport (single record from 1999) and across grassland habitat south of Section 10.
- Red Swainson-pea: at Echuca airport, to the west of Echuca and across grassland habitat south of Section 10.

Within Victoria, database records generally occur within Plains Grassland EVC 132, which was not recorded within the assessment corridor. However, some suitable habitat was identified within higher-quality and more open areas of Plains Woodland EVC 803 within Section 10.

Table 21Slender Darling-pea Swainsona murrayana and Red Swainson-pea Swainsona plagiotropis –
assessment against Significant Impact Criteria (DoE 2013)

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	No plants of either species were recorded on the proposed trail alignment, therefore, it is not anticipated that any significant numbers of plants or populations will be destroyed that could lead to a long-term decline in the size of an important population.
Reduce the area of occupancy of an important population	Unlikely	No plants of either species were recorded on the proposed trail alignment, therefore, it is not anticipated that any significant numbers of plants or populations of either species will be destroyed, or that habitat or area of occupancy will be reduced significantly.
Fragment an existing important population into two or more populations	Unlikely	No plants were recorded on the proposed trail alignment. Resultant disturbance post-trail construction will be a permeable narrow barrier that will not affect physical or functional connectivity between populations. In the context of existing levels of disturbance within the assessment corridor the proposed trail would not present an increase in barriers for the movement of either species, retaining population scale connectivity.
Adversely affect habitat critical to the survival of the species	Unlikely	Critical habitat has not been defined for either species. The proposed trail construction will impact up to 0.46 hectares of Plains Woodland EVC 803 habitat within Section 10, however this is considered an over-estimation of suitable habitat for these species as much of these areas are too densely treed to support either species (which typically occur in grasslands). Soil disturbance and subsequent weed invasion will be minimised through strict hygiene protocol during construction. The project CEMP will specifically deal with controlling the introduction and spread of weed species, especially those species associated with walking track edges. Ongoing



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
		monitoring will be required to manage the establishment of weeds once the trail is operational.
Disrupt the breeding cycle of an important population	Unlikely	The trails and any resultant disturbance will be a permeable narrow barrier in a discrete location that is unlikely to affect pollination, seed dispersal, gene flow or vegetative reproduction.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The availability and quality of habitat will not decline significantly as a result of the proposed trail construction works. Impacts on habitat are likely to be restricted to the trail edge, providing that weeds, diseases, and pathogens are managed appropriately. Therefore, Slender Darling-pea and/or Red Swainson-pea (if present within or adjacent to the trail) are not likely to decline due to the reduction in extent or quality of habitat caused by the operation or construction of the trail.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	Soil disturbance and subsequent weed invasion will be minimised through strict hygiene protocol during construction. The project CEMP will specifically deal with controlling the introduction and spread of weed species, especially those species associated with walking track edges. Ongoing monitoring will be required to manage the establishment of weeds once the trails are operational, and a trail management plan will be developed to address this.
Introduce disease that may cause the species to decline	Unlikely	The project is unlikely to introduce diseases that would affect this species providing hygiene protocols are adhered to in the CEMP.
Interfere substantially with the recovery of a species	Unlikely	A recovery plan has not been made for Slender Darling-pea or Red Swainson-pea. The trail is therefore unlikely to interfere with the recovery of either species.



Appendix 6.2 Fauna

Threatened aquatic fauna: Trout Cod *Maccullochella macquariensis* (endangered) and Silver Perch *Bidyanus bidyanus* (critically endangered)

These two threatened fish species have been assessed together against significant impact criteria for critically endangered and endangered species as they are likely to be supported by aquatic habitat. Both species are considered likely to occur within the Murray River, Goulburn River, and Broken Creek within and adjacent to the study area.

Silver Perch is listed as a critically endangered under the EPBC Act. The Silver Perch is a large-bodied obligate freshwater fish that is native to the Murray-Darling river system. The Silver Perch was one of the most common large fish in the Murray, Murrumbidgee and Darling/Paroo Rivers drainages systems in the 1970's. Today, although still recorded in many areas of the Murray Darling Basin, the only significant population of Silver Perch is present in the lower Murray River below Yarrawonga (DPI 2017). It historically inhabited a wide variety of river types from slow turbid rivers to larger upland streams and rivers, however they do display a preference for fast flowing waters, including rapids and areas of open water. The Silver Perch migrates upstream to spawn, with breeding triggered by a rise in temperature and water levels. Silver Perch have been severely impacted by barriers to fish passage and flow reduction, as they have reduced its ability to migrate and breed successfully. The species is also affected by the EHN Virus carried by exotic fish such as Redfin Perch *Perca fluviatilis*.

Trout Cod is listed as endangered under the EPBC Act. This species is also a large-bodied obligate freshwater fish that is native to the Murray-Darling River system. Trout Cod were once widespread in the mid reaches of the Murray River and its tributaries in Victoria, and in the Murrumbidgee River system in NSW. The species now occurs in a series of natural and stocked populations throughout Victoria, NSW and the ACT. The primary breeding populations are thought to be restricted to one population in the Murray River between Yarrawonga and Barmah, and a second population in Seven Creeks established from a translocation from the Goulburn River (DSE 2008). Trout Cod generally prefer river habitat where large woody debris is present in high quantity, close to deeper water and high surface velocity towards the centre of rivers (DSE 2008). Populations are impacted by several major and suspected threats including de-snagging (removal of large woody debris), river regulation, barriers to fish passage, disease, altered water quality, flows, temperatures, and competition and recreational fishing.



Table 22Trout Cod Maccullochella macquariensis and Silver Perch Bidyanus bidyanus – assessment
against Significant Impact Criteria (DoE 2013)

Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely	The proposed trail alignment has been designed to utilise existing tracks and water crossings where possible. This includes use of the existing bridge at Stewards Bridge Road where the trail crosses the Goulburn River (Section 9), Broken Creek uses the existing track to the Dharnya Centre (Section 8), and existing bridges and creek crossings at Walhalla Creek (Section 9), Yarran Creek (Section 10) and Cameron Creek (Section 10). Several tributaries throughout Section 11 occur along the existing trail and will not be directly impacted. The primary impacts on aquatic habitat are proposed to
		occur in the form of a long boardwalk-style bridge at Deep Creek and a smaller culvert crossing at Mullers Creek. No records of Silver Perch or Trout Cod occur in these creeks, however they provide connectivity to Murray River where species records occur, and may be utilised by individuals. Indirect impacts on the Murray River from trail construction will be avoided through the use of best practise erosion and sediment control measures. Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided, however where impacts may occur these will be localised and short term from the construction of crossings. As such, project works are not anticipated to result in any significant impacts on populations of Silver Perch and Trout Cod in the form of mortalities, fragmentation, or habitat removal.
Reduce the area of occupancy of the species	Unlikely	The proposed impact area of the trail alignment is unlikely to result in a reduction of aquatic habitat for Silver Perch and Trout Cod. The bridge crossing at Deep Creek is proposed as two towers with footings at either side of the creek, with supporting cable wire ropes across the length of the bridge. Footings should be set back from the creek banks as much as possible to reduce impacts on banks, and no footings are proposed in the deep-water zone.
Fragment an existing population into two or more populations	Unlikely	Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided, however where impacts may occur these will be localised and short term during bridge construction. As such the project works are not expected to impact upon connectivity for this species in the long term.



Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Adversely affect habitat critical to the survival of the species	Unlikely	No areas of critical habitat are listed for Silver Perch or Trout Cod in the Register of Critical Habitat maintained by the minister under the EPBC Act. There is no adopted or made national Recovery Plan for Silver Perch. The national Recovery Plan for Trout Cod (DSE 2008) identified that assessments of habitat critical to the survival of the Murray River population may include 'river positions with high quantities of woody debris, close to deeper water and high surface velocity, further from the river bank'. The project works are not considered likely to adversely impact upon areas of key fish habitat, or reduce connectivity to areas of habitat for this species outside of the proposed impact area. Potential indirect impacts include downstream sedimentation during construction, and in the worst case, temporary blockage of fish passage. Recommendations provided in Section 5.4 should be adopted to avoid impacts on potential critical habitat in Deep Creek, in particular the retainment of large woody-debris and preservation or reformation of bank form following works. The proposed works are unlikely to impact deeper water and high surface velocity zones further from the riverbank, as footings are proposed to be located at the creek edge.
Disrupt the breeding cycle of a population	Unlikely	Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided through use of existing bridges and creek crossings, however where impacts may occur at Deep Creek these will be localised and short term. Additionally, the aquatic habitat is not considered an area that Silver Perch or Trout Cod are likely to use for spawning. As such, the proposed works are not expected to significantly disrupt the breeding cycle of populations of Silver Perch and Trout Cod.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided, however where impacts may occur at Deep Creek and Mullers Creek these will be localised and short term. Recommendations provided in Section 5.4 should be adopted to avoid impacts, including construction during periods of no and low flow, retention of large woody debris and reformation of bank form following works. The proposed trail alignment is not expected to impact upon areas of habitat for this species to the extent that either species is likely to decline.



Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The proposed works are unlikely to result in the spread of invasive species, such as Carp, within the existing waterways. A CEMP will be implemented to ensure aquatic waterway species that may be invasive to adjoining riparian environments are not introduced or spread by the proposed works.
Introduce disease that may cause the species to decline	Unlikely	The project is not likely to introduce any diseases that Silver Perch or Trout Cod are susceptible to, or that are not already present in the local area. Silver Perch is also affected by the EHN Virus carried by exotic fish such as Redfin Perch (Langdon 1989), this virus is unlikely to be introduced or spread by the proposed action.
Interfere with the recovery of a species	Unlikely	The proposed trail alignment is not expected to significantly impact upon areas of habitat, interfere with breeding or migratory behaviour for this species, provided that the recommended mitigation measures are adopted. As such the project is not expected to interfere with the recovery of Silver Perch or Trout Cod.

Conclusion for Silver Perch and Trout Cod

It is considered unlikely that the proposed action will result in a significant impact on Silver Perch or Trout Cod. The key considerations in this conclusion are the containment of localised impacts that may affect instream aquatic habitat and fish community connectivity, and is dependent on the adoption of recommended mitigation measures (Section 5.4) to protect the integrity of aquatic and riparian zones. This must include minimising impact on creek banks during bridge construction, preservation or reformation of bank form following works and the retainment of critical habitat features such as large woody debris.



Threatened aquatic fauna: Murray Cod Maccullochella peelii (vulnerable)

The Murray Cod is listed as vulnerable under the EPBC Act. This species prefers large, slow flowing rivers and is often associated with instream structures such as large woody-debris, undercut banks and boulders (DSE 2010). The Murray Cod is endemic to the Murray Darling Basin and has experienced a decline in number since European colonisation, however it has been suggested that there have been increases in populations in recent times (DSE 2010). An identified important population which requires consideration for the project occurs in Broken Creek (intersecting the impact area). The species is common throughout the Murray-Darling Basin, although patchy and susceptible to a range of impacts including overfishing and instream barriers. The species is considered likely to occur in all flowing waterways intersected by the study area.

Table 23	23 Murray Cod Maccullochella peelii – assessment against Significant Impact Criteria (Do 2013)				
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Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The proposed trail alignment has been designed to utilise existing tracks and water crossings where possible. This includes use of the existing bridge at Stewards Bridge Road where the trail crosses the Goulburn River (Section 9), Broken Creek uses the existing track to the Dharnya Centre (Section 8), and existing bridges and creek crossings at Walhalla Creek (Section 9), Yarran Creek (Section 10) and Cameron Creek (Section 10). Several tributaries throughout Section 11 occur along the existing trail and will not be directly impacted. The primary impacts on aquatic habitat are proposed to occur in
		the form of a long boardwalk-style bridge at Deep Creek and a smaller culvert crossing at Mullers Creek. No records of Murray Cod occur in these creeks, however they provide connectivity to Murray River where the species is known to occur, and may be occasionally utilised by individuals. Indirect impacts on the Murray River and connecting waterways will be minimised through implementing best practise erosion and sediment control measures.
		Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided, however where impacts may occur these will be localised and short term from the construction of crossings. As such, project works are not anticipated to result in any long-term decrease in the size of an important population of Murray Cod.
Reduce the area of occupancy of an important population	Unlikely	The proposed impact area of the trail alignment is unlikely to result in a reduction of aquatic habitat for an important population of Murray Cod. The trail alignment at Broken Creek will utilise an existing bridge crossing. The bridge crossing at Deep Creek is proposed as two towers with footings at either side of the creek, with supporting cable wire ropes across the length of the bridge. Footings should be set back from the creek banks as much as possible to reduce impacts on banks, and no footings are proposed in the deep water zone. The detailed design should also consider incorporating natural surfaces, and suitable humidity,



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
		temperature, and light levels to maintain existing environmental conditions.
Fragment an existing important population into two or more populations	Unlikely	Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided, however where impacts may occur these will be localised and short term. As such the project works are not expected to impact upon connectivity for this species in the long term.
Adversely affect habitat critical to the survival of the species	Unlikely	No areas of critical habitat are listed for Murray Cod in the Register of Critical Habitat under the EPBC Act. The species national Recovery Plan identifies actions to 'Identify and protect habitat areas critical to the survival of Murray Cod' (DSE 2010). In the Murray-Darling River system, populations are often associated with complex structural cover such as large rocks, large snags and smaller structural woody habitat, undercut banks and over-hanging vegetation (DSE 2010). The project works are not considered likely to adversely impact upon areas of key fish habitat, or reduce connectivity to areas of habitat for this species outside of the proposed impact area. Areas of key fish habitat identified in this report are not expected to be significantly impacted, given the type and method of project works to protect key fish habitat. Potential indirect impacts include downstream sedimentation during construction, and in the worst case, temporary blockage of fish passage. Recommendations provided in Section 5.4 should be adopted to avoid impacts on potential habitat in Deep Creek, in particular the retainment of large woody-debris and preservation or reformation of bank form following works. The proposed works are unlikely to impact deeper water and high surface velocity zones further from the riverbank, as footings are proposed to be located at the creek edge.
Disrupt the breeding cycle of an important population	Unlikely	Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided through use of existing bridges and creek crossings, including where an important population occurs at Broken Creek. As such, the project is unlikely to disrupt the breeding cycle of an important population of Murray Cod.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Impacts on in-stream aquatic habitat and fish community connectivity are mostly avoided, however where impacts may occur at Deep Creek and Mullers Creek these will be localised and short term. Recommendations provided in Section 5.4 should be adopted to avoid impacts, including construction during periods of no and low flow, retention of large woody debris and reformation of bank form following works. The proposed trail alignment is not expected to impact upon areas of habitat for this species to the extent that the species is likely to decline.



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	The proposed works are unlikely to result in the spread of invasive species, such as Carp and Redfin Perch, within the existing waterways. A CEMP will be implemented to ensure aquatic waterway species that may be invasive to adjoining riparian environments are not introduced or spread by the proposed works.
Introduce disease that may cause the species to decline	Unlikely	Little information is available on the prevalence and potential impact of diseases on Murray Cod (DSE 2010). The species Recovery Plan identifies potential diseases and pathogens of concern including EHN Virus, Viral Encephalopathy and Retinopathy (VER), Goldfish Ulcer Disease (GUD), Asian Fish Tapeworm <i>Bothriocephalus acheilognathis</i> and Anchorworm <i>Lernaea cyprinacea</i> . Murray Cod are also susceptible to infections by <i>Saprolegnia</i> species of parasitic water moulds (Cth DCCEEW 2024). The project is not likely to introduce any new diseases that Murray Cod are susceptible to, or that are not already present in the local area. Murray Cod are highly susceptible to the EHN Virus carried by exotic fish such as Redfin Perch (Langdon 1989), however this virus is unlikely to be introduced or spread by the proposed action.
Interfere substantially with the recovery of a species	Unlikely	The proposed trail alignment is not expected to significantly impact upon areas of habitat, interfere with breeding or migratory behaviour for this species, provided that the recommended mitigation measures are adopted. As such the project is not expected to interfere substantially with the recovery of Murray Cod.

Conclusion for Murray Cod

It is considered unlikely that the proposed action will result in a significant impact on Murray Cod. The key considerations in this conclusion are the utilisation of existing crossing structures where an important population occurs at Broken Creek. The proposed works also involve containment of localised impacts that may affect in-stream aquatic habitat and fish community connectivity, which is dependent on the adoption of recommended mitigation measures (Section 5.4) to protect the integrity of aquatic and riparian zones. This must include minimising impact on creek banks during bridge construction, preservation or reformation of bank form following works and the retainment of habitat features such as complex structural cover including large rocks, woody habitat, undercut banks and over-hanging vegetation where possible.



Grey-headed Flying-fox Pteropus poliocephalus (vulnerable)

Grey-headed Flying-fox is listed as vulnerable under the EPBC Act. The Grey-headed Flying-fox trends with the distribution of plants with similar flowering and fruiting times, support regular annual cycles of migration (Eby & Lunney 2002). It can be associated with flowering eucalyptus dependant on seasonality. Grey-headed Flying-foxes congregate in daytime 'camps' within densely treed sites where thousands of individuals may roost. They fly out to feed nocturnally and may travel tens of kilometres to forage on fruit and nectar of flowering trees. Key threats to the Grey-headed Flying-fox include habitat fragmentation and habitat degradation, low levels of mortality, exploitation and competition. The species is largely impacted by urban growth displacing individuals.

Previous records of the Grey-headed flying fox exist in the surrounding locality, though there are no records of the species occurring within five kilometres from the study area. No camp sites were detected within the study area or subject land during the field investigation. Given the nearby resources, surrounding intact vegetation and camp located near Nathalia approximately 20 kilometres to the east of the study area, the species may use the study area for occasional foraging resources. The nearest Nationally Important camp occurs in Bendigo, over 80 kilometres from the study area.

The proposed works will result in the potential removal of eight large trees which constitutes foraging habitat for the species. The remainder of the 6.8 hectares of native vegetation proposed for removal will consist of understorey vegetation and will not impact forest and woodland canopy. An assessment of whether the proposed project is likely to lead to a significant impact Grey-headed Flying-fox is provided below.

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	While the proposed trail construction will result in the removal of potential foraging resources for Grey-headed Flying-fox, the total area of habitat being removed is considered low quality, non- breeding habitat. Additionally, the species is likely to infrequently occur within the study area.
		The species prefers large, consolidated vegetation communities that produce significant foraging resources. Given the scale of the impact, and amount of low quality foraging habitat to be removed (eight large trees), it is unlikely that it will lead to a long- term decrease in the size of an important Grey-headed Flying- fox population.
Reduce the area of occupancy of an important population	Unlikely	The species is highly mobile and relatively widespread, roosting and maternity sites are well documented and conspicuous. No roosting or breeding habitat was recorded during field assessment.
		Due to the small area, limited number of potential feed trees to be removed and no known camps within the locality the overall area of occupancy of the species is likely to remain unchanged.
		The species will continue to forage in retained habitat either side of the trail alignment and the proposed trail construction will not represent a barrier to the movement of individuals.

Table 24Grey-headed Flying-fox Pteropus poliocephalus – assessment against Significant Impact
Criteria (DoE 2013)



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Fragment an existing important population into two or more populations	Unlikely	The national population of the Grey-headed Flying-fox is considered a single population as it is a highly mobile species. The study area contains low to moderate condition forest and woodland vegetation that may be occasionally provide foraging resources. No camps have previously been recorded within the study area and no roosting individuals were present during field investigation. Given that no roosting camp is located nearby and the highly mobile nature of the species (known to travel up to 50 kilometres whilst foraging), the proposed removal of up to eight large trees including a small amount of potential foraging habitat for the species will not fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of the species	Unlikely	Habitat critical to the survival of the Grey-headed Flying-fox includes important breeding and foraging resources. Limiting foraging resources may constitute habitat critical for the survival of Grey-headed Flying-fox and may include areas with highly productive winter flowering tree species. It is considered unlikely that removal of a small extent of potential foraging habitat in the impact area would constitute an adverse effect to habitat critical to the survival of the Grey-headed Flying-fox. The species is infrequently recorded along the Murray River, and no camps will be impacted by the proposed development.
Disrupt the breeding cycle of an important population	Unlikely	While the project may result in the removal of vegetation utilised for foraging by the species, the project will not result in the disruption to the breeding cycle of any local Grey-headed Flying- fox population or the species as a whole. The proposal will not provide further disturbance from noise or lighting pollution that will substantially interfere with the species' ability to reproduce successfully as the subject land is not within close proximity to breeding areas. Grey-headed Flying-foxes will continue to breed in camps unaffected by vegetation loss and as a result the breeding cycle of the population will not be disrupted.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	Grey-headed Flying-foxes are assumed to utilise the study area on occasion for foraging. The project will only impact a small number of trees which may provide foraging resources at certain times of the year. Some sections of the proposed trail alignment are surrounded by higher-quality resources as part of intact native vegetation within the locality, therefore the project will only impact a very small number of potential resources within the broader landscape. The removal of a small number of trees is also unlikely to compromise the capacity of the local area to support a future camp. The proposed development will remove up to eight large trees, with primary impacts on understorey vegetation in the impact area, this will not fragment or isolate the population as it is a small area, and vegetation within the locality is largely intact and native. While the project will result in the removal of trees, some of which may be occasionally used by the species, this level of



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
		loss is not likely to result in the decline of the species at a national scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	There are a moderate number of feral animals and plants that are known or likely to be well established in the study area. Some of these have potential to negatively impact Grey-headed Flying-fox including foxes and dogs. However it is unlikely that the project would result in the establishment of new species. The proposed action is unlikely to exacerbate the current level of invasive species threat operating within the project area.
Introduce disease that may cause the species to decline	Unlikely	The project is unlikely to result in the introduction of a disease that could reduce the reproductive output of Grey-headed Flying-foxes in or near the project area.
Interfere substantially with the recovery of a species	Unlikely	The project will not fragment habitat for the Grey-headed Flying- fox and will not significantly contribute to the loss of habitat as it will result in the removal of up to eight large trees. The proposed development will not result in activities likely to lead to the exploitation of the species, or increase incidence of competition or hybridisation. The project is therefore unlikely to substantially interfere with the recovery of the Grey-headed Flying-fox.

Conclusion for Grey-headed Flying-fox

It is considered unlikely that the proposed action will result in a significant impact on Grey-headed Flying-fox. The key considerations in this conclusion are that minimal impacts on tree canopy will occur from the proposed project, as the majority of vegetation removal is proposed to be understorey. The proposed works may result in the potential removal of eight large trees which constitutes foraging habitat for the species. This impact will remove a very small extent of potential foraging habitat within the broader corridor of native vegetation surrounding the Murray River, where the species infrequently occurs.



Threatened woodland birds: Diamond Firetail *Stagonopleura guttata* (vulnerable) and Brown Treecreeper (south eastern) *Climacteris picumnus victoriae* (vulnerable)

These two threatened woodland bird species have been assessed together against significant impact criteria for vulnerable species as they are both supported by woodland habitat in the impact area. Both species are known to occur within and adjacent to the study area, and were recorded during fauna assessments.

The Diamond Firetail is listed as vulnerable under the EPBC Act. The species typically occurs in open woodland and grassland habitats inland of the Great Dividing Range. They prefer habitat with relatively low tree density, limited log and litter cover but high grass cover (DCCEEW 2023a). Populations have significantly declined in recent years, thought to be driven by a loss of habitat from native vegetation clearing for large scale agriculture (DCCEEW 2023a). Flocks typically forage in the understorey and nests are built in trees, shrubs or often at the base of large raptor stick-nests.

The Brown Treecreeper (south-eastern) is listed as vulnerable under the EPBC Act. The species typically occurs in dry open eucalypt dominated woodlands and forests, with an open or shrubby understorey. Brown Treecreeper forage in pairs or small family groups in both understorey and canopy stratum (DCCEEW 2023b). The species are usually cooperative breeders and families are dependent on hollows for nesting.

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	No important populations of Diamond Firetail or Brown Treecreeper are defined in the species Conservation Advice. The populations of these species occurring within and around the study area likely form part of a broader population occurring throughout south-east mainland Australia. Impacts on woodland birds have been largely minimised through the use of existing trails, however the project proposes to remove 6.8 hectares of primarily understorey native vegetation, and eight large trees. Removal of this extent of habitat along a narrow trail alignment is unlikely to lead to a long-term decrease in the size of the populations.
Reduce the area of occupancy of an important population	Unlikely	The construction of a narrow trail designed to minimise native vegetation removal, maintain canopy connectivity, and utilise existing walking trails where possible is unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	Unlikely	The disturbance associated with trail construction will be a discrete narrow disturbance that will not act as a barrier for dispersal for Diamond Firetail or Brown Treecreeper, as the canopy will remain effectively contiguous in the context of this species dispersal and movement patterns.
Adversely affect habitat critical to the survival of the species	Unlikely	No areas of critical habitat are listed for Diamond Firetail or Brown Treecreeper in the Register of Critical Habitat under the EPBC Act. The conservation advice for Diamond Firetail and Brown Treecreeper states that any known or likely habitat should be considered habitat critical to the survival of the species (DCCEEW 2023a, DCCEEW 2023b). Both species have been recorded utilising the study area, and native vegetation

Table 25Diamond Firetail Stagonopleura guttata and Brown Treecreeper (south-eastern) Climacteris
picumnus victoriae – assessment against Significant Impact Criteria (DoE 2013)



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
		removal for the proposed trail alignment may be considered to meet this broad definition. However, individuals are wide ranging and highly mobile, likely to utilise a range of suitable habitat in the surrounding landscape. The removal of a narrow corridor of habitat is unlikely to be considered sufficient to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Unlikely	Eight large trees are proposed for removal, which are likely to contain hollows. These large trees may provide breeding habitat for Brown Treecreeper if they contain hollows, or tree canopies (branches) may be utilised by Diamond Firetail for nesting. If the trail alignment cannot avoid the removal of hollow-bearing trees, removal should occur outside of the breeding season for Diamond Firetail (August to January) and Brown Treecreeper (July to February) to avoid potential disruption to the species breeding period.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project will likely impact a small amount of the habitat available for Diamond Firetail and Brown Treecreeper in the broader landscape. The proposed trail is not likely to isolate populations as the trail will not constitute a barrier to movement. While the works will result in the removal of understorey vegetation and several trees within forest and woodland occupied by these species, this level of loss is not likely to result in the decline of the species at a local or national scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	Invasive fauna species are already present within the project area (e.g. invasive weeds, cats and foxes), it is unlikely that other invasive species harmful to Diamond Firetail and Brown Treecreeper will become established within the project area. In particular, invasive annual grasses pose a key threat to the species (DCCEEW 2023). Actions should be taken to prevent the introduction and spread of weeds during and post trail construction.
Introduce disease that may cause the species to decline	Unlikely	The project will not result in the introduction of a disease that is harmful to Diamond Firetail or Brown Treecreeper.
Interfere substantially with the recovery of a species	Unlikely	The Conservation Advice for Diamond Firetail (DCCEEW 2023a) identifies the key threats to the species to include habitat loss, degradation and fragmentation and the reduction in the extent and quality of habitat due to weeds, die-back and damage caused by livestock and feral herbivores. Key conservation actions are identified as retaining, protecting, and maintaining areas of high-quality habitat, including woodland, open forest, grassland, and mallee habitat. The Conservation Advice for Brown Treecreeper (DCCEEW 2023b) identifies the key threats to the species to include habitat loss, degradation and fragmentation, climate change, competition and invasive species. Key conservation actions include ceasing all land clearing of habitat critical of the survival of the species, undertake vegetation, promote ecological



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
		management and connectivity of remnant woodland and ensure populations remain connected, and promote appropriate water regimes.
		The scale of possible effects of the project on the species is not likely to interfere substantially with the recovery of Diamond Firetail or Brown Treecreeper.

Conclusion for Diamond Firetail and Brown Treecreeper

The project is considered unlikely to result in a significant impact on Diamond Firetail or Brown Treecreeper based on an assessment against the significant impact criteria for vulnerable species. This conclusion has been reached on the basis that the impact area comprises a small component of foraging resources and potential nesting habitat for Diamond Firetail or Brown Treecreeper and is unlikely to result in a long-term species decline. It is recommended that the impact area avoids the removal of large hollow-bearing trees to further reduce impacts on woodland birds.



Hooded Robin Melanodryas cucullata (endangered)

Hooded Robin is listed as endangered under the EPBC Act. The species occurs in pairs or small flocks in dry eucalypt and acacia woodlands and shrublands with an open understorey (Cth DCCEEW 2023c). The species exhibits a preference for larger connected patches and may avoid woodlands with tall or dense tree cover, and foraging often occurs in grassy clearings. Populations are declining, though to be attributed to habitat loss and fragmentation, threats from invasive mammals and weeds, competition with Noisy Miners *Manorina melanocephala* and overgrazing (Cth DCCEEW 2023c).

Table 26	Hooded Robin <i>Melanodryas cucullata</i> – assessment against Significant Impact Criteria (DoE
	2013)

Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely	Impacts on woodland birds have been largely minimised through the use of existing trails, however the project proposed to remove 6.8 hectares of primarily understorey native vegetation, and eight large trees. Removal of this extent of habitat along a narrow trail alignment is unlikely to lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of the species	Unlikely	The construction of a narrow trail designed to minimise native vegetation removal, maintain canopy connectivity, and utilise existing walking trails where possible is unlikely to reduce the area of occupancy of the population.
Fragment an existing population into two or more populations	Unlikely	The disturbance associated with trail construction will be a discrete narrow disturbance that will not act as a barrier for dispersal for Hooded Robin, as the canopy will remain effectively contiguous in the context of this species dispersal and movement patterns.
Adversely affect habitat critical to the survival of the species	Unlikely	No areas of critical habitat are listed for Hooded Robin in the Register of Critical Habitat under the EPBC Act. The conservation advice for Hooded Robin states that any known or likely habitat should be considered habitat critical to the survival of the species (DCCEEW 2023b). The native vegetation removal for the proposed trail alignment may be considered to meet this broad definition. However, individuals are wide ranging and highly mobile, likely to utilise a range of suitable habitat in the surrounding landscape. The removal of a narrow corridor of potential habitat is unlikely to be considered sufficient to adversely affect habitat critical to the survival of the species. Organic litter, logs and rocks should be avoided and retained as much as possible during trail constriction to maintain suitable foraging habitat for Hooded Robin.



Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Disrupt the breeding cycle of a population	Unlikely	The Hooded Robin breed from July to November in nests located in a tree fork or crevice low to the ground (1 to 5 m). Minimal disturbance to potential breeding habitat will result from the proposed project. If the eight large trees propose for removal cannot be avoided, removal should occur outside of the species breeding season to avoid potential disruption to the species breeding cycle.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The project will likely impact a small amount of the habitat available for the Hooded Robin in the broader landscape. The proposed trail is not likely to isolate populations as the trail will not constitute a barrier to movement. While the works will result in the removal of understorey vegetation and several trees within forest and woodland occupied by these species, this level of loss is not likely to result in the decline of the species at a local or national scale.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	Invasive fauna species are already present within the project area (e.g. invasive weeds, cats and foxes), it is unlikely that other invasive species harmful to Hooded Robin will become established within the project area. In particular, invasive perennial grasses pose a key threat to the species (DCCEEW 2023b). Actions should be taken to prevent the introduction and spread of weeds during and post trail construction.
Introduce disease that may cause the species to decline	Unlikely	The project will not result in the introduction of a disease that is harmful to Hooded Robin.
Interfere with the recovery of a species	Unlikely	The Conservation Advice for Hooded Robin (DCCEEW 2023b) identifies the key threats to the species to include habitat loss, degradation and fragmentation, climate change, competition, fire and invasive species. Key conservation actions are identified as retaining, protecting, and maintaining areas of habitat critical to the species survival, retaining and restoring woodland patches, revegetation and maintaining landscape connectivity. The constriction of a narrow trail alignment will not interfere with woodland connectivity, and will result in a minimal extent of disturbance to potential foraging and breeding habitat. The scale of possible effects of the project on the species is not likely to interfere with the recovery of Hooded Robin.

Conclusion for Hooded Robin

It is considered unlikely that the proposed action will result in a significant impact on Hooded Robin. The key considerations in this conclusion are that the proposed impact area comprises a small component of foraging resources and potential nesting habitat for Hooded Robin and is unlikely to result in a long-term species



decline. Utilising existing trails where possible and maintaining connectivity along the proposed alignment will ensure populations remain connected. If possible, the trail should avoid the removal of large trees, and avoid disturbing areas of high organic litter, logs and rocks, to further reduce impacts on woodland birds.



Swift Parrot Lathamus discolor (critically endangered)

Swift Parrot is listed as critically endangered under the EPBC Act. The Swift Parrot breeds exclusively in Tasmania during the summer, with the entire population migrating to south-eastern mainland Australia for the winter. The species acts as a single nomadic population, following seasonally available food. The species feeds primarily on the nectar of flowering eucalypts and psyllid lerps. Foraging habitat in Victoria predominantly occurs in dry forests and box-ironbark communities inland of the Great Dividing Range, as well as occasional records in Melbourne and Geelong urban areas and the Gippsland region.

Habitat for the species within the study area includes all woodland and forest habitat with mature flowering eucalypts for occasional foraging. The study area is outside of the species breeding range. Swift Parrot is known to occasionally occur in the local area, and the species may occasionally forage in or move through in the assessment corridor.

Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of a population	Unlikely	The impact area contains potential foraging habitat, however no preferred foraging trees are proposed to be impacted, and the project is not within an area identified as priority habitat
Reduce the area of occupancy of the species	Unlikely	for conservation management of Swift Parrot in the species National Recovery Plan (DCCEEW 2024). The eucalypt canopy within the project area will be mostly unaffected, though eight large River Red-gum are proposed for removal. The impact area also does not contain breeding habitat, and the project will not result in the construction of any structures that could present a collision risk. The project therefore has no capacity to lead to a population decrease or reduce the area of occupancy for the species.
Fragment an existing population into two or more populations	Unlikely	It is unlikely that the proposed works will fragment the population as the species is highly mobile (capable of flight), occurs as a single migratory population, and is unlikely to be significantly impacted by the minimal habitat loss or disturbance.
Adversely affect habitat critical to the survival of the species	Unlikely	For Swift Parrot in Victoria, foraging habitat includes all preferred foraging species within known and likely foraging habitat on the mainland. Impacts on trees will be largely avoided along the trail alignment, and no key foraging tree species are proposed to be impacted, therefore the proposed works are unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	Unlikely	Swift Parrots only breed in eastern and south-eastern Tasmania and do not breed on mainland Australia. The project therefore has no capacity to disrupt the breeding cycle of Swift Parrots.

Table 27 Swift Parrot Lathamus discolor – assessment against Significant Impact Criteria (DoE 2013)



Significant impact criteria (critically endangered/endangered species)	Likelihood of significant impact	Justification		
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The impact area contains potential foraging habitat, however no preferred foraging trees are proposed to be impacted, and the project is not within an area identified as priority habitat for conservation management of Swift Parrot in the species National Recovery Plan (DCCEEW 2024). The eucalypt canopy within the project area will be mostly unaffected, though eight large trees are proposed for removal. The impact area also does not contain breeding habitat. It is therefore considered unlikely that the project will result in any changes to availability or quality of habitat that could result in species decline.		
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely	The project does not include any known mechanism that would result in establishment of invasive species that are not already present in the local area. To prevent further spread or establishment of new weed species, a detailed CEMP should include weed management strategies and a site induction should highlight the conservation value of native vegetation.		
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the local environment. A detailed CEMP should include weed management strategies to avoid the introduction and spread of disease.		
Interfere with the recovery of a species	Unlikely	The species national Recovery Plan identifies actions to improve the extent, condition and connectivity of habitat, reduce anthropogenic threats and maintain increasing population trend (DCCEEW 2024). The project does not conflict with the objectives or actions outlined in the species' recovery plan.		

Conclusion for Swift Parrot

It is considered unlikely that the proposed action will result in a significant impact on Swift Parrot. The key considerations in this conclusion are no loss of preferred foraging trees or priority habitat, no impact on breeding habitat and maintaining habitat connectivity throughout the landscape.



Superb Parrot Polytelis swainsonii (vulnerable)

The Superb Parrot is listed as vulnerable under the EPBC Act. Superb Parrots are absent from large areas of the Riverina and northern Victoria, confined to the Barmah Forest area with the core distribution being west of the Great Dividing Range in NSW from Canberra, Goulburn and as far west as Nyngan and Swan Hill. There are only three main breeding areas: an area of the south-west slopes bounded by Molong, Rye Park, Yass, Coolac, Cootamundra and Young (NSW); along the Murrumbidgee River, between Wagga Wagga and Toganmain Station, and farther north at Goolgowi (NSW); and along the Murray and Edward Rivers, from east of Barmah and Millewa State Forest to south of Taylors Bridge (NSW and Victoria). The species occurs in boxgum and acacia woodlands and riverine woodlands. They mostly feed on the ground on fruits and seeds from a variety of plants but also feed extensively in shrubs and trees. The species is considered likely to occur throughout River Red-gum dominated habitat.

It was formerly considered that there were two separate populations of the Superb Parrot, one in southern NSW and northern Victoria, and the other further north in NSW (Forshaw & Cooper 1969, 1981), but it is now apparent that only a single population exists (Higgins 1999).

Table 28Superb Parrot Polytelis swainsonii – assessment against Significant Impact Criteria (DoE
2013)

Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Lead to a long-term decrease in the size of an important population of a species	Unlikely	The proposed trail alignment will result in the removal of areas of woodland (including derived woodland) and large trees that provide foraging habitat for Superb Parrot. The study area intersects the potential breeding range for Superb Parrot in its eastern most extent (Section 8) in the south-western section of Barmah National Park, with the Victorian Barmah region estimated to support 30–40 nest trees (DSE 2011). Within Barmah National Park, very minor disturbance is proposed to occur, associated with a small extent of understorey removal for the Gulf Campground and Barmah Lakes Canoe Launch. No trees are proposed to be impacted within this region. Given the local scale of removal and the availability of roosting, foraging and breeding resources in the broader study area and surrounding landscape, The proposed trail alignment is unlikely to lead to a long-term decrease in the size of a population of the species.
Reduce the area of occupancy of an important population	Unlikely	The Recovery Plan indicates that 'actions that remove habitat critical to survival would likely interfere with the recovery of the Superb Parrot and reduce the area of occupancy of the species' (DAWE 2021b). The proposed removal of eight large trees may be considered to meet the definition of habitat critical to the species survival, if the large trees contain hollows with the key characteristics required for breeding. However, individuals are wide ranging and highly mobile, likely to utilise a range of suitable habitat in the surrounding landscape. Additionally, the species primarily breeds in the Riverina and nearby Barmah National Park, beyond the proposed impact area of the trail alignment. The removal of a narrow corridor of habitat is unlikely to reduce the area of occupancy of the population in the context of available habitat throughout the species broader distribution.



Significant impact criteria (vulnerable species)	Likelihood of significant impact	Justification
Fragment an existing important population into two or more populations	Unlikely	Superb Parrot displays seasonal movement patterns typified by post-breeding dispersal and local nomadism. The species is highly mobile and individuals can move freely through areas of unsuitable and marginal habitat to seek out and exploit favourable habitat patches. The disturbance associated with trail construction will be a discrete narrow disturbance that will not act as a barrier for dispersal for the species, as the canopy will remain effectively contiguous in the context of this species dispersal and movement patterns. As such, the proposed trial alignment is unlikely to fragment the existing population.
Adversely affect habitat critical to the survival of the species	Unlikely	 The National Recovery Plan for Superb Parrot (DAWE 2021b) lists foraging and breeding habitat as critical habitat for Superb Parrot. Key Biodiversity Areas (KBAs) defined in the national Recovery Plan are considered critical for supporting the long-term persistence of the species. Other critical habitat is associated with areas containing riparian woodlands, with suitable large, hollowbearing trees for nesting and breeding. The proposed trail alignment is within the Barmah-Millewa KBA and involves the removal of riparian woodlands that could be considered breeding habitat critical to the survival of Superb Parrot is defined in the species national Recovery Plan as: Known breeding colonies with a 10 km buffer zone, with suitable hollow-bearing trees (DBH of around 113 cm) which area essential for breeding. All preferred foraging habitat during breeding and nonbreeding seasons, including agricultural and non-native feeding areas. Breeding records from over 40 years ago of the species of the proposed large tree removal at Deep Creek, and the population is known to breed in nearby in Barmah National Park. The Recovery Plan indicates that 'actions that remove habitat critical to the superior of the species'. The proposed removal of eight large trees may be considered to meet the definition of habitat critical to the species survival. However, the species is highly mobile with a broad dispersal extent, and the impact area is located beyond the key breeding habitat in Barmah National Park. The removal of eight large trees to the extent of possible decline. If the large trees proposed for removal provide suitable breeding habitat in the survival of the species to the extent of possible decline. If the large trees proposed for removal provide suitable breeding habitat critical to the survival of the species to the extent of possible decline.



Significant impact criteria	Likelihood of	Justification			
(vulnerable species)	significant impact				
		qualified Ecologist. Tree removal must occur outside of the species key breeding period (September to December).			
Disrupt the breeding cycle of an important population	Unlikely	Provided the above mitigation measures around pre-clearance surveys for hollow-bearing trees and the timing the removal of any hollow-bearing trees are adhered to, the risk of disrupting the breeding cycle of an important population of this species is considered low.			
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely	The proposed trail alignment will result in the removal of known and potential foraging habitat and potential breeding habitat fo Superb Parrot. However, as described above, the magnitude of the impact is small in the context of other causes of habitat loss operating across the species' range and in isolation is unlikely to impact the species to the extent that it would cause a decline in the population.			
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely	Most locations where this habitat for this species occurs are subject to existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding agricultural land use. The proposed trail alignment is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to Superb Parrot.			
Introduce disease that may cause the species to decline	Unlikely	The project does not include any known mechanism that would result in introduction of any disease that is not already present in the relevant environment. A detailed CEMP should include weed management strategies to avoid the introduction and spread of disease.			
Interfere substantially with the recovery of a species	Unlikely	Major threats to the Superb Parrot are loss and degradation of habitat, competition for nest hollows, road kills, illegal removal of wild birds, Psittacine beak and feather disease (PBFD) and climate change. If the large trees proposed for removal provide suitable breeding hollows and cannot be avoided, the loss of a small extent of potential foraging and breeding habitat may be considered interference with the species recovery as defined by the national Recovery Plan (DAWE 2021b). Additionally, increased human activity in near breeding sites (eg. from camping and picnic areas) has the potential to interfere with nesting behaviours (DSE 2011) and may be considered a facilitated impact. Given the existing the long-term use of the study area by visitors and recreational campers, it is not expected that these impacts will be significantly increased from present levels. However, the proposed extent of habitat removal along a narrow linear corridor is considered relatively minor in the context of available foraging, roosting and breeding habitat in the local area, and is unlikely to substantially interfere with the species recovery.			



Conclusion for Superb Parrot

It is considered unlikely that the proposed action could result in a significant impact on Superb Parrot. The key considerations in this conclusion are that the removal of a small extent of potential breeding and foraging habitat is unlikely to adversely affect habitat critical to the survival of Superb Parrot to the extent of species decline, given the context removal along a narrow trail alignment and the availability of roosting, foraging and breeding resources in the broader surrounding landscape. Mitigation measures must be implemented to reduce potential impacts on the species and their breeding cycle, including pre-clearance surveys to identify potential hollows and supervision of tree removal by a suitable qualified ecologist. Additionally, tree removal must occur outside the species key breeding period (September to December).



Appendix 6.3 Threatened ecological communities

Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Table 29Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of
South-eastern Australia, endangered – assessment against Significant Impact Criteria (DoE
2013)

Significant impact criteria (critically endangered/endangered community) Reduce the extent of an	Likelihood of significant impact Unlikely	Justification Construction of the proposed MRAT will require the removal of
ecological community.		0.44 hectares of vegetation within this community. Vegetation removal will be restricted to a disjunct and narrow (i.e. 2.5 m) linear corridor and will be limited to the removal of understorey vegetation only – the canopy will not be impacted by trail construction works. Occurrence of this community within the MRAT alignment are within its core geographic range so are not outliers or unique examples of the community. Therefore, impacts will not lead to a reduction in the community's extent across its range.
Fragment or increase fragmentation of an ecological community.	Unlikely	Works will generally occur in areas of existing disturbance (i.e. informal trails), where the understorey is already partly reduced/fragmented. The proposed works will not impact on the canopy, and thus are highly unlikely to cause further fragmentation of the ecological community.
Adversely affect habitat critical to the survival of an ecological community.	Unlikely	Construction of the trail will require understorey vegetation removal from within a landscape that has been subject to ongoing informal disturbances (e.g. 4WD use, informal trails). Construction of the trail may have beneficial outcomes for areas of the community outside the construction footprint by reducing disturbance by pedestrian and vehicle traffic through remnant vegetation. The proposed works will not impact on the canopy. Soil disturbance and subsequent weed invasion will be minimised through strict hygiene protocol during construction. The project CEMP will specifically deal with controlling the introduction and spread of weed species, especially those species associated with walking track edges. Ongoing monitoring will be required to manage the establishment of weeds once the trails are operational, and a trail management plan will be developed to address this. On these grounds, the works are considered highly unlikely to adversely affect habitat critical to the survival of the ecological community.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage	Unlikely	The proposed trail and campsite construction works will not impact on groundwater levels or alter surface water drainage patterns. The landscape is mostly flat is flood-prone. Consideration of the flood-prone nature of the landscape has been a key consideration during trail design, and the proposed gravel pathway will not impede or alter drainage of the local area post-construction.



Significant impact criteria (critically endangered/endangered community)	Likelihood of significant impact	Justification
patterns.		
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.	Unlikely	Construction will require the removal of understorey vegetation only, from within a narrow linear corridor. The canopy will remain intact during and post-construction. A strict machinery hygiene protocol will be implemented during construction to ensure risk of introduction of any new species during construction is minimised. A trail management plan to guide management priorities post-construction (including treatment of weeds) will also be developed. On this basis, the works are considered unlikely to cause a change in the species composition of the area.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - Assisting invasive species establishment - Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	Unlikely	 Mitigation measures to reduce risk of invasive (weed) species establishment include: A strict machinery hygiene protocol to be implemented during construction. Development of a trail management plan to guide management priorities post-construction (including treatment of weeds). Works will not increase mobilisation of fertilisers, herbicides or other pollutants into the ecological community. On the basis of implementation of the above mitigation measures, the works are considered unlikely to cause a substantial reduction in the quality or integrity of the community across the MRAT alignment.
Interfere with the recovery of an ecological community.	Unlikely	There is no recovery plan for the community and development of one has been deemed not required.

Conclusion for Grey Box Woodlands

Construction of the trail will require the removal of 0.44 hectares of the community, which will be restricted to understorey vegetation only. The trail has been designed to follow areas of existing informal disturbances, and the canopy will remain intact thus construction of the trail will not contribute to fragmentation of the community. A strict machinery hygiene protocol to be implemented during construction and a trail management plan will guide operational management of the trail post construction (including management of weeds). On this basis, a significant impact on the Grey Box Woodland community is not expected to occur as a result of the project.



Appendix 7 Vegetation impact assessment results

Appendix 7.1 Vegetation quality assessment results

Table 30 Vegetation quality assessment results within the Section 8 assessment corridor

Habitat Zone ID		3 (25.7.22)	2 (25.7.22)	6 (25.7.22)	Gulf campground (S8)	
EVC #: Name		MuF_814 - moderate quality	MuF_295 - moderate quality	MuF_106 - high quality	816 MuF	
		Max Score	Score	Score	Score	Score
	Large Trees	10	7	7	5	5
	Tree Canopy Cover	5	5	5	5	4
c	Lack of Weeds	15	6	6	2	4
Site Condition	Understorey	25	15	15	15	15
	Recruitment	10	10	5	10	10
	Organic Litter	5	3	3	5	3
	Logs	5	2	3	3	5
Total Site Score	Total Site Score		48	44	45	46
e	Patch Size	10	8	8	8	8
scap	Neighbourhood	10	7	7	7	7
Landscape Value	Distance to Core Area	5	4	4	4	4
Total Landscape Score			19	19	19	19
Habitat	Habitat points = #/100 100		67	63	64	65
CONDITION SCORE 1		0.67	0.63	0.64	0.65	



Table 31Vegetation quality assessment results within the Section 9 assessment corridor

На	bitat Zone ID		20 (27.7.2 2)	1 (26.7.2 2)	14 (27.7.2 2)	17 (27.7.2 2)	6 (26.7.2 2)	1_EK (26.7.2 2)	2_EK (26.7.2 2)	3 (26.7.2 2)	3 (26.7.2 2)	EK 815	GZ 106	GZ 814	Kiln Bend (S9)
EV	C #: Name		MuF_29 5	MuF_56	MuF_80 3	MuF_80 3	MuF_29 5	MuF_56	MuF_10 3	MuF_10 3	MuF_29 5	MuF_81 5	VicRiv/ MuF_10 6	MuF_81 4	MuF_29 5
		Max Scor e	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
	Large Trees	10	9	10	7	10	7	9	9	9	9	9	9	3	5
c	Tree Canopy Cover	5	5	5	5	5	4	4	4	5	4	4	5	4	5
Condition	Lack of Weeds	15	2	9	9	9	9	2	2	9	2	2	2	0	13
ond	Understorey	25	5	15	15	15	15	15	15	15	15	5	10	15	10
	Recruitment	10	10	5	6	6	5	10	5	5	5	5	10	10	5
Site	Organic Litter	5	3	3	3	3	3	5	3	3	5	3	5	5	5
	Logs	5	0	0	4	5	5	5	5	4	5	5	5	5	0
	Total Site Score		34	47	49	53	48	50	43	50	45	33	46	42	43
e	Patch Size	10	8	8	8	8	8	8	8	8	8	8	8	8	8
e Value	Neighbourhoo d	10	2	3	2	2	5	5	5	4	6	4	5	5	7
Landscape	Distance to Core Area	5	4	4	4	4	4	4	4	4	4	4	4	4	4
Lan	Total Landscape Score	2	14	15	14	14	17	17	17	16	18	16	17	17	19
Ha #/1	bitat points = 00	100	48	62	63	67	65	67	60	66	63	49	63	59	62
СО	NDITION SCORE	1	0.48	0.62	0.63	0.67	0.65	0.67	0.6	0.66	0.63	0.49	0.63	0.59	0.62



Table 32 Vegetation quality assessment results within the Section 10 assessment corridor

Habita	Habitat Zone ID		1001 22.8.22	1004/7 22.8.22	1015 23.8.22	1017 24.8.22 (EPBC)	2022 24.8.22	1008 23.8.22	1013 23.8.22 (EPBC)	1010 23.8.22	1006 23.8.22 (derived)	1016 24.8.22
EVC #:	Name		MuF_295	MuF_295	VicRiv_106	MuF_803	MuF_816	MuF_106	MuF_803	MuF_803	MuF_803	MuF_295
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
	Large Trees	10	10	5	5	9	9	9	9	9	0	9
	Tree Canopy Cover	5	5	5	5	5	5	5	5	5	0	5
c	Lack of Weeds	15	6	2	2	6	2	2	2	2	6	2
Site nditio	Understorey	25	15	15	15	15	15	10	15	15	15	10
Site Condition	Recruitment	10	10	6	10	6	10	10	10	10	5	5
U	Organic Litter	5	3	3	5	3	3	5	5	3	5	3
	Logs	5	5	3	0	5	0	5	3	5	0	5
	Total Site Score		54	39	42	49	44	46	49	49	31	39
e	Patch Size	10	1	8	8	8	8	8	8	8	8	8
Landscape Value	Neighbourhood	10	4	5	3	5	5	3	5	5	2	3
und: Val	Distance to Core Area	5	3	4	4	4	4	4	4	4	4	4
Ľ	Total Landscape Score		8	17	15	17	17	15	17	17	14	15
Habita	it points = #/100	100	62	56	57	66	61	61	66	66	45	54
CONDI	ITION SCORE	1	0.62	0.56	0.57	0.66	0.61	0.61	0.66	0.66	0.45	0.54



Table 33 continued

Habita	Habitat Zone ID		JK 28 24.8.22	JK 24 24.8.22	JK 3 22.8.22	JK 4 23.8.22 (EPBC)	JK 14 23.8.22	JK 18 23.8.22	JK 10 23.8.22	JK 25 24.8.22	JK 26 24.8.22 (EPBC)	EK
EVC #:	Name		VicRiv_106	MuF_803	VicRiv_295	VicRiv_803	MuF_295	MuF_103	MuF_803 23.8.22	VicRiv_103	MuF_803	MuF_56
		Max Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
	Large Trees	10	10	9	9	9	9	9	2	10	10	9
	Tree Canopy Cover	5	5	4	4	2	5	5	0	5	5	5
Ę	Lack of Weeds	15	2	2	2	9	6	9	6	6	9	2
Site Condition	Understorey	25	10	10	15	15	15	15	5	15	10	5
Si	Recruitment	10	6	10	10	10	5	10	3	10	10	10
Ŭ	Organic Litter	5	5	3	3	3	5	3	5	3	3	3
	Logs	5	5	0	2	5	5	2	0	2	0	0
	Total Site Score		43	38	45	53	50	53	21	51	47	34
e	Patch Size	10	8	8	8	8	8	8	8	8	8	1
Landscape Value	Neighbourhood	10	4	1	1	1	2	5	1	3	5	4
und: Val	Distance to Core Area	5	4	4	4	4	4	4	4	4	4	3
La	Total Landscape Score		16	13	13	13	14	17	13	15	17	8
Habita	it points = #/100	100	59	51	58	66	64	70	34	66	64	42
COND	ITION SCORE	1	0.59	0.51	0.58	0.66	0.64	0.7	0.34	0.66	0.64	0.42



Table 33	Vegetation quality assessment results within the Section 11 assessment corridor
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Habita	t Zone ID		1001 25.8.22	1006 25.8.22	1013 25.8.22	1004 25.8.22	1003 25.8.22	1012 25.8.22	1 JK 25.8.22	1010 25.8.22	Nursery Bend campsite	Broken River Bend campsite	Yarran Ck campsite
EVC #:	Name		106_MuF	803_MuF	803_MuF	814_MuF	814_MuF	816_MuF	816_MuF	295_MuF	816 MuF	816 MuF	106 MuF
		Max Score	Score	Score	Score								
	Large Trees	10	2	9	6	5	3	9	9	9	9	9	5
	Tree Canopy Cover	5	4	4	5	2	4	5	5	5	5	5	3
5	Lack of Weeds	15	0	6	15	4	0	2	2	2	7	9	7
Site Condition	Understorey	25	10	10	10	15	15	15	15	10	15	15	10
Con	Recruitment	10	10	10	10	10	10	10	10	5	10	3	6
	Organic Matter	5	5	3	3	3	5	3	3	3	3	3	5
	Logs	5	3	5	3	5	5	5	0	5	2	5	0
	Total Site Score		34	47	52	44	42	49	44	39	51	49	36
a	Patch Size	10	8	8	8	8	8	8	8	8	8	8	8
cap. Je	Neighbourhood	10	7	7	7	7	8	7	4	7	8	8	8
Landscape Value	Distance to Core Area	5	4	4	4	4	4	4	4	4	4	4	4
	Total Landscape	Score	19	19	19	19	20	19	16	19	20	20	20
Habita	t points = #/100	100	53	66	71	63	62	68	60	58	71	69	56
CONDI	TION SCORE	1	0.53	0.66	0.71	0.63	0.62	0.68	0.6	0.58	0.710	0.690	0.560



Appendix 7.2 Tree data

Table 34Large trees deemed lost by proposed works

Scientific name	Common name	Circumference (cm)	Hollow bearing?	Status
Eucalyptus camaldulensis	River Red-gum	283	No	Deemed lost
Eucalyptus camaldulensis	River Red-gum	314	No	Deemed lost
Eucalyptus camaldulensis	River Red-gum	314	No	Deemed lost
Eucalyptus camaldulensis	River Red-gum	336	Yes	Deemed lost
Eucalyptus camaldulensis	River Red-gum	254	Yes	Deemed lost
Eucalyptus camaldulensis	River Red-gum	691	Yes	Deemed lost
Eucalyptus camaldulensis	River Red-gum	443	Yes	Deemed lost
Eucalyptus camaldulensis	River Red-gum	314	Yes	Deemed lost



Appendix 8 Native vegetation removal report



NVRR ID: 347_20241004_BHA

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

Report details

Date created: 04/10/2024

Local Government Area:

MOIRA SHIRE CAMPASPE SHIRE GANNAWARRA SHIRE

Shapefile name: NVR_Removal_MRAT37179_20240930.shp

Site assessor name:

gzacks SarahHilliar ekelly janekenny (1 additional assessor not listed)

Registered Aboriginal Party: Yorta Yorta

Coordinates: 144.96382, -36.07960

Address:

PIANTA ROAD WHARPARILLA 3564 33 TRETHOWAN ROAD ECHUCA VILLAGE 3564 CAMPASPE ESPLANADE ECHUCA 3564 BRAUND ROAD ECHUCA 3564 STEWARTS BRIDGE ROAD LOWER MOIRA 3639 CRESCENT STREET ECHUCA 3564 ECHUCA-NATHALIA ROAD LOWER MOIRA 3639 MOOR STREET BARMAH 3639 302 SHINBONE ALLEY ECHUCA 3564 MOIRA LAKES ROAD BARMAH 3639 (29 additional addresses not listed)

Regulator Notes

Removal polygons are located:

Within a DEECA Mapped Wetland areaOn Crown Land

This report includes partial removal



Summary of native vegetation to be removed

Assessment pathway	Detailed Assessment Pathway									
Location category	characteris as encomp wetland or	vegetation extent map indicates that this area sed as supporting native vegetation. Additional assing an endangered Ecological Vegetation C sensitive coastal area. The removal of less tha etation in this area will not require a Species O	ly, it is modelled ass, sensitive n 0.5 hectares of							
Total extent including past and proposed removal (ha) Includes endangered EVCs (ha): 1.741	6.8	Extent of past removal (ha) Extent of proposed removal - Patches (ha) Extent of proposed removal - Scattered Trees (ha)	0 6.800 0.000							
No. Large Trees proposed to be removed	8	<i>No. Large Patch Trees</i> <i>No. Large Scattered Trees</i>	8 0							
No. Small Scattered Trees	0									

Offset requirements if approval is granted

Any approval granted will include a condition to obtain an offset, before the removal of native vegetation, that meets the following requirements:

General Offset amount ¹	2.9100 General Habitat Units						
Vicinity	Goulburn Broken CMA, North Central CMA or MOIRA SHIRE LGA, CAMPASPE SHIRE LGA, GANNAWARRA SHIRE LGA						
Minimum strategic biodiversity value score ²	0.6521						
Large Trees [*]	8						
*The total number of Large Trees that the offset must protect	8 Large Trees to be protected in either the General, Species or combination across all habitat units protected						

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

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species with mapped habitat at the site Appendix 3 includes the following figures

- Location map
- Strategic Biodiversity Value map
- Condition map
- Endangered EVCs map
- Aerial photograph showing mapped native vegetation
- Property in context
- Habitat Importance maps

- 2. Minimum strategic biodiversity value score is 80 per cent of the weighted average score across habitat zones where a General Offset is required.
- 3. The Species Offset amount(s) required is the sum of all Species Habitat Units in Appendix 1.

^{1.} The General Offset amount required is the sum of all General Habitat Units in Appendix 1.



Next steps

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

If you wish to remove the mapped native vegetation you are required to apply for approval from the responsible authority. The responsible authority will refer your application to DEECA for assessment, as required. **This report is not a referral assessment by DEECA.**

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

Refer to the Guidelines for a full list of application requirements This report provides information that meets the following application requirements:

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

Additional application requirements must be met including:

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

Appendix 1: Description of native vegetation to be removed

The Species-General Offset Test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the Species Offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact meets or exceeds the Species Offset threshold, a Species Offset is required. This test is completed for all species with mapped habitat at the site. Multiple Species Offsets will be required if the Species Offset threshold is exceeded for multiple species.

Where a zone requires Species Offset(s), the Species Habitat Units for each species in that zone are calculated by the following equation in accordance with the Guidelines: Species Habitat Units = extent without overlap x condition score x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The Species Offset amount(s) required is the sum of all Species Habitat Units per zone.

Where a zone does not require a Species Offset, the General Habitat Units in that zone are calculated by the following equation in accordance with the Guidelines: General Habitat Units = extent without overlap x condition score x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The General Offset amount required is the sum of all General Habitat Units per zone.

Native vegetation to be removed

	Information provided by or on behalf of the applicant							Information calculated by NVR Map								
Zone	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type			
1-AA	Patch	-	MuF_0803	Endangered	yes	0.630	-	0.031	0.031	0.920	-	0.014	General			
1-AB	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.098	0.098	0.914	-	0.046	General			
1-AC	Patch	-	MuF_0295	Vulnerable	no	0.650	3	0.082	0.082	0.873	-	0.075	General			
1-AD	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.063	0.063	0.921	-	0.022	General			



Туре

Zone

Information provided by or on behalf of the applicant Information calculated by NVR Map Extent Bioregional Polygon DBH EVC Partial Condition Large without SBV н Habitat conservation extent **Offset Type** Removal Score Units (cm) code score Tree(s) overlap score status (ha) (ha)

1-AE	Patch	-	MuF_0803	Endangered	yes	0.670	-	0.306	0.306	0.736	-	0.134	General
1-AF	Patch	-	MuF_0103	Endangered	yes	0.600	-	0.039	0.039	0.946	-	0.017	General
1-AG	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.025	0.025	0.830	-	0.012	General
1-AH	Patch	-	MuF_0815	Vulnerable	yes	0.490	-	0.113	0.113	0.850	-	0.038	General
1-Al	Patch	-	MuF_0815	Vulnerable	yes	0.490	-	0.022	0.022	0.887	-	0.008	General
1-AJ	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.006	0.006	0.270	-	0.002	General
1-AK	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.072	0.072	0.861	-	0.024	General
1-AL	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.072	0.072	0.860	-	0.024	General
1-AM	Patch	-	MuF_0103	Endangered	yes	0.600	-	0.037	0.037	0.500	-	0.013	General
1-AN	Patch	-	MuF_0103	Endangered	yes	0.600	-	0.164	0.164	0.760	-	0.065	General
1-AO	Patch	-	MuF_0103	Endangered	yes	0.600	-	0.053	0.053	0.870	-	0.022	General
1-AP	Patch	-	MuF_0103	Endangered	yes	0.660	-	0.037	0.037	0.810	-	0.016	General
1-AQ	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.001	0.001	0.940	-	0.000	General
1-AR	Patch	-	MuF_0103	Endangered	yes	0.660	-	0.171	0.171	0.824	-	0.077	General
1-AS	Patch	-	MuF_0106	Depleted	yes	0.570	-	0.039	0.039	0.804	-	0.015	General
1-AT	Patch	-	MuF_0103	Endangered	yes	0.660	-	0.042	0.042	0.820	-	0.019	General
												•	



	Information provided by or on behalf of the applicant						Information calculated by NVR Map						
Zone	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
1-AU	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.005	0.005	0.270	-	0.001	General
1-AV	Patch	-	MuF_0106	Depleted	yes	0.570	-	0.058	0.058	0.893	-	0.023	General
1-AW	Patch	-	VRiv0106	Depleted	yes	0.570	-	0.279	0.279	0.828	-	0.109	General
1-AX	Patch	-	MuF_0295	Vulnerable	no	0.620	3	0.056	0.056	0.830	-	0.048	General
1-AY	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.026	0.026	0.830	-	0.011	General
1-AZ	Patch	-	MuF_0803	Endangered	yes	0.450	-	0.010	0.010	0.810	-	0.003	General
1-BA	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.084	0.084	0.477	-	0.026	General
1-BB	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.001	0.001	0.840	-	0.001	General
1-BC	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.017	0.017	0.270	-	0.005	General
1-BD	Patch	-	VRiv0295	Vulnerable	no	0.580	2	0.050	0.050	0.832	-	0.040	General
1-BE	Patch	-	VRiv0295	Vulnerable	yes	0.640	-	0.030	0.030	0.890	-	0.014	General
1-BF	Patch	-	VRiv0803	Endangered	yes	0.660	-	0.011	0.011	0.830	-	0.005	General
1-BG	Patch	-	VRiv0803	Endangered	yes	0.660	-	0.058	0.058	0.840	-	0.026	General
1-BH	Patch	-	VRiv0295	Vulnerable	yes	0.640	-	0.004	0.004	0.840	-	0.002	General
1-BI	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.016	0.016	0.700	-	0.007	General
1-BJ	Patch	-	MuF_0816	Depleted	yes	0.710	-	0.002	0.002	0.810	-	0.001	General



Zone

1-BK

1-BL

1-BM

1-BN

1-BO

1-BP

1-BQ

1-BR

1-BS

1-BT

1-BU

1-BV

1-BW

1-BX

1-BY

1-BZ

Patch

-

-

-

-

-

-

-

-

-

-

-

MuF 0816

MuF 0816

MuF 0816

MuF 0816

MuF 0816

MuF 0816

MuF 0056

MuF_0103

MuF_0106

MuF 0295

MuF_0295

Depleted

Depleted

Depleted

Depleted

Depleted

Depleted

Depleted

Endangered

Depleted

Vulnerable

Vulnerable

0.710

0.710

0.710

0.710

0.710

0.710

0.670

0.600

0.570

0.620

0.620

yes

Inform	nation	provided by	v or on behalf o	f the appli	cant	Information calculated by NVR Map								
Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type		
Patch	-	MuF_0816	Depleted	yes	0.710	-	0.002	0.002	0.810	-	0.001	General		
Patch	-	MuF_0816	Depleted	yes	0.710	-	0.002	0.002	0.810	-	0.001	General		
Patch	-	MuF_0816	Depleted	yes	0.710	-	0.002	0.002	0.810	-	0.001	General		
Patch	-	MuF_0816	Depleted	yes	0.710	-	0.002	0.002	0.810	-	0.001	General		
Patch	-	MuF_0816	Depleted	yes	0.710	-	0.002	0.002	0.810	-	0.001	General		

0.002

0.002

0.000

0.000

0.000

0.003

0.055

0.171

0.010

0.002

0.002

-

-

-

-

-

-

-

-

-

-

-

0.002

0.002

0.000

0.000

0.000

0.003

0.055

0.171

0.010

0.002

0.002

0.810

0.810

0.810

0.810

0.810

0.810

0.880

0.784

0.900

0.870

0.870

-

-

-

-

-

-

-

-

-

-

-

0.001

0.001

0.000

0.000

0.000

0.001

0.026

0.069

0.004

0.001

0.001

General

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Information provided by or on behalf of the applicant Information calculated by NVR Map

Zone	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
1-CA	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.002	0.002	0.870	-	0.001	General
1-CB	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.002	0.002	0.870	-	0.001	General
1-CC	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.002	0.002	0.870	-	0.001	General
1-CD	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.000	0.000	0.870	-	0.000	General
1-CE	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.000	0.000	0.870	-	0.000	General
1-CF	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.008	0.008	0.870	-	0.004	General
1-CG	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.000	0.000	0.870	-	0.000	General
1-CH	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.002	0.002	0.870	-	0.001	General
1-Cl	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.002	0.002	0.870	-	0.001	General
1-CJ	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.002	0.002	0.870	-	0.001	General
1-CK	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.002	0.002	0.870	-	0.001	General
1-CL	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.012	0.012	0.870	-	0.005	General
1-CM	Patch	-	MuF_0295	Vulnerable	yes	0.620	-	0.012	0.012	0.870	-	0.005	General
1-CN	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.016	0.016	0.970	-	0.008	General
1-CO	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.002	0.002	0.970	-	0.001	General
1-CP	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.002	0.002	0.970	-	0.001	General



Information provided by or on behalf of the applicant Information calculated by NVR Map Extent Bioregional Polygon EVC Partial Condition without SBV нι Habitat Large conservation **Offset Type** extent

Zone	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
1-CQ	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.002	0.002	0.970	-	0.001	General
1-CR	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.002	0.002	0.970	-	0.001	General
1-CS	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.002	0.002	0.971	-	0.001	General
1-CT	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.002	0.002	0.970	-	0.001	General
1-CU	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.002	0.002	0.970	-	0.001	General
1-CV	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.000	0.000	0.970	-	0.000	General
1-CW	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.001	0.001	0.980	-	0.000	General
1-CX	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.000	0.000	0.950	-	0.000	General
1-CY	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.000	0.000	0.950	-	0.000	General
1-CZ	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.000	0.000	0.950	-	0.000	General
1-DA	Patch	-	MuF_0816	Depleted	yes	0.650	-	0.000	0.000	0.950	-	0.000	General
1-DB	Patch	-	VRiv0106	Depleted	yes	0.570	-	0.187	0.187	0.860	-	0.074	General
1-DC	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.009	0.009	0.840	-	0.004	General
1-DD	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.035	0.035	0.840	-	0.014	General
1-DE	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.035	0.035	0.893	-	0.014	General
1-DF	Patch	-	MuF_0295	Vulnerable	yes	0.630	-	0.014	0.014	0.880	-	0.006	General



Information provided by or on behalf of the applicant Information calculated by NVR Map

Zone	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
1-DG	Patch	-	VRiv0295	Vulnerable	yes	0.560	-	0.049	0.049	0.744	-	0.018	General
1-DH	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.117	0.117	0.576	-	0.033	General
1-DI	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.021	0.021	0.854	-	0.008	General
1-DJ	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.108	0.108	0.866	-	0.051	General
1-DK	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.048	0.048	0.800	-	0.015	General
1-DL	Patch	-	VRiv0106	Depleted	yes	0.570	-	0.061	0.061	0.856	-	0.024	General
1-DM	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General
1-DN	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General
1-D0	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General
1-DP	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General
1-DQ	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General
1-DR	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.000	0.000	0.820	-	0.000	General
1-DS	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.000	0.000	0.820	-	0.000	General
1-DT	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.000	0.000	0.820	-	0.000	General
1-DU	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General
1-DV	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General



Zone

	Inform	Information provided by or on behalf of the applicant Information calculated by NVR Map														
•	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type			
						0.000						0.001				

1-DW Patch - MuF_0803 Endangered yes 0.660 - 0.002 0.820 - 0.001 General 1-DX Patch - MuF_0803 Endangered yes 0.660 - 0.008 0.820 - 0.004 General 1-DY Patch - MuF_0816 Depleted no 0.650 - 0.004 0.907 - 0.004 General 1-DZ Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.802 0.890 - 0.001 General 1-EA Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General 1-EB Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General 1-EC Patch - MuF_0816 Depleted yes										(na)				
1-DY Patch - MuF_0816 Depleted no 0.650 - 0.004 0.070 - 0.004 General 1-DZ Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General 1-EA Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General 1-EB Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General 1-EB Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General 1-EC Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General 1-ED Patch - MuF_0816 Depleted yes 0.690 <t< td=""><td>1-DW</td><td>Patch</td><td>-</td><td>MuF_0803</td><td>Endangered</td><td>yes</td><td>0.660</td><td>-</td><td>0.002</td><td>0.002</td><td>0.820</td><td>-</td><td>0.001</td><td>General</td></t<>	1-DW	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.002	0.002	0.820	-	0.001	General
Image: Instruction of the state of	1-DX	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.008	0.008	0.820	-	0.004	General
I-EA Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EB Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EB Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EC Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EC Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 <	1-DY	Patch	-	MuF_0816	Depleted	no	0.650	-	0.004	0.004	0.970	-	0.004	General
I-EB Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.002 0.890 - 0.001 General I-EC Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-ED Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-ED Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EE Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes <	1-DZ	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
I-EC Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.002 0.890 - 0.001 General I-ED Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-ED Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EE Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EG Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EH Patch - MuF_0816 Depleted yes <	1-EA	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
I-E Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.002 0.890 - 0.001 General I-EE Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EE Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EH Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.890 - 0.000 General I-EH Patch - MuF_0816 Depleted yes <t< td=""><td>1-EB</td><td>Patch</td><td>-</td><td>MuF_0816</td><td>Depleted</td><td>yes</td><td>0.690</td><td>-</td><td>0.002</td><td>0.002</td><td>0.890</td><td>-</td><td>0.001</td><td>General</td></t<>	1-EB	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
I-EE Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EG Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EG Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EH Patch - MuF_0816 Depleted yes 0.690 - 0.001 0.875 - 0.000 General I-EI Patch - MuF_0816 Depleted yes <	1-EC	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
I-EF Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.002 0.890 - 0.001 General I-EG Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EG Patch - MuF_0816 Depleted yes 0.690 - 0.002 0.890 - 0.001 General I-EH Patch - MuF_0816 Depleted yes 0.690 - 0.001 0.890 - 0.001 General I-EH Patch - MuF_0816 Depleted yes 0.690 - 0.001 0.875 - 0.000 General I-EI Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.872 - 0.000 General I-EK Patch - MuF_0816 Depleted yes <	1-ED	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
1-EG Patch MuF_0816 Depleted yes 0.690 0.002 0.890 0.001 General 1-EH Patch MuF_0816 Depleted yes 0.690 0.002 0.890 0.001 General 1-EH Patch MuF_0816 Depleted yes 0.690 0.001 0.890 0.000 General 1-EI Patch MuF_0816 Depleted yes 0.690 0.001 0.875 0.000 General 1-EJ Patch MuF_0816 Depleted yes 0.690 0.000 0.875 0.000 General 1-EJ Patch MuF_0816 Depleted yes 0.690 0.006 0.870 0.003 General 1-EK Patch - MuF_0816 Depleted yes 0.	1-EE	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
I-EH Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.890 - 0.000 General 1-EI Patch - MuF_0816 Depleted yes 0.690 - 0.001 0.890 - 0.000 General 1-EI Patch - MuF_0816 Depleted yes 0.690 - 0.001 0.875 - 0.000 General 1-EJ Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.875 - 0.000 General 1-EJ Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.872 - 0.000 General 1-EK Patch - MuF_0816 Depleted yes 0.690 - 0.006 0.870 - 0.003 General 1-EK Patch - MuF_0816 Depleted yes 0.690 - 0.006 0.870 - 0.003 General	1-EF	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
I-El Patch - MuF_0816 Depleted yes 0.690 - 0.001 0.001 0.875 - 0.000 General 1-EJ Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.875 - 0.000 General 1-EJ Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.872 - 0.000 General 1-EK Patch - MuF_0816 Depleted yes 0.690 - 0.006 0.870 - 0.003 General 1-EK Patch - MuF_0816 Depleted yes 0.690 - 0.006 0.870 - 0.003 General	1-EG	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.002	0.002	0.890	-	0.001	General
1-EJ Patch - MuF_0816 Depleted yes 0.690 - 0.000 0.000 0.872 - 0.000 General 1-EK Patch - MuF_0816 Depleted yes 0.690 - 0.006 0.872 - 0.003 General	1-EH	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.000	0.000	0.890	-	0.000	General
1-EK Patch - MuF_0816 Depleted yes 0.690 - 0.006 0.006 0.870 - 0.003 General	1-EI	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.001	0.001	0.875	-	0.000	General
	1-EJ	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.000	0.000	0.872	-	0.000	General
1-EL Patch - MuE 0816 Depleted ves 0.690 - 0.003 0.003 0.890 - 0.001 General	1-EK	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.006	0.006	0.870	-	0.003	General
	1-EL	Patch	-	MuF_0816	Depleted	yes	0.690	-	0.003	0.003	0.890	-	0.001	General



Zone

1-EN

1-EP

Information provided by or on behalf of the applicant Information calculated by NVR Map Extent Bioregional Polygon DBH EVC Partial Condition Large without SBV нι Habitat Туре conservation extent **Offset Type** Removal Units (cm) code score Tree(s) overlap score Score status (ha) (ha) MuF_0106 Patch Depleted 0.610 0.152 0.152 0.812 0.063 General yes --MuF_0106 0.002 Patch Depleted 0.560 0.002 0.860 0.001 General yes --

1-EQ	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.002	0.002	0.860	-	0.001	General
1-ER	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.002	0.002	0.860	-	0.001	General
1-ES	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.002	0.002	0.900	-	0.001	General
1-ET	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.002	0.002	0.900	-	0.001	General
1-EU	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.002	0.002	0.900	-	0.001	General
1-EV	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.002	0.002	0.860	-	0.001	General
1-EW	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.002	0.002	0.860	-	0.001	General
1-EX	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.004	0.004	0.900	-	0.002	General
1-EY	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.000	0.000	0.860	-	0.000	General
1-EZ	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.000	0.000	0.900	-	0.000	General
1-FA	Patch	-	MuF_0106	Depleted	yes	0.560	-	0.000	0.000	0.860	-	0.000	General
1-FB	Patch	-	MuF_0295	Vulnerable	yes	0.470	-	0.143	0.143	0.849	-	0.047	General
1-FC	Patch	-	MuF_0295	Vulnerable	yes	0.640	-	0.058	0.058	0.820	-	0.025	General
1-FD	Patch	-	VRiv0295	Vulnerable	yes	0.640	-	0.040	0.040	0.888	-	0.018	General



Zone

	Inform	ation p	provided by	v or on behalf o	f the applie	cant			Info	ormatio	n calcul	ated by N	VR Map
2	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type

		(,		status				(ha)	(ha)			•	
1-FE	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.066	0.066	0.887	-	0.031	General
1-FF	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.016	0.016	0.870	-	0.007	General
1-FG	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.044	0.044	0.821	-	0.017	General
1-FI	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.074	0.074	0.864	-	0.025	General
1-FJ	Patch	-	MuF_0295	Vulnerable	no	0.480	-	0.032	0.032	0.870	-	0.022	General
1-FK	Patch	-	MuF_0295	Vulnerable	yes	0.630	-	0.138	0.138	0.868	-	0.061	General
1-FL	Patch	-	MuF_0295	Vulnerable	yes	0.630	-	0.007	0.007	0.860	-	0.003	General
1-FM	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.169	0.169	0.843	-	0.078	General
1-FN	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.030	0.030	0.940	-	0.015	General
1-FO	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.003	0.003	0.940	-	0.002	General
1-FP	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.219	0.219	0.944	-	0.107	General
1-FQ	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.001	0.001	0.940	-	0.000	General
1-FR	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.005	0.005	0.940	-	0.003	General
1-FS	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.013	0.013	0.940	-	0.006	General
1-FT	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.023	0.023	0.940	-	0.011	General
1-FU	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.063	0.063	0.791	-	0.020	General



Zone Type

	Inform	nation p	provided by	y or on behalf o	f the applic	cant			Info	ormatio	n calcul	lated by N	VR Map
•	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap	SBV score	HI Score	Habitat Units	Offset Type

Zone	Туре	(cm)	code	conservation status	Removal	score	Tree(s)	extent (ha)	overlap (ha)	score	Score	Units	Offset Type
1-FV	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.008	0.008	0.743	-	0.003	General
1-FW	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.011	0.011	0.585	-	0.003	General
1-FX	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.010	0.010	0.570	-	0.003	General
1-FY	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.129	0.129	0.843	-	0.060	General
1-FZ	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.020	0.020	0.800	-	0.009	General
1-GA	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.077	0.077	0.822	-	0.035	General
1-GB	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.007	0.007	0.840	-	0.003	General
1-GC	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.013	0.013	0.840	-	0.006	General
1-GD	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.003	0.003	0.840	-	0.001	General
1-GE	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.003	0.003	0.840	-	0.001	General
1-GF	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.012	0.012	0.840	-	0.006	General
1-GG	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.057	0.057	0.850	-	0.026	General
1-GH	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.071	0.071	0.592	-	0.028	General
1-GI	Patch	-	MuF_0056	Depleted	yes	0.670	-	0.031	0.031	0.725	-	0.013	General
1-GJ	Patch	-	MuF_0815	Vulnerable	yes	0.490	-	0.003	0.003	0.845	-	0.001	General
1-GK	Patch	-	MuF_0815	Vulnerable	yes	0.490	-	0.014	0.014	0.840	-	0.005	General



Information provided by or on behalf of the applicant Information calculated by NVR Map

Zone	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type
1-GL	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.003	0.003	0.940	-	0.002	General
1-GM	Patch	-	MuF_0295	Vulnerable	yes	0.650	-	0.045	0.045	0.748	-	0.019	General
1-GN	Patch	-	VRiv0295	Vulnerable	yes	0.620	-	0.014	0.014	0.800	-	0.006	General
1-G0	Patch	-	VRiv0295	Vulnerable	yes	0.620	-	0.001	0.001	0.800	-	0.001	General
1-GP	Patch	-	VRiv0295	Vulnerable	yes	0.620	-	0.003	0.003	0.800	-	0.001	General
1-GQ	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.068	0.068	0.842	-	0.027	General
1-GR	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.138	0.138	0.883	-	0.057	General
1-GS	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.007	0.007	0.940	-	0.003	General
1-GT	Patch	-	VRiv0295	Vulnerable	yes	0.580	-	0.002	0.002	0.800	-	0.001	General
1-GU	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.067	0.067	0.830	-	0.026	General
1-GV	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.003	0.003	0.460	-	0.001	General
1-GW	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.004	0.004	0.810	-	0.002	General
1-GX	Patch	-	MuF_0295	Vulnerable	yes	0.560	-	0.015	0.015	0.810	-	0.006	General
1-GY	Patch	-	VRiv0803	Endangered	yes	0.660	-	0.012	0.012	0.840	-	0.005	General
1-GZ	Patch	-	VRiv0803	Endangered	yes	0.660	-	0.014	0.014	0.870	-	0.006	General
1-HA	Patch	-	VRiv0295	Vulnerable	yes	0.640	-	0.010	0.010	0.820	-	0.004	General



Zone

Туре

Information provided by or on behalf of the applicant Information calculated by NVR Map Extent Bioregional Polygon DBH EVC Partial Condition Large without SBV нι Habitat **Offset Type** conservation extent (cm) code Removal score Tree(s) overlap score Score Units

		(cm)	coue	status	Removal	score	nee(s)	(ha)	(ha)	score	Score	onits	
1-HB	Patch	-	VRiv0295	Vulnerable	yes	0.640	-	0.142	0.142	0.820	-	0.062	General
1-HC	Patch	-	MuF_0295	Vulnerable	yes	0.640	-	0.155	0.155	0.811	-	0.067	General
1-HD	Patch	-	MuF_0295	Vulnerable	yes	0.640	-	0.019	0.019	0.820	-	0.008	General
1-HE	Patch	-	MuF_0295	Vulnerable	yes	0.640	-	0.001	0.001	0.820	-	0.000	General
1-HF	Patch	-	MuF_0295	Vulnerable	yes	0.640	-	0.001	0.001	0.820	-	0.000	General
1-HG	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.001	0.001	0.820	-	0.000	General
1-HH	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.005	0.005	0.820	-	0.002	General
1-HI	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.004	0.004	0.820	-	0.002	General
1-HJ	Patch	-	VRiv0295	Vulnerable	yes	0.640	-	0.002	0.002	0.820	-	0.001	General
1-HK	Patch	-	MuF_0295	Vulnerable	yes	0.540	-	0.027	0.027	0.746	-	0.009	General
1-HL	Patch	-	MuF_0295	Vulnerable	yes	0.540	-	0.083	0.083	0.821	-	0.030	General
1-HM	Patch	-	VRiv0803	Endangered	yes	0.640	-	0.122	0.122	0.928	-	0.056	General
1-HN	Patch	-	VRiv0803	Endangered	yes	0.640	-	0.067	0.067	0.870	-	0.030	General
1-HO	Patch	-	VRiv0803	Endangered	yes	0.640	-	0.019	0.019	0.830	-	0.008	General
1-HP	Patch	-	VRiv0803	Endangered	yes	0.640	-	0.030	0.030	0.830	-	0.013	General
1-HR	Patch	-	MuF_0295	Vulnerable	yes	0.480	-	0.189	0.189	0.361	-	0.046	General



1-IG

1-IH

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1-IK

1-IL

Patch

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Endangered

Endangered

Endangered

Endangered

yes

yes

yes

yes

yes

yes

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0.660

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0.660

	Information provided by or on behalf of the applicant							Information calculated by NVR Map						
Zone	Туре	DBH (cm)	EVC code	Bioregional conservation status	Partial Removal	Condition score	Large Tree(s)	Polygon extent (ha)	Extent without overlap (ha)	SBV score	HI Score	Habitat Units	Offset Type	
1-HS	Patch	-	MuF_0103	Endangered	yes	0.620	-	0.004	0.004	0.870	-	0.002	General	
1-HT	Patch	-	MuF_0803	Endangered	yes	0.670	-	0.130	0.130	0.870	-	0.061	General	
1-HU	Patch	-	MuF_0056	Depleted	yes	0.620	-	0.012	0.012	0.870	-	0.005	General	
1-HV	Patch	-	MuF_0803	Endangered	yes	0.670	-	0.069	0.069	0.827	-	0.032	General	
1-IA	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.015	0.015	0.820	-	0.007	General	
1-IB	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.001	0.001	0.820	-	0.001	General	
1-IC	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.001	0.001	0.820	-	0.001	General	
1-ID	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.001	0.001	0.820	-	0.001	General	
1-IE	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.001	0.001	0.820	-	0.001	General	
1-IF	Patch	-	MuF_0803	Endangered	yes	0.660	-	0.001	0.001	0.820	-	0.001	General	

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General

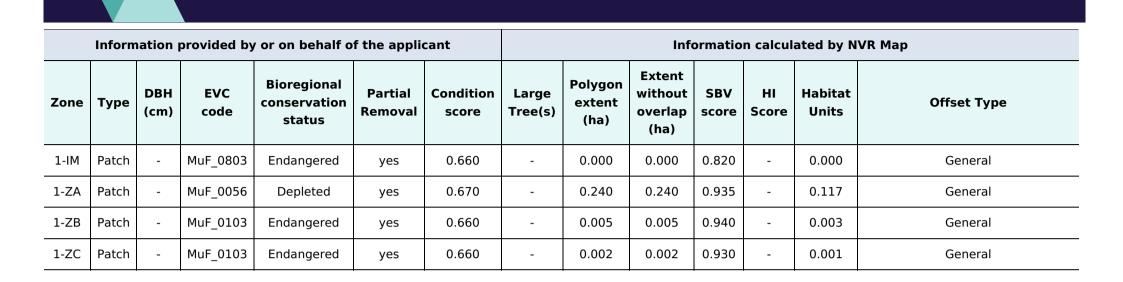
General

General

General

General

General



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

This table identifies all rare or threatened species with mapped habitat at the site and the proportional impact associated with the proposed native vegetation removal.

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Silver Perch	Bidyanus bidyanus	528544	Vulnerable	Dispersed	Habitat importance map	0.0021
Freshwater Catfish	Tandanus tandanus	528545	Endangered	Dispersed	Habitat importance map	0.0012
Murray-Darling Rainbowfish	Melanotaenia fluviatilis	4774	Vulnerable	Dispersed	Habitat importance map	0.0011
Open Summer-grass	Digitaria diffusa	501044	Endangered	Dispersed	Habitat importance map	0.0011
Murray Cod	Maccullochella peelii	4871	Vulnerable	Dispersed	Habitat importance map	0.0008
Broad-shelled Turtle	Chelodina expansa	5133	Endangered	Dispersed	Habitat importance map	0.0008
Stiff Groundsel	Senecio behrianus	503101	Endangered	Dispersed	Habitat importance map	0.0007
Superb Parrot	Polytelis swainsonii	10277	Endangered	Dispersed	Habitat importance map	0.0006
Wavy Marshwort	Nymphoides crenata	502287	Vulnerable	Dispersed	Habitat importance map	0.0006
Southern Pygmy Perch (Murray-Darling lineage)	Nannoperca australis (Murray-Darling lineage)	903231	Vulnerable	Dispersed	Habitat importance map	0.0006

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Blue Burr-daisy	Calotis cuneifolia	500594	Rare	Dispersed	Habitat importance map	0.0005
Swamp Buttercup	Ranunculus undosus	502915	Vulnerable	Dispersed	Habitat importance map	0.0005
Flat-headed Galaxias	Galaxias rostratus	4692	Vulnerable	Dispersed	Habitat importance map	0.0004
Button Rush	Lipocarpha microcephala	502020	Vulnerable	Dispersed	Habitat importance map	0.0004
Squat Picris	Picris squarrosa	504827	Rare	Dispersed	Habitat importance map	0.0004
Riverina Bitter-cress	Cardamine moirensis	505032	Rare	Dispersed	Habitat importance map	0.0004
Twin-leaf Bedstraw	Asperula gemella	500280	Rare	Dispersed	Habitat importance map	0.0003
Flat Spike-sedge	Eleocharis plana	501144	Vulnerable	Dispersed	Habitat importance map	0.0003
Northern Sandalwood	Santalum lanceolatum	503005	Endangered	Dispersed	Habitat importance map	0.0003
Murray River Turtle	Emydura macquarii	5135	Vulnerable	Dispersed	Habitat importance map	0.0003
Australian Painted Snipe	Rostratula australis	10170	Critically endangered	Dispersed	Habitat importance map	0.0002

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Bush Stone-curlew	Burhinus grallarius	10174	Endangered	Dispersed	Habitat importance map	0.0002
Brolga	Grus rubicunda	10177	Vulnerable	Dispersed	Habitat importance map	0.0002
Little Egret	Egretta garzetta nigripes	10185	Endangered	Dispersed	Habitat importance map	0.0002
White-bellied Sea-Eagle	Haliaeetus leucogaster	10226	Vulnerable	Dispersed	Habitat importance map	0.0002
Grey-crowned Babbler	Pomatostomus temporalis temporalis	10443	Endangered	Dispersed	Habitat importance map	0.0002
Squirrel Glider	Petaurus norfolcensis	11137	Endangered	Dispersed	Habitat importance map	0.0002
Growling Grass Frog	Litoria raniformis	13207	Endangered	Dispersed	Habitat importance map	0.0002
Silky Umbrella-grass	Digitaria ammophila	501041	Vulnerable	Dispersed	Habitat importance map	0.0002
Long Eryngium	Eryngium paludosum	501238	Vulnerable	Dispersed	Habitat importance map	0.0002
Veiled Fringe-sedge	Fimbristylis velata	501369	Rare	Dispersed	Habitat importance map	0.0002
Smooth Minuria	Minuria integerrima	502201	Rare	Dispersed	Habitat importance map	0.0002

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Dwarf Bitter-cress	Rorippa eustylis	502944	Rare	Dispersed	Habitat importance map	0.0002
Jericho Wire-grass	Aristida jerichoensis var. subspinulifera	504631	Endangered	Dispersed	Habitat importance map	0.0002
Coolibah Grass	Panicum queenslandicum var. queenslandicum	504806	Endangered	Dispersed	Habitat importance map	0.0002
Floodplain Fireweed	Senecio campylocarpus	507136	Rare	Dispersed	Habitat importance map	0.0002
Carpet Python	Morelia spilota metcalfei	62969	Endangered	Dispersed	Habitat importance map	0.0002
Lewin's Rail	Lewinia pectoralis pectoralis	10045	Vulnerable	Dispersed	Habitat importance map	0.0001
Intermediate Egret	Ardea intermedia	10186	Endangered	Dispersed	Habitat importance map	0.0001
Eastern Great Egret	Ardea modesta	10187	Vulnerable	Dispersed	Habitat importance map	0.0001
Australian Little Bittern	Ixobrychus dubius	10195	Endangered	Dispersed	Habitat importance map	0.0001
Australasian Bittern	Botaurus poiciloptilus	10197	Endangered	Dispersed	Habitat importance map	0.0001
Australasian Shoveler	Anas rhynchotis	10212	Vulnerable	Dispersed	Habitat importance map	0.0001

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Freckled Duck	Stictonetta naevosa	10214	Endangered	Dispersed	Habitat importance map	0.0001
Hardhead	Aythya australis	10215	Vulnerable	Dispersed	Habitat importance map	0.0001
Blue-billed Duck	Oxyura australis	10216	Endangered	Dispersed	Habitat importance map	0.0001
Musk Duck	Biziura lobata	10217	Vulnerable	Dispersed	Habitat importance map	0.0001
Grey Falcon	Falco hypoleucos	10236	Endangered	Dispersed	Habitat importance map	0.0001
Barking Owl	Ninox connivens connivens	10246	Endangered	Dispersed	Habitat importance map	0.0001
Bearded Dragon	Pogona barbata	12177	Vulnerable	Dispersed	Habitat importance map	0.0001
Mallee Golden Wattle	Acacia notabilis	500065	Vulnerable	Dispersed	Habitat importance map	0.0001
Buloke Mistletoe	Amyema linophylla subsp. orientalis	500217	Vulnerable	Dispersed	Habitat importance map	0.0001
Umbrella Grass	Digitaria divaricatissima var. divaricatissima	501045	Vulnerable	Dispersed	Habitat importance map	0.0001
Winged Peppercress	Lepidium monoplocoides	501905	Endangered	Dispersed	Habitat importance map	0.0001

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Spiny Lignum	Duma horrida subsp. horrida	502230	Rare	Dispersed	Habitat importance map	0.0001
Waterbush	Myoporum montanum	502240	Rare	Dispersed	Habitat importance map	0.0001
Branching Groundsel	Senecio cunninghamii var. cunninghamii	503104	Rare	Dispersed	Habitat importance map	0.0001
Red Swainson-pea	Swainsona plagiotropis	503324	Endangered	Dispersed	Habitat importance map	0.0001
Yellow-tongue Daisy	Brachyscome chrysoglossa	503654	Vulnerable	Dispersed	Habitat importance map	0.0001
Dwarf Brooklime	Gratiola pumilo	503753	Rare	Dispersed	Habitat importance map	0.0001
Striped Water-milfoil	Myriophyllum striatum	503869	Vulnerable	Dispersed	Habitat importance map	0.0001
Mallee Annual-bluebell	Wahlenbergia tumidifructa	504060	Rare	Dispersed	Habitat importance map	0.0001
Deane's Wattle	Acacia deanei subsp. paucijuga	504201	Rare	Dispersed	Habitat importance map	0.0001
Pale Swamp Everlasting	Coronidium gunnianum	504655	Vulnerable	Dispersed	Habitat importance map	0.0001
Pepper Grass	Panicum laevinode	504808	Vulnerable	Dispersed	Habitat importance map	0.0001

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Late-flower Flax-lily	Dianella tarda	505085	Vulnerable	Dispersed	Habitat importance map	0.0001
Austral Crane's-bill	Geranium solanderi var. solanderi s.s.	505337	Vulnerable	Dispersed	Habitat importance map	0.0001
Common Greenshank	Tringa nebularia	10158	Vulnerable	Dispersed	Habitat importance map	0.0000
Grey Goshawk	Accipiter novaehollandiae novaehollandiae	10220	Vulnerable	Dispersed	Habitat importance map	0.0000
Square-tailed Kite	Lophoictinia isura	10230	Vulnerable	Dispersed	Habitat importance map	0.0000
Black Falcon	Falco subniger	10238	Vulnerable	Dispersed	Habitat importance map	0.0000
Powerful Owl	Ninox strenua	10248	Vulnerable	Dispersed	Habitat importance map	0.0000
Major Mitchell's Cockatoo	Lophocroa leadbeateri	10270	Vulnerable	Dispersed	Habitat importance map	0.0000
Swift Parrot	Lathamus discolor	10309	Endangered	Dispersed	Habitat importance map	0.0000
White-throated Needletail	Hirundapus caudacutus	10334	Vulnerable	Dispersed	Habitat importance map	0.0000
Chestnut-rumped Heathwren	Calamanthus pyrrhopygius	10498	vulnerable	Dispersed	Habitat importance map	0.0000

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Painted Honeyeater	Grantiella picta	10598	Vulnerable	Dispersed	Habitat importance map	0.0000
Regent Honeyeater	Anthochaera phrygia	10603	Critically endangered	Dispersed	Habitat importance map	0.0000
Grey-headed Flying-fox	Pteropus poliocephalus	11280	Vulnerable	Dispersed	Habitat importance map	0.0000
Lace Monitor	Varanus varius	12283	Endangered	Dispersed	Habitat importance map	0.0000
Brown Toadlet	Pseudophryne bibronii	13117	Endangered	Dispersed	Habitat importance map	0.0000
Yarran Wattle	Acacia omalophylla	500069	Endangered	Dispersed	Habitat importance map	0.0000
Umbrella Wattle	Acacia oswaldii	500070	Vulnerable	Dispersed	Habitat importance map	0.0000
Jerry-jerry	Ammannia multiflora	500202	Vulnerable	Dispersed	Habitat importance map	0.0000
Buloke	Allocasuarina luehmannii	500678	Endangered	Dispersed	Habitat importance map	0.0000
Bear's-ear	Cymbonotus lawsonianus	500902	Rare	Dispersed	Habitat importance map	0.0000
Cane Grass	Eragrostis australasica	501184	Vulnerable	Dispersed	Habitat importance map	0.0000

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Spreading Emu-bush	Eremophila divaricata subsp. divaricata	501200	Rare	Dispersed	Habitat importance map	0.0000
Spotted Emu-bush	Eremophila maculata subsp. maculata	501204	Rare	Dispersed	Habitat importance map	0.0000
Button Immortelle	Leptorhynchos waitzia	501949	Vulnerable	Dispersed	Habitat importance map	0.0000
Small Scurf-pea	Cullen parvum	502773	Endangered	Dispersed	Habitat importance map	0.0000
Hairy Tails	Ptilotus erubescens	502825	Vulnerable	Dispersed	Habitat importance map	0.0000
Slender Darling-pea	Swainsona murrayana	503321	Endangered	Dispersed	Habitat importance map	0.0000
Small Burr-grass	Tragus australianus	503418	Rare	Dispersed	Habitat importance map	0.0000
Rye Beetle-grass	Tripogon loliiformis	503455	Rare	Dispersed	Habitat importance map	0.0000
Pale Plover-daisy	Leiocarpa leptolepis	503782	Endangered	Dispersed	Habitat importance map	0.0000
Spear-grass	Austrostipa trichophylla	504512	Rare	Dispersed	Habitat importance map	0.0000
Spiny-fruit Saltbush	Atriplex spinibractea	504608	Endangered	Dispersed	Habitat importance map	0.0000

Species common name	Species scientific name	Taxon ID	Conservation status	Group	Habitat impacted	Proportional impact (%)
Southern Swainson-pea	Swainsona behriana	504944	Rare	Dispersed	Habitat importance map	0.0000
Fuzzy New Holland Daisy	Vittadinia cuneata var. hirsuta	505068	Rare	Dispersed	Habitat importance map	0.0000
Cobberas Grevillea	Grevillea brevifolia	505489	Rare	Dispersed	Habitat importance map	0.0000
Cotton Sneezeweed	Centipeda nidiformis	505616	Rare	Dispersed	Habitat importance map	0.0000
Scaly Mantle	Eriochlamys squamata	505661	Vulnerable	Dispersed	Habitat importance map	0.0000
Black-tailed Godwit	Limosa limosa	528553	Vulnerable	Dispersed	Habitat importance map	0.0000

Habitat Group

- Highly localised habitat means there is 2,000 hectares or less mapped habitat for the species.
- Dispersed habitat means there is more than 2,000 hectares of mapped habitat for the species.

Habitat Impacted

The Species General Offset test, as described in Section 5.3.1 of the Guidelines, is used to determine if proposed native vegetation removal will result in a proportionally significant impact on the habitat value of rare or threatened species. The test is applied where the native vegetation proposed for removal:

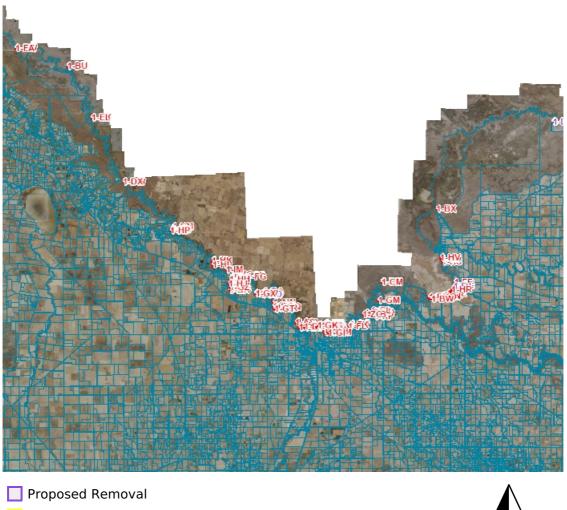
- Intersects the Habitat Importance Map for a rare or threatened species; or
- Intersects the 'top ranking' modelled habitat for a rare or threatened species with dispersed habitat, as identified in its Top Ranking Habitat Importance Map.

Top Ranking Maps consist of the 2,000 hectares of habitat with the highest Habitat Importance Scores for each dispersed species.

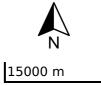
The 'Habitat impacted' column identifies whether the Habitat Importance Map or its Top Ranking Map was used to determine the proportional impact for a species with dispersed habitat.

Appendix 3: Images of mapped native vegetation

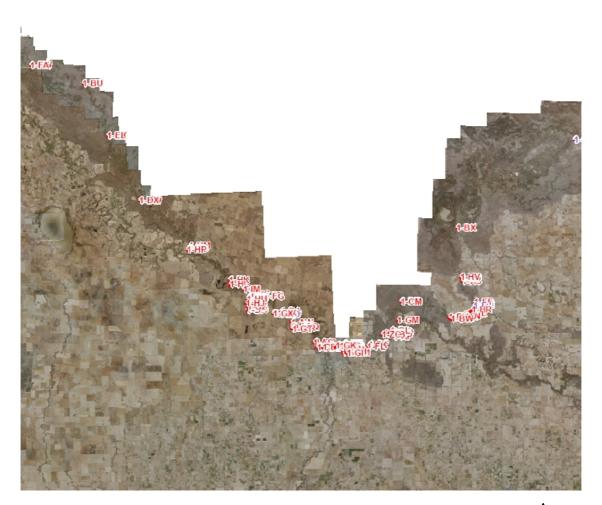
1. Property in context



- Past Removal
- Partial Removal
- Property Boundaries



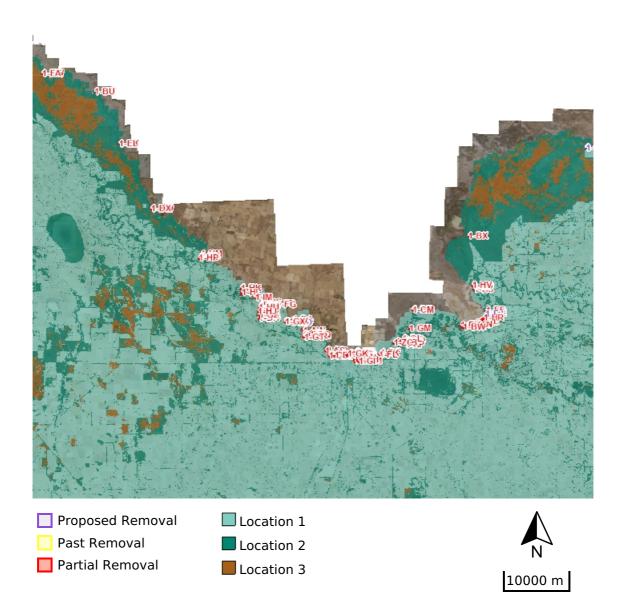
2. Aerial photograph showing mapped native vegetation



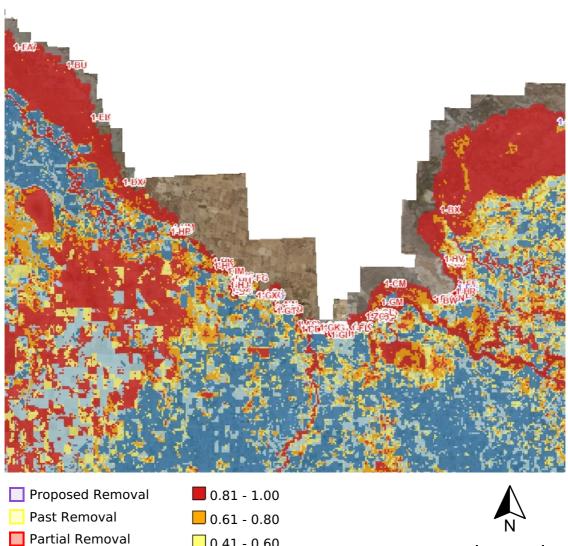
Proposed Removal
 Past Removal
 Partial Removal







4. Strategic Biodiversity Value Score Map

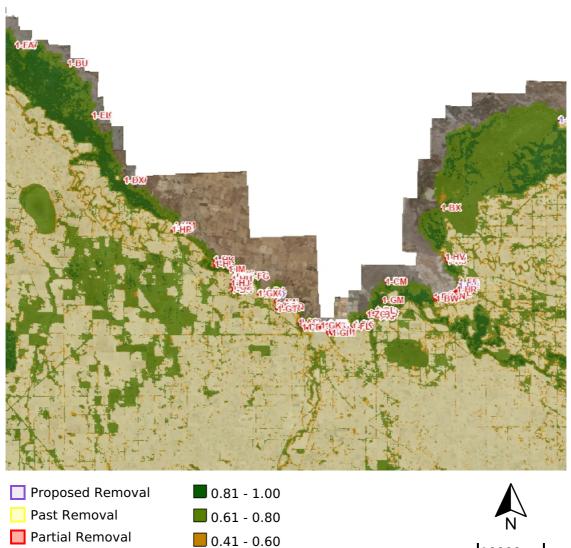


Partial Removal

– 0.	01 1.00	
0.	61 - 0.80	
0.	41 - 0.60	
0.	21 - 0.40	
0.	00 - 0.20	

10000 m

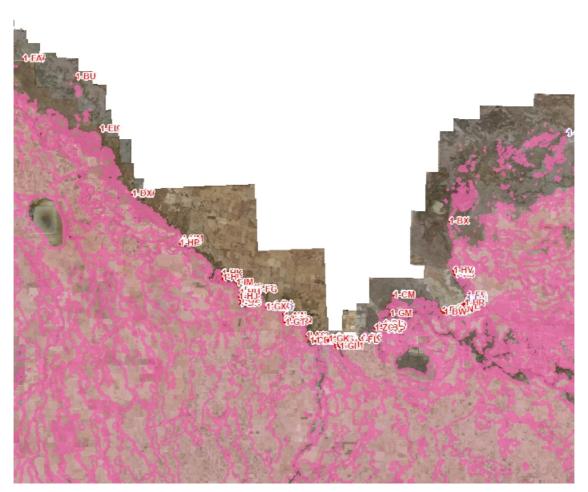
5. Modelled Condition Score Map



0.21 - 0.40

10000 m

6. Modelled Endangered EVCs



- Proposed Removal
 - Past Removal
- 🔲 Partial Removal
- Endangered 1750 Ecological Vegetation Classes





7. Habitat Importance maps

Not Applicable

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Appendix 9 Arborist report





Murray River Adventure Trail Arboricultural impact assessment report

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Report code:

23037 mrat0524_AIA

Site assessment: 13-14 July 2024

Report date:

19 July 2024

Stage	Title	Туре	Date	Version	Author
>	23037 mrat0524_AIA	Arboricultural impact assessment	19 July 2024	1	Rhys Oldmeadow



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1 Introduction

1.1 Purpose

Oldmeadow Arboriculture has been engaged to undertake an objective assessment of the likely impact to adjacent trees from the proposed construction of the Murray River Adventure Trail, as well as provide general comments on potential impacts from eight (8) campground/facilities site upgrades, and two (2) river crossings.

1.2 Scope

- Review likely impacts to native trees from the construction proposal for the Murray River Adventure Trail
 as a general assessment in accordance with assessing impacts to native vegetation where a long and
 linear action is proposed through an area with lots of trees as per page 3 Native Vegetation Regulations
 Newsletter Dated November 2019.
- Undertake an assessment of the eight (8) proposed campground/facilities upgrade areas, as well as two
 (2) bridge sites, and provide recommendations to minimise impacts to native trees.
 - Individual tree data will not be collected for trees within the campgrounds. A general assessment only will be undertaken with consideration of the provided construction documentation.

1.3 Method

• A site visit was undertaken by Rhys Oldmeadow on 13-14 July 2024. Much of the Murray River Adventure Trail was driven in a vehicle, all eight (8) campground/ facilities site upgrade areas as well as the two (2) river crossing sites were visited as well as several sections of unmade trail.

Documents viewed for the preparation of this report

- Murray river adventure trail section 8 Barmah lakes kayak launch design. Concept design. Drawing No. – JJR-4211023D-8-ST001. Issue – A. Dated – 29.02.2024. Drafted by – R. Abbasi. JJ Ryan Consulting Pty Ltd.
- Murray river adventure trail section 10 Braund Bend Stepped Canoe Launch. Concept design. Drawing No. – JJR-4211023D-10-ST001. Issue – A. Dated – 11.03.2024. Drafted by – S. EJLAI. JJ Ryan Consulting Pty Ltd.
- Broken River Bend. Concept Design. Drawing No. LD-MRAT-04. Rev. A. Dated 22/02/2024. Drafted by – NK. McGregor Coxall.
- Murray river adventure trail section 09 Kiln Bend Stepped Canoe Launch. Concept design. Drawing No. – JJR-4211023D-9-ST001. Issue – A. Dated – 11.03.2024. Drafted by – S. EJLAI. JJ Ryan Consulting Pty Ltd.
- Kiln Bend. Concept Design. Drawing No. LD-MRAT-12. Rev. A. Dated 22/02/2024. Drafted by NK. McGregor Coxall.
- Master's Landing. Concept Design. Drawing No. LD-MRAT-05. Rev. A. Dated 22/02/2024. Drafted by – NK. McGregor Coxall.
- Murray river adventure trail section 11 Masters Landing Kayak Launch. Concept design. Drawing No. JJR-4211023D-11-ST001. Issue A. Dated 06.03.2024. Drafted by R. ABBASI. S. EJLALI. JJ Ryan Consulting Pty Ltd.
- Nursery Bend. Concept Design. Drawing No. LD-MRAT-03. Rev. A. Dated 22/02/2024. Drafted by – NK. McGregor Coxall.
- Murray river adventure trail section 11 Nursery Bend Stepped Canoe Launch. Concept design. Drawing No. – JJR-4211023D-11-ST001. Issue – B. Dated – 06.03.2024. Drafted by – R. ABBASI. S. EJLALI. JJ Ryan Consulting Pty Ltd.
- The Gulf. Concept Design. Drawing No. LD-MRAT-15. Rev. A. Dated 22/02/2024. Drafted by NK. McGregor Coxall.
- Yarran Creek. Concept Design. Drawing No. LD-MRAT-02. Rev. A. Dated 22/02/2024. Drafted by – NK. McGregor Coxall.
- Murray river adventure trail section 09 Deep Creek Bridge Bridge design. Drawing No. JJR-4211023D-9-BR001. Issue – A. Dated – 03.05.2022. Drafted by – R. ABBASI. JJ Ryan Consulting Pty Ltd.

1.4 Limitations

- No individual tree data was collected
- Impacts were assessed based on the proposed construction cross section details, taking into consideration the methodology, existing site impacts as well as vegetation type, health and condition.



2 Observations

2.1 Proposed campground/ facilities site upgrade areas

Yarran Creek

Yarran Creek campground is located next to an existing bridge as well as a concrete boat ramp. The area is already compacted from vehicle traffic. There are several large, mature river red gums within the area, all in fair-good health. The largest tree in the area has an estimated DBH of around 120cm and is located adjacent to the existing boat ramp.

The proposed trailer parking area is quite close to a single tree which is already in fair-poor condition. However, given the already compacted nature of the campground, there is no expected reduction in health or useful life expectancy of this tree. Providing a mulched circle around trees which are close to parking areas will potentially mitigate some of the additional compaction possible with establishing parking.

Some tree removal may be required to facilitate the new vehicle entrance.

The proposed toilet facility appears well removed from larger trees which would be more susceptible to root disturbance.

Proposed campgrounds are situated in areas already utilised for camping. Delineating camping areas will possibly reduce impacts on adjacent trees as it may reduce access for vehicles to designated areas only.



Plate 1: Panorama of Yarran Campground; bridge to the left of image, proposed trailer parking in the foreground.

Nursery Bend

Nursery Bend comprises a much denser tree canopy cover compared to Yarran Creek, with a gentler slope into the river.

The proposed toilet facility and turn around area is located in a small natural clearing and should have limited impact on adjacent trees.

The proposed camping areas are again located in areas which are already heavily utilised for camping with existing compaction.



Plate 2: Panorama of Nursery Bend; proposed turn around and toilet facility to the left of image.



The location for the stepped canoe launch will need to be carefully considered as it will likely require excavation into the bank. However, there should be ample space between some of the larger trees with the possible removal of some small self-seeded trees.



Plate 3: Stepped canoe launch could be situated where these fallen logs are.

Broken River

The track leading into Broken River was very boggy in places with evidence of vehicle use off track to avoid the worst sections. The likely entrance into the campground passes beneath a low, leaning tree.

The fallen tree noted on the plans has already been cut up by campers and will likely be used for firewood in the short-mid term.



Plate 5: Boggy track leading to Broken River.



Plate 4: Low leaning tree at entrance.



There is sufficient space between smaller trees to locate the stepped canoe launch without detrimental impacts to trees.

There is also ample space in a natural clearing to facilitate the vehicle turn around and toilet without impacting trees.

The site is heavily compacted from current camping use, and delineating camping areas may well reduce impacts to surrounding trees.

Masters Landing

Masters Landing is already a well-established campground with existing toilet facilities and a service road loop. Camping areas are already utilised and well compacted. Delineating camp sites will have no further impact on adjacent trees.

The location of the kayak launch was not clear, however there is sufficient space between large trees to minimise impact and ensure no long-term effect on tree health or useful life expectancy.



Plate 6: Entrance to Masters Landing.



Mullers Creek crossing

No designs have been seen for this site, however, it is currently proposed to be a culvert crossing. The banks on either side of Mullers Creek are steep and densely vegetated with river red gums.

Any proposal will need to consider; access with heavy machinery to place culverts, fill material around the culverts, or possible screw piles and above grade track construction.

Excavation should be avoided, especially within the tree protection zone (TPZ) or structural root zone (SRZ) of retained trees.



Plate 7: Proposed location for Mullers Creek crossing.

Braund Bend The only works proposed at Braund Bend is construction of a stepped canoe launch.

There is ample space between large trees to achieve this without a detrimental impact to tree health or useful life expectancy.



Plate 8: Braund Bend river access



Kiln Bend

The track in to Kiln Bend was very rough and very muddy. Due to this there were dozens of alternate routes and it was difficult to determine which was the primary route. Improving the access track will significantly reduce compaction from vehicles attempting to find alternative routes in.

The campground itself was heavily compacted and appeared to have been impacted by storm events with evidence of many broken limbs and branches in the surrounding trees. Tree health and condition was reduced compared to the previous campgrounds, with a higher percentage of deadwood present in the tree canopies.

The proposed location of the stepped canoe launch appears to be quite close to a large, veteran river red gum with a history of branch and limb failures and multiple habitat hollows. Ensuring that canoe launch is outside of the TPZ will reduce impacts to this tree and may prevent failures from impacting the canoe launch.

Given the compacted condition of this camping area, there are no further impacts to trees expected from the construction of camping and parking areas. Provided that the location of the toilet is outside TPZs and SRZs of large trees to be retained, there will be no further impacts.

The condition of the trees may necessitate pruning be undertaken to reduce the likelihood of failure over higher use areas such as parking, and campsites. All pruning should be undertaken by an AQF 3 qualified arborist and in accordance with natural target pruning as pert AS4373 *Pruning amenity trees*, unless internodal pruning allows the retention of habitat hollows.



Plate 10: Kiln Bend compacted campground.

Deep Creek bridge site

Deep Creek is densely vegetated on the northern bank, with much sparser vegetation on the southern bank.

The crossing is deep and very wide and will require a substantial bridge to be constructed. Early construction drawings depict substantial concrete footings ~3mx3m by 600mm high, to be excavated into the bank. A further large concrete anchor footing is also required on each end. Given the substantially more vegetated northern



Plate 9: Kiln Bend poor track in and evidence of storm damage to trees.

bank, some losses are expected, and some trees may require removal to facilitate the construction footprint.

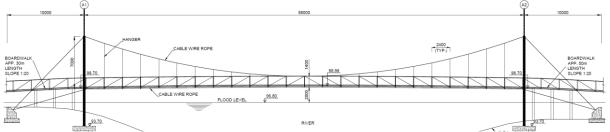


Plate 11: Murray River adventure trail section 09 Deep Creek Bridge – Bridge design. Drawing No. – JJR-4211023D-9-BR001. Issue – A. Dated – 03.05.2022. Drafted by – R. ABBASI. JJ Ryan Consulting Pty Ltd.





Plate 13: Deep Creek - Looking south.



Plate 12: Same location as plate 12 - looking north

Barmah Lakes

Barmah Lakes is a well-established day visiting area with toilet facilities and undercover tables.

The only proposed works at this location is construction of a canoe launch.

Preliminary designs indicate pile driven piers, which, provided they are outside structural root zones, should not adversely impact the health or useful life expectancy of retained trees.



Plate 14: Possible proposed location of canoe launch, centrally located between trees.



The Gulf camping area

The Guld camping area is well established with camping to the west of the site, and a day visitor area to the east and adjacent the river.

There is also an established boat ramp to the southeast of the site, close to the sacred Yorta Yorta tree.

The proposed toilet facility should be located outside of the tree protection zone of the large river red gum adjacent. Some impacts to trees are anticipated, mostly small patch trees, given the density of surrounding trees.



Plate 15: Panorama of the Gulf site, with camping to the right of image, and day visitor area to the left.



Plate 16: Possible toilet facility location, with large veteran tree behind.

One tree is proposed for removal to better align the parking bays.

Given the existing compaction of most of the site, no further detrimental impacts to tree health or useful life expectancy are anticipated from the campground upgrade.



3 Discussion

3.1 Encroachment/ impacts on trees

Works such as site cut and fill, re-grading, trenching, installation of underground services, building footings, landscaping or reducing the rain catchment within Tree Protection Zones (TPZ) are considered as encroachment. These activities may damage trees; this may be via direct (physical wounding) or indirect (soil alteration) impacts. Encroachment may result in wounds, decay, increased deadwood, thinning foliage, decreased health, instability, failures and death.

Likely impacts are assessed based on the degree of encroachment, the type of proposed works, the tree, and surrounding conditions.

3.2 Typical construction (new trail – not on existing tracks)

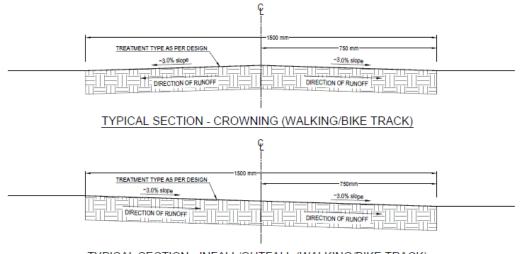
The following construction methods have been provided by Parks Victoria to Oldmeadow Arboriculture (T. McBean, personal communication, July 15 2024).

Excavate maximum 100mm below current surface level along alignment (This can be reduced to as low as excavate 50mm in areas of good subgrade)

Place and compact 150mm of 20mm imported crushed rock (This can be reduced to as low as 75mm in areas of good subgrade)

Excavated material to be utilised with construction footprint

This will mean the track will sit slightly higher that the surround[ing] area to maintain drainage in one of the below ways.



TYPICAL SECTION - INFALL/OUTFALL (WALKING/BIKE TRACK)

There are only a few areas where cross track drainage will occur and these will be done with culverts passing underneath the track following the fall of the land with minimal additional excavation required 200-300mm depth.

Our most impactful works relate to the rectification of soft spots or repairs of rutting along these sections. Where removal / ripping and recompacting of unsuitable ground would go to a depth of 200mm below existing surface.

Then crushed rock would be placed on top.

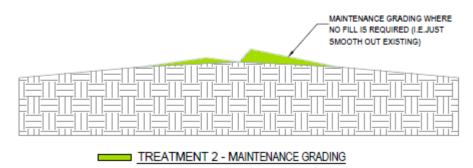
These areas are localised to areas of poor / damaged subgrade.



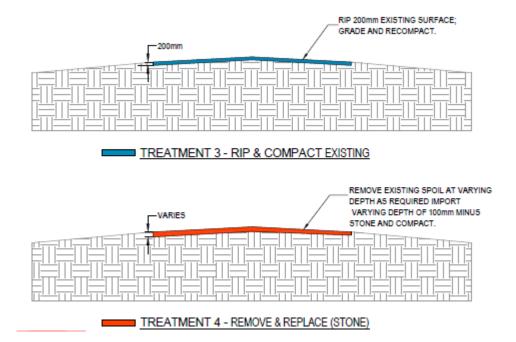
P 200mm EXISTING SURFACE; RADE AND COMPACT	BOX OUT MIN. 75mm AS REQUIRED. IMPORT AND COMPACT 20mm CRUSHED ROCK. LOCATION VARIES
TREA	TMENT 6 - DEPRESSION TOPPING LAYER (CR)

3.3 Typical construction (existing tracks)

The majority of the roads treatment is just maintenance grading



Where more significant damage has occurred the following are applied as directed by the engineer. The worse the damage the road the larger the intervention.

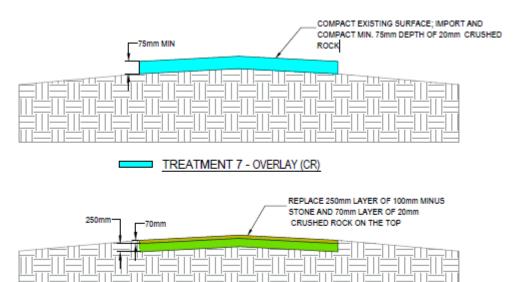




REMOVE EXISTING SPOIL AT VARYING DEPTH AS REQUIRED. IMPORT VARYING DEPTH OF 100mm MINUS STONE AND COMPACT TO 150mm BELOW FINISHED SURFACE LEVEL (FSL) IMPORT 150mm DEPTH OF 20mm CRUSHED ROCK AND COMPACT.



TREATMENT 5 - REMOVE & REPLACE (STONE & CR)



TREATMENT 9 - REPLACE (STONE & CR)

Drainage works to the road works component would be limited to existing drainage crossing and the repair or replacement of these.



3.4 Existing site conditions

Existing site conditions have been taken into consideration when determining the likely impact of proposed works. Much of the Murray River Adventure Trail (MRAT) utilises existing vehicle tracks, and as such, is not anticipated to have a significant impact on adjacent trees.

The most significant intervention required to rehabilitate the track will be in areas which have already been significantly impacted by compaction. Whilst accessing some campgrounds, such as Kiln Bend, it was observed that some wheel ruts were already at depths of up to approx. 500mm below grade. In such cases, the treatment required to rehabilitate the road is unlikely to have a greater impact than that already created by wheel ruts.

Much of the track into, and the existing campground areas, is also heavily compacted from current use. Soil compaction occurs more readily when soil conditions are wet, which is a regular occurrence along the Murray River. Delineating campgrounds with bollards and improving track conditions will reduce vehicle compaction in areas other than those designated for use.



Plate 17: Example of track conditions west of Masters Landing.

4 Conclusion

Oldmeadow Arboriculture undertook a site inspection on 13-14 July of the proposed Murray River Adventure Trail (MRAT), including eight (8) campground/facilities site upgrades, as well as two (2) river crossing sites.

The proposed alignment of the MRAT was inspected for both existing road rehabilitation sites as well as for sites proposed for new trail construction.

For existing access roads, even the heaviest proposed rehabilitation methods are unlikely to have a more significant impact than the existing site conditions.

For the new trail areas, the maximum proposed excavation of 100mm will be tolerated by adjacent trees, provided that the alignment is considerate and avoids structural root zones as far as practicable.

The most likely sites to be impacted will be areas where new trail is to be constructed and the current conditions are boggy, with poor subgrade material which will require rehabilitation. Careful alignment choice, locating works requiring excavation of depths greater than 100mm outside of structural roots zones, will minimise impacts to retained trees. It is anticipated that this will be achievable given the density of trees. This will minimise potential impacts to a level which should be tolerated by adjacent trees.



In general, the campground/ facilities site upgrades will have minimal impact on the surrounding trees provided that considerate construction methods are utilised and that works are sensitively located to avoid impacts to larger trees. Areas which have already been significantly compacted or disturbed should be utilised first.

Accurate losses for the two (2) river crossing sites cannot be determined without further detailed design or construction method. The Mullers Creek crossing may have a lesser impact if a culvert is utilised, however, a construction method or detailed construction designs would need to be viewed to interpret this.

The Deep Creek crossing will very likely require some tree removal and will potentially impact other trees due to the substantial footings required to support the bridge. Detailed designs inclusive of tree protection zones of adjacent trees will need to be prepared to determine the actual impact.

Given the scale of this project, only minimal tree losses are anticipated primarily due to:

- The Deep Creek Crossing
- Possible tree removals in campgrounds to facilitate car parking (directly in the footprint of proposed construction)
- Some possible losses due to ground rehabilitation to facilitate trail construction.

However, there will likely be substantial benefits if access roads into campgrounds can be improved, minimising off-road vehicles trying to avoid boggy sections.

There will also be some benefit to delineating parking and campground areas, minimising access to other areas.

5 Recommendations

General recommendations on minimising tree impact

- Where possible, existing soil disturbance is to be utilised for the trail alignment (e.g., contain all works within existing road formations or vehicle tracks as far as practicable)
- Excavation must be minimised. Where possible fill should be used to achieve the required grade, rather than excavation.
- Excavation inside Structural Root Zones should be avoided as far as practicable. Given the difficulty of calculating SRZs for all trees on site, these can nominally be considered as:
 - Trees <150mm diameter: SRZ 1m radius
 - Trees >150mm<250mm diameter: SRZ 1.5m radius
 - Trees >250mm<400mm diameter: SRZ 2.3m radius
 - o Trees >400mm<600mm diameter: SRZ 2.7m radius
 - Trees >600mm<800mm diameter: SRZ 3m radius
 - Trees >800mm diameter: SRZ 3.5m radius
- Detailed design or a sensitive construction method should be prepared for the Mullers Creek crossing.
- Detailed design should be prepared for the Deep Creek bridge crossing to clarify likely impacts to adjacent trees.
- If the scope of works changes to include road widening, new culvert installations or any further excavation, then detailed construction plans must be drawn up inclusive of adjacent trees which may be impacted and tree protection zones.
- All pruning works must be undertaken by a minimum certificate III qualified arborist and in accordance with natural target pruning as outlined in Australian Standard 4373 *Pruning of amenity trees*.
 - Trees within the Kiln Bend campsite should be inspected and pruned by a suitably qualified arborist to reduce tree related risk at this location.
- Vehicles used for track construction should remain within the track alignment footprint.
- Stockpiling of materials and equipment set down areas should be cognisant of, and located outside of, tree protection zones which can be calculated as 12x Trunk Diameter (in meters) at Breast height (1.4m).

6 References

Standards Australia (2007), AS 4373-2007 Pruning of amenity trees

Standards Australia (2009), AS 4970-2009 Protection of trees on development sites



7 Appendix 1. Protection of retained trees

Pruning standards / Lopping

An Australian standard exists to give guidance on pruning of trees.

It is important that all remedial works are carried out by a competent contractor in accordance with the Australian Standard. (AS. 4373 2007 - Pruning of Amenity Trees).

Lopping; as defined within the Standard, is detrimental to trees, often resulting in decay and poorly attached epicormic shoots. Natural Target Pruning methods should be used wherever possible when removing sections from trees.

Establishment of Tree Protection Zones

The tree protection zone (TPZ) is the principal means of protecting trees on development sites. Usually fencing will be used to delineate the Tree Protection Zones (TPZ) as defined by AS 4970-2009 Protection of trees on development sites.

Fencing is installed following permitted vegetation removal and pruning but prior to construction site establishment. Fencing should be retained until completion of all construction related activity.

Some works and activities within the TPZ may be authorised by the Responsible Authority. These works should be supervised by the project arborist. Any additional encroachment that becomes necessary as the site works progress should be reviewed by the project arborist and be acceptable to the Responsible Authority before being carried out (AS 4970--2009).

Activities restricted within the TPZ

A TPZ area may surround a single tree or group or a patch of vegetation, activities that must NOT be carried out within a TPZ include, but are not limited to, the following:

- (a) machine excavation including trenching;
- (b) excavation for silt fencing;
- (c) cultivation;
- (d) storage;
- (e) preparation of chemicals, including preparation of cement products;
- (f) parking of vehicles and plant;
- (g) refuelling;
- (h) dumping of waste;
- (i) wash down and cleaning of equipment;
- (j) placement of fill;
- (k) lighting of fires;
- (I) soil level changes;
- (m) vehicle movement access ways;
- (n) changes of grade;
- (o) temporary or permanent installation of utilities and signs, and
- (p) damage to the tree.

Maintaining Tree Protection Zones (TPZ)

If at any time the TPZ must be infringed upon for works such as excavation for the installation of pipes or drainage or the movement of equipment or any other interference that may cause a change in the availability of water or oxygen to the tree, a suitably qualified arborist should be consulted to supervise the works and permission from the responsible authority may be required.

It may be possible to work or construct within a TPZ without significantly impacting a tree however the size and number of roots in the area would need to be determined and the specifics of the tree and its resilience to impacts would need to be reviewed prior to commencement. Design and construction methods may need alteration to minimise adverse tree impact.

AS 4970-2009 (extract)

Variations to the TPZ

General

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching.



Minor encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.

Variations must be made by the project arborist considering relevant factors listed in (see standard)

Major encroachment

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable.

The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods and consideration of relevant factors listed in (see standard)

Physical / mechanical damage to trees

Physical damage to tree parts, particularly the trunk, provides entry points for pests and diseases such as fungal infections. This may cause long-term decay and can lead to partial or complete tree failure and death.

Alteration of soil levels

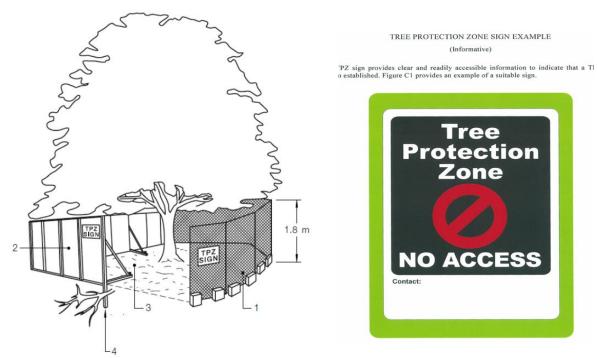
Alteration of soil levels around trees will affect the root zone and stability of a tree as well as tree metabolism. This may result in reduced tree health, excessive deadwood, thinning foliage and poor vigour; it can take some years for the impact to become evident at which time it is normally irreversible.

Tree protection zone fencing

Protective fencing is used to delineate the TPZ. The fence must provide high visibility and act as a physical barrier to construction vehicles. No construction activity is to be undertaken within the fenced TPZ. The fence should be adequately signed, be sturdy and prevent the entry of heavy equipment, vehicles, workers and the public.

Once erected, protective fencing must not be removed or altered without approval by the project arborist or responsible authority. The TPZ should be secured to restrict access. Tree protection fencing will consist of chain wire mesh panels held in place with concrete feet. The tree protection zone shall be clearly signed "Tree Protection Zone – No Access".





Source – AS 4970-2009 Protection of trees on development sites

Temporary access(Tree Protection)to the TPZWhen tree protection fencing cannot be installed or requires temporary removal, other tree protection measures
should be used.

Where necessary, physical protection for the trunk and branches of trees should be installed. The materials and positioning of protection will be specified by the project arborist. A minimum height of 2m is recommended.

If temporary access for machinery is required within the TPZ, ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards. These measures may also be applied to root zones beyond the TPZ (see image).

Root protection during works within the TPZ

Works that have been approved by the Responsible Authority to occur within the TPZ, such as re-grading, installation of piers or landscaping have the potential to damage roots.

If the grade is to be raised the material should be coarser or more porous than the underlying material.

Depth changes and compaction should be minimized. Manual excavation should be carried out under the supervision of the project arborist to identify roots critical to tree stability and health. Relocation or redesign of works may be required.

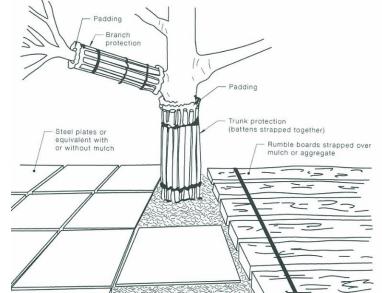
Where the project arborist identifies roots to be pruned within or at the outer edge of the TPZ, they should be pruned with a final cut to undamaged wood. Pruning cuts should be made with sharp tools such as secateurs, pruners, handsaws or chainsaws. Pruning wounds should not be treated with dressings or paints.



It is not acceptable for roots within the TPZ to be 'pruned' with machinery such as backhoes or excavators.

Where roots within the TPZ are exposed by excavation, temporary root protection should be installed to prevent them drying out. This may include jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting should be pegged in place and kept moist during the period that roots are exposed.

Other excavation works in proximity to trees, including landscape works such as paving, irrigation and planting can adversely affect root systems, seek advice from the project arborist.



Source – AS 4970-2009 Protection of trees on development sites

(Ground Protection)

If temporary access is required within a

Tree Protection Zone this may be

carried out using sheets of heavy plywood or like protection but should not be considered for long term requirements.

Installing underground services within TPZ

All services should be routed outside the TPZ. If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches using non-destructive methods such as Air or hydro excavation.

The directional drilling bore should be at least 600 mm deep. The project arborist should assess the likely impacts of boring and bore pits on retained trees.

Driveways and paving within TPZ's

Works should not encroach into a TPZ. If encroachment is unavoidable any hard surfaces such as paving or driveways should:

1. not require any scraping or excavation – most roots, particularly small absorbing roots, are shallow; within the upper 100mm of soil.

2. be constructed of a permeable material and laid on a base and subbase specifically designed to allow the movement of water through and into the soil below.

If construction is permitted within a TPZ it should be suspended on piers leaving the ground undisturbed other than the careful placement of pier holes. The bottom of supporting beams should be above existing ground level or, if this is not possible beams should run radially away from the tree trunk. There should be NO excavation of any description, including piers, within a Structural Root Zone (SRZ)



8 Arboricultural consultancy: Assumptions

- Any legal description provided to Oldmeadow Arboriculture is assumed to be correct. Any titles and ownerships to any property are assumed to be correct. No responsibility is assumed for matters outside the consultant's control.
- Oldmeadow Arboriculture assumes that any property or project is not in violation of any applicable codes, ordinances, statutes or other local, state or federal government regulations.
- Oldmeadow Arboriculture has taken care to obtain all information from reliable sources. All data has been verified insofar as possible; however Oldmeadow Arboriculture can neither guarantee nor be responsible for the accuracy of the information provided by others not directly under Oldmeadow Arboriculture's control.
- No Oldmeadow Arboriculture employee shall be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services.
- Loss of this report or alteration of any part of this report not undertaken by Oldmeadow Arboriculture invalidates the entire
 report.
- Possession of this report or a copy thereof does not imply right of publication or use for any purpose by anyone but the client
 or their directed representatives, without the prior consent of Oldmeadow Arboriculture.
- This report and any values expressed herein represent the opinion of Oldmeadow Arboriculture's consultant and Oldmeadow Arboriculture's fee is in no way conditional upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
- Sketches, diagrams, graphs and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural drawings, reports or surveys.
- Unless expressed otherwise: i) Information contained in this report covers only those items that were covered in the project brief or that were examined during the assessment and reflect the condition of those items at the time of inspection; and ii) The inspection is limited to visual examination of accessible components without dissection, excavation or probing unless otherwise stipulated.
- There is no warranty or guarantee, expressed or implied by Oldmeadow Arboriculture., that the problems or deficiencies of the plants or site in question may not arise in the future.
- All instructions (verbal or written) that define the scope of the report have been included in the report and all documents and
 other materials that the Oldmeadow Arboriculture consultant has been instructed to consider or to take into account in
 preparing this report have been included or listed within the report.
- To the writer's knowledge all facts, matter and all assumptions upon which the report proceeds have been stated within the body of the report and all opinion contained within the report have been fully researched and referenced and any such opinion not duly researched is based upon the writers experience and observations.

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