Victorian Murray Floodplain Restoration Project

Flora and Fauna Assessment - Burra Creek Floodplain Restoration Project

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Lower Murray Urban and Rural Water Corporation

Victorian Murray Floodplain Restoration Project

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Program Manager:	John Myers
Author:	Dan Eyles, Drew King
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Jacobs Group (Australia) Pty Limited and GHD Pty Ltd trading as R8 Joint Venture
Floor 11, 452 Flinders Street
Melbourne VIC 3000
PO Box 312, Flinders Lane
Melbourne VIC 8009 Australia
T +61 3 8668 3000
F +61 3 8668 3001

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Contents

Executive Summary

Project overview

The Burra Creek Floodplain Restoration Project (the project) is one of nine discrete environmental works projects being undertaken as part of the Victorian Murray Floodplain Restoration Project (VMFRP), which is being implemented as part of Victoria's obligations under the Murray Darling Basin Plan. Lower Murray Urban and Rural Water Corporation (LMW) has been nominated by the partnership established to deliver VMFRP, as the project proponent for the purpose of submitting referrals and approval applications.

The project aims to restore a more natural inundation regime and improve ecological condition across approximately 330 ha of high ecological value Murray River floodplain at Burra North and a further 73 ha of creek habitats at Burra South, through the construction of new infrastructure, the modification of existing infrastructure and removal of some existing barriers to flow within Burra Creek. The project is designed to enable managed inundation up to a design water level of 58.7 mAHD at Burra North and up to the top of bank level along Burra Creek at Burra South using water from both natural flood events and pumping from the Murray River.

The project involves the construction of three new regulators (B1, B2 and B4), two temporary pump hardstands, a drop structure to control erosion, and a series of containment banks incorporating spillways. The project also involves the removal of some existing obstructions to flow in Burra Creek, including removal of Banks 1, 2, 3 and 4, and modification of Bank 5. Maintenance works may also be required along access tracks to enable use by construction and operational vehicles. Temporary construction laydown areas will also be established near the main work sites (i.e. near Regulator B1, Regulator B2 and Bank 5).

The project is located almost entirely in the State of Victoria, within the Rural City of Swan Hill local government area. A small portion of the proposed works associated with the drop structure, extends down the western bank of the Murray River into New South Wales and the Murray River Council local government area. The project is mostly located on Crown land (natural features reserve) managed by Parks Victoria, within some access tracks, a temporary laydown area and part of the inundation area on private land.

This flora and fauna assessment has been prepared for the project to support the preparation of referrals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Victorian *Environment Effects Act 1978*. Specifically, this assessment consolidates the findings of previous ecological assessment reports prepared for the project area (Lumsden *et. al.* 2007; Brown *et al.* 2013; GHD 2013; and Australian Ecosystems 2016), as well as outlining the results of the most recent assessments undertaken by R8 in October, November and December 2019 (targeted surveys for rare and threatened species and vegetation condition assessment at each construction footprint). This assessment identifies rare or threatened flora or fauna and communities within the project area, and to provide information on likely impacts to native vegetation, threatened flora and fauna and communities that may occur as a result of the project.

Results

Native vegetation and fauna habitat was identified within the construction footprints that have the potential to be impacted by the proposed works. In total, 12.614 hectares of native vegetation comprising nine different Ecological Vegetation Classes (EVCs) (across 29 distinct habitat zones) was identified at the construction footprints, along with 105 Large Trees. Of this, 7.129 ha is potentially impacted by the construction footprint of proposed structures, containment banks, hardstands and laydown areas, and 5.482 ha is associated with access tracks. The scope and requirement for works along access tracks is still to be confirmed and will be designed to avoid and minimise native vegetation removal. In some instances these works may be limited to minor maintenance and upgrades that require minimal if any vegetation clearance. As such the current estimate of potential vegetation removal along tracks is conservative.

No vegetation communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the *Flora and Fauna Guarantee Act 1988* (FFG Act) were identified in the proposed construction footprint or inundation areas.

No fauna species (and communities) listed under the EPBC Act were recorded in the project area during the survey. However, one fauna species listed under the EPBC Act is known to occur within the project area; the Regent Parrot (*Polytelis anthopeplus monarchoides*) (Vulnerable under EPBC Act); and was recorded 2 km north west of the nearest construction footprint (Regulator B1) during the current assessment.

No flora species listed under the EPBC Act were identified within the construction footprint. However, rare or threatened flora were recorded in, or close to, the construction footprints including:

- One FFG Act listed threatened flora species (*Acacia oswaldii*)
- Seven flora species considered rare or threatened in Victoria (DELWP Advisory)
- Fourteen flora species listed as protected under the FFG Act

Legislation, permits and approvals

There are a number of ecological values present within the project area with the potential to trigger the requirement to obtain a permit under various items of legislation if impacted.

The following permits/approvals are likely to be required for this project:

- A permit (Management Authorisation) under the *Wildlife Act 1975* is likely to be required for salvage, handling and disturbance of native fauna that may be at risk of harm during construction. This could be achieved by engaging a qualified ecologist in possession of this permit to undertake this task.
- A permit under the FFG Act is required where works may impact threatened and/or protected flora and native vegetation that threatened fauna are likely to use on public land. Once the construction footprint at each of the sites is finalised a permit will need to be obtained for impacts to both listed and protected flora species.
- If the capture, handling or translocation of fish is required during construction (e.g. dewatering work sites) or operation of the project, persons undertaking these activities will need to hold the appropriate permit or licence under the *Fisheries Act 1995*
- Planning approval to remove native vegetation under the *Planning and Environment Act 1987* and the Swan Hill Planning Scheme in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017)
- Offsets would be sought in accordance with the requirements of the *Guidelines for removal, destruction or lopping of native vegetation* (DELWP 2017) or through an alternate arrangement agreed with the Secretary to DELWP. The loss of native vegetation due to construction activities is proposed to be offset, at least in part, by the expected improvement in native vegetation quality in the inundation area resulting from environmental watering. The method for confirming this offset would be developed in consultation with DELWP. Any offset requirements that cannot be met through environmental watering would be purchased by the project.

A referral to the Commonwealth Environment Minister for a determination under the EPBC Act is being developed, as although it has been suggested that it is unlikely that a significant impact will occur on Matters of National Environmental Significance (MNES), a precautionary approach to refer the project has been adopted.

A referral to the Victorian Minister for Planning for a determination under the *Environment Effects Act 1978* as to whether an Environment Effects Statement, is also being developed for the project. This assessment has determined that the project is likely to require the removal of more than 10 hectares of native vegetation, which is a criterion for referral under the *Environment Effects Act 1978*.

Recommendations and Next Steps

Additional steps to avoid and minimise impacts to ecological values during the design, construction and implementation of the project have been outlined in Section 8, and include, but are not limited to:

- Develop specific mitigation measures related to the works and incorporate these into a project specific CEMP
- Refine the construction footprint utilising the existing ecological values mapping to avoid and minimise impacts to native vegetation and threatened flora/fauna and communities within the construction footprint where practicable
- Engage with DELWP, discussing the proposed construction footprint and the efforts that have been made to avoid and minimise impacts to native vegetation during the preliminary and refinement phases of the project
- Depending on the extent of impacts to areas of treed vegetation a qualified arborist may need to be engaged to determine the full extent of impacts to native trees (both within and immediately adjacent to the proposed construction footprint). This assessment would take in to account direct impacts to trees (tree removal) and indirect impacts to trees (through encroachment of their TPZs). An arborist assessment would also consider the individual tree location and habit, as well as specific characteristics of certain tree species (e.g. mallee eucalypts) where it's possible that individual trees will survive greater than 10% encroachment of their TPZs or the pruning of over 30% of the existing crown (the standard measures for determining indirect tree losses under the guidelines).
- Engage with DELWP, discussing the proposed approach for obtaining offsets for the project and whether the conservation works exemption or an alternative offset approach may apply to the project. This approach may include the establishment of a vegetation condition monitoring regime within the proposed inundation areas that would identify changes in condition to the vegetation within these areas that results from the environmental watering regime.
- Prepare an Offset Plan for the project to support any application for planning approval to remove native vegetation under the Planning and Environment Act 1987
- A CEMP should be developed for the project and implemented in full to further avoid and minimise impacts to areas of ecological value. The CEMP should be prepared once the footprint and construction methods for the proposed works have been finalised, and should include provisions relevant to protecting the ecological values identified within the construction footprints.

This report is subject to, and must be read in conjunction with, the limitations set out below and the assumptions and qualifications contained throughout the report.

Abbreviations

Abbreviation	Description
CaLP Act	Victorian *Catchment and Land Protection Act 1994*
CMA	Catchment Management Authority
CEMP	Construction Environmental Management Plan
DAWE	Commonwealth Department of Agriculture, Water and Environment (formerly DOEE)
DBH	Diameter at breast height
DELWP	Victorian Department of Environment, Land, Water and Planning (formerly DEPI)
DEPI	Victorian Department of Environment and Primary Industries (now DELWP)
DOEE	Commonwealth Department of the Environment and Energy (formerly DOTE now DAWE)
DOTE	Commonwealth Department of the Environment (now DAWE)
EE Act	Victorian *Environment Effects Act 1978*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	Victorian *Flora and Fauna Guarantee Act 1988*
GHD	GHD Pty Ltd
GIS	Geographic Information System
LGA	Local Government Authority
MDBA	Murray-Darling Basin Authority
MNES	Matters of National Environmental Significance
Mallee CMA	Mallee Catchment Management Authority
PMST	Protected Matters Search Tool
R8	R8 Joint Venture by GHD and Jacobs
SDL	Sustainable Diversion Limits
SHRCC	Swan Hill Rural City Council
sp.	Species
spp.	More than one species
SRZ	Structural Root Zone
subsp.	Subspecies
TPZ	Tree Protection Zone
var.	Variety
VBA	Victorian Biodiversity Atlas
VMBC	Victorian Mallee Bird Community
VMFRP	Victorian Murray Floodplain Restoration Project
VTWBC	Victorian Temperate Woodland Bird Community

Abbreviation	Description
VROTS	Species listed on the *Advisory List of Rare or Threatened Plants in Victoria* (DEPI, 2014), the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE, 2013) or the *Advisory List of Threatened Invertebrate Fauna in Victoria* (DSE, 2009).
WoNS	Weed of National Significance

Important note about your report

The purpose of R8's engagement under the Victorian Murray Floodplain Rehabilitation Project (VMFRP) is to design infrastructure for VMFRP including regulators, levees, roads, access tracks and culverts. The designs are required to be suitable for construction pricing to inform business case prioritisation. The purpose of this infrastructure is to allow floodplains to be watered at the hydraulic design levels nominated by VMFRP. R8 is also engaged to provide Regulatory Approvals and Cultural Heritage Services. The purpose of these services is for VMFRP to lodge the necessary approvals documents for the project with the relevant approvals authorities.

The sole purpose of this report and the associated services performed by R8 is to complete a flora and fauna assessment in accordance with the scope of services agreed between R8 and VMFRP. This report will support the preparation of referrals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Victorian *Environment Effects Act 1978*.

R8 has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. However, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

In preparing this report, R8 has relied on the information provided by VMFRP. In particular R8 is reliant on VMFRP's prior flood modelling work to define inundation levels and extents. R8 is not responsible for achievement of the project's desired operational ecological outcomes.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by R8 for use of any part of this report in any other context. This report has been prepared on behalf of, and for the exclusive use of VMFRP, and is subject to, and issued in accordance with, the provisions of the contract between R8 and VMFRP. R8 accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

The services undertaken by R8 in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report as follows:

- Ecological assessments were limited to vascular plant species (ferns, conifers and flowering plants). Non-vascular flora (e.g. mosses, liverworts, lichens), fungi and terrestrial invertebrates have not been considered in detail as part of this assessment, except where listed threatened species are known or suspected to occur, or where bryophytes comprise part of the EVC benchmark used for the habitat hectare assessment (e.g. cover of Bryophytes);
- Maps in this report displaying site information should not be relied on for the detailed design during the construction process. Please refer to engineering drawings/specifications and survey for detailed site information
- Fieldwork was limited to terrestrial vertebrate fauna. Freshwater and marine fauna or invertebrate fauna were considered at a desktop level only.
- Fieldwork involved the use of Collector for ArcGIS version 10.3.3 mapping application to record site information. This mapping tool is accurate to within ten metres on site
- Ecological assessments assume there will be no impacts to native vegetation outside the proposed construction footprint provided by VMFRP
- This report does not include a detailed assessment of planning implications with relation to legislation outside of those considered from an ecological perspective

- This report does not address requirements under NSW legislation due to the very minor component of the proposed works that may occur within NSW (less than approximately 500 square metres). Specific ecological requirements under NSW legislation will be addressed as part of subsequent assessment and approvals processes in line with the project's NSW Regulatory Approvals Strategy.

- Ecological assessments included flora investigations and targeted surveys in 2015 and 2019 were conducted in Spring, however, in 2019 the conditions in the lead up to the surveys were dry and potentially additional native species have the potential to be recorded at the in wetter years. Therefore, it is considered possible that additional rare or threatened flora may be present, however, this has been accounted for in determining the potential impacts on rare and threatened flora.

- Ecological assessments included a field investigation during late spring/early summer which is an adequate time of year for conducting fauna assessments in the Mallee region. However, no field investigation was conducted that would be optimal for detecting other fauna species, e.g. February-March for juvenile and hence more readily detectable small mammals and reptiles, however the timeframes for the project did not allow for surveys during this period.

- Ecological assessments did not consider targeted surveys for rare or threatened fauna species that involved extensive trapping (e.g. pitfall, Elliot, funnel trapping). This was beyond the scope of this assessment. Fauna surveys were limited to timed bird survey, active searching and incidental observations.

- Using the VBA database, a defined geographical area can be searched to produce lists and details of flora and fauna species that have been documented within the defined search area. These database results are only as accurate as the quality and quantity of data that have been recorded and documented from the area. The use of the database for this assessment has the following limitations:
  - Observations are regularly updated but there is a delay. Consequently, all known records, particularly recent records, may not be available at the time of use. The VBA was most recently accessed in February 2020.
  - This dataset is not exhaustive. Many locations locally and across Victoria have a low level of documented survey effort for one or more groups of flora and fauna. During field surveys, it is not uncommon to find species at locations for which there are few or no previous nearby database records.

Acknowledgments

R8 acknowledges the assistance, advice and/or information provided by:

- The Victorian Department of Environment, Land, Water and Planning (DELWP) for access to the VBA database and NatureKit

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

1. Introduction

1.1 Background

The Burra Creek Floodplain Restoration Project (the project) is one of nine discrete environmental works projects being undertaken as part of the Victorian Murray Floodplain Restoration Project (VMFRP), which is being implemented as part of Victoria's obligations under the Murray Darling Basin Plan. The VMFRP aims to return a more natural inundation regime across more than 14,000 ha of Victorian Murray River floodplain exhibiting high ecological value through the construction of new infrastructure and modification of existing infrastructure.

The VMFRP is being implemented in partnership between Lower Murray Urban and Rural Water Corporation (LMW), Goulburn Murray Rural Water Corporation (GMW), Mallee Catchment Management Authority (Mallee CMA), North Central Catchment Management Authority (North Central CMA), Parks Victoria and the Department of Environment, Land, Water and Planning (DELWP), and is funded by the Commonwealth Department of Agriculture, Water and Environment (DAWE). LMW has been nominated by the partnership as the project proponent for the purpose of submitting referrals and approval applications.

R8 is a joint venture formed between Jacobs and GHD, which has been engaged by LMW to deliver design, cultural heritage and approvals services for the VMFRP. This flora and fauna assessment has been prepared for the project to support the preparation of referrals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Victorian *Environment Effects Act 1978*.

1.2 Project description

The project aims to restore a more natural inundation regime and improve ecological condition across approximately 330 ha of high ecological value Murray River floodplain at Burra North and a further 73 ha of creek habitats at Burra South, through the construction of new infrastructure, the modification of existing infrastructure and removal of some existing barriers to flow within Burra Creek. The project is designed to enable managed inundation up to a design water level of 58.7 mAHD at Burra North and up to the top of bank level of Burra Creek at Burra South using water from both natural flood events and pumping from the Murray River.

Ecological Associates (2014a) established objectives to restore three specific water regime classes at Burra North: Seasonal Anabranch and Billabongs, Lignum Shrubland and Woodland, and Black Box and Red Gum Woodland. Mallee CMA subsequently decided to implement environmental watering within the Burra Creek channel at Burra South with the aim of restoring additional habitat in the Seasonal Anabranch and Billabongs water regime class. Modelling by Gippel (2014) for the flow thresholds associated with inundation of these water regime classes, indicates that the frequency of river flows of 17,500 ML/day, 30,000 ML/day and 35,000 ML/day has decreased since river regulation, while the duration of 17,500 ML/day flows has decreased and the duration of more than 30,000 ML/day flows has increased. The project ('with measure') aims to more closely align the frequency and duration of inundation with natural conditions (see Table 1).

Table 1: Comparison of water regimes provided by natural, baseline, Basin Plan and proposed measure[1]

Threshold (ML/day)	Water regime class[2]	EVCs	Scenario	Frequency Mean (per 100 years)	Duration Median (days)
17,500	Seasonal anabranch and billabongs	Waterbody – Fresh Floodway Pond Herbland	With measure[3]	90	120
			Natural	98.2	157
			Baseline	68.4	84

[1] Source: Mallee CMA (2014), based on interpretation of modelling by Gippel (2014) and preliminary operating plans adapted from Ecological Associates (2014b). The proposed measure scenario is based on implementation of works at Burra North only.
[2] Water regime class and constituent EVCs are derived from Ecological Associates, 2014a.
[3] Based on Mallee CMA (2014) interpretation of preliminary operations plans adapted from Ecological Associates (2014b).

Threshold (ML/day)	Water regime class[2]	EVCs	Scenario	Frequency Mean (per 100 years)	Duration Median (days)
			Basin Plan 2750 without measure	85.1	110
30,000	Lignum shrubland and woodland	Lignum Shrubland Lignum Swamp Lignum Swampy Woodland	With measure	20	35
			Natural	21.9	35
			Baseline	11.4	41
			Basin Plan 2750 without measure	12.3	38
35,000	Black box and red gum woodland	Riverine Chenopod Woodland Shrubby Riverine Woodland Riverine Grassy Woodland Grassy Riverine Forest Grassy Riverine Forest / Floodway Pond Herbland Complex	With measure	3	15
			Natural	3.5	15
			Baseline	1.8	23
			Basin Plan 2750 without measure	1.8	25

The project involves the following main infrastructure and works components:

- Regulator B1 – A large regulator would be installed in Burra Creek at the northern / downstream end of the Burra North managed inundation area, and is designed to enable inflows (backflow) from the Murray River into the creek, the retention of water in the managed inundation area and the return of managed floodwaters to the Murray River on completion of a managed event
- Regulator B2 – A small regulator would be installed in Burra Creek at the southern / upstream end of the Burra North managed inundation area, and is designed to enable the retention of water in Burra North and to prevent flows into private land at Burra South during a managed event.
- Regulator B4 – A small regulator would be installed within an existing containment bank in Burra Creek at the southern / upstream end of the creek near its junction with the Murray River near Tooleybuc, and is designed to allow flow into Burra Creek and to enable pumping through the regulator when required
- Drop structure - A drop structure would be installed at the northern / downstream confluence of Burra Creek and the Murray River, to control erosion during managed releases from Burra Creek to the river, including some modification of the western bank of the Murray River and placement of 0.3 m thick reno mattress down the river bank to approximately 50 mAHD
- Containment banks - Approximately 2.48 km of containment bank (four sections, Section A, B, C and D) would be constructed by raising existing access tracks at Burra North to facilitate a managed water level of 58.7 mAHD. Proposed containment banks would supplement the existing river levee to retain water at the design water level. Access tracks would be reinstated on top of the proposed containment banks and surfaced with gravel, with passing bays at necessary locations.
- Spillways – Four spillways (approx. 400 m total combined length) at an upstream level of 58.8 mAHD would be incorporated into the containment banks to enable controlled release of larger flows prior to overtopping of the containment banks

- Temporary pump hardstands – A 6 m x 6 m hardstand area would be constructed at Regulator B4 to support temporary pump infrastructure, and an existing private pump station site at Spillway 4 would be modified to make it suitable for temporary pumping by installing a 6 m x 6 m hardstand and rock-lining in the existing pump discharge pool for erosion control. Temporary pump infrastructure would include a trailer-mounted rig with a suction pipe extending into the Murray River, which would be brought onto site as required.

- Blockage removal - Four existing blockages (Banks 1, 2, 3 and 4) within Burra Creek at Burra North would be removed and one existing block bank (Bank 5) within Burra Creek at Burra North would be modified

Access during construction and operation of the project would use existing access tracks, which may require some maintenance to allow for construction and operational vehicles. Maintenance works would involve grading and applying additional road base to the track surface.

Temporary construction work sites would include laydown areas at Regulator B1 (approx. 50 m north east of the regulator work site), Regulator B2 (two alternative locations: approx. 15 m north west of the regulator work site on public land and 40 m south east of the regulator work site on private land) and Bank 5 (approx. 50 m west of the work site).

This report has been prepared based on the Issue for Review (IFR) Design dated March 2020.

The location of the main project infrastructure and works components, and associated area of investigation and construction footprints, is shown at Figure 1. The location of the proposed inundation area is shown at Figure 2.

1.3 Project location

The project site is located in the Murray Fans bioregion in north western Victoria, between Swan Hill and Robinvale. Burra Creek is a 54 km long anabranch of the Murray River that diverges from the River near Piangil, Victoria (opposite the township of Tooleybuc, NSW) and re-joins the Murray River approximately 10 km upstream of its junction with the Wakool River. The area enclosed between Burra Creek and the Murray River is known as Macredie Island. The northern part of Macredie Island is known as Burra Forest.

For the purposes of describing this project, the Burra Creek floodplain is divided into two areas by the privately owned Piambie Channel, these being described as:

- Burra North – floodplain north of Piambie Channel through to the northern / downstream end of Burra Creek

- Burra South - floodplain south of Piambie Channel through to the southern / upstream end of Burra Creek

The majority of proposed project infrastructure and the majority of the proposed inundation area (approx. 330 ha) are located at Burra North. A minor component of the proposed inundation area (approx. 73 ha) associated with the Burra Creek channel and one of the proposed regulating structures (Regulator B4) are located at Burra South.

The majority of the proposed inundation area and area of investigation at Burra North, including the development footprint of all proposed infrastructure, is located within the River Murray Reserve, a natural features reserve which is managed by Parks Victoria for conservation purposes. The majority of the proposed inundation area and area of investigation at Burra South, including the development footprint of all proposed infrastructure, is also contained within natural features reserve managed by Parks Victoria. Parts of the proposed inundation area, some sections of access track and one proposed construction laydown area are located on private land.

The construction footprints are comprised of wetlands and floodplain forest and woodland areas that receive water from the Murray River, and include infrequently flooded higher floodplain terraces dominated by Black Box (*Eucalyptus largiflorens*) or chenopod shrublands along with more frequently flooded terraces and creeklines that largely support River Red Gum (*Eucalyptus camaldulensis*) (Australian Ecosystems, 2016). There are limited areas of deep siliceous sands (Lowan Sands), which are dominated by semi-arid woodland and shrub-land (Australian Ecosystems, 2016).

1.4 Previous studies

Biodiversity information has been collected for the project over a number of years and during this time, the location and extent of construction areas has been revised numerous times with the overall aim of minimising impacts to areas of ecological value.

This flora and fauna assessment has been informed by the following previous studies undertaken for the project:

- Lumsden, L., Brown, G., Cheers, G. and Palmer, C. (2007) Floodplain fauna surveys – Macredie Island and Burra Forest. In 2007, Lumsden, Brown, Cheers and Palmer were engaged by Mallee CMA to undertake baseline floodplain fauna surveys across a broad area of the Burra Creek area, incorporating trapping methods (pitfall, Harp trapping), infrared motion-activated cameras, Anabat ultrasonic bat recorders and diurnal/nocturnal active searches for birds, frogs and herpetofauna.

- Brown, G., Bryant, D. and Horrocks, G. (2013) Terrestrial vertebrate fauna surveys of the Burra Creek and Nyah-Vinifera reserves, northern Victoria. In 2013 the Arthur Rylah Institute was engaged by Mallee CMA to undertake terrestrial vertebrate fauna surveys of the Burra Creek and Nyah-Vinifera reserves incorporating trapping methods (pitfall, funnel traps), infrared motion-activated cameras, Anabat ultrasonic bat recorders, diurnal/nocturnal active searches for birds, frogs and herpetofauna and call playback for owls.

- GHD (2013) Summary Report for the flora census of Burra, Nyah and Vinifera SDL sites - Memorandum prepared for Mallee CMA. In 2013 GHD were engaged by Mallee CMA to complete flora surveys including quadrats, cover percentages for litter, logs, bare ground and soil crust, and EVC mapping.

- Australian Ecosystems (2016) Nyah and Vinifera SDL Project - Flora and Fauna assessment. Detailed Design Stage. Report prepared for Mallee CMA. In 2016, Australian Ecosystems was engaged by Mallee CMA to undertake baseline flora and fauna surveys across the Burra Creek project area including mapping EVCs and large old trees, Habitat Hectare Assessments, bird surveys and nocturnal spotlighting for arboreal fauna.

- Jenkin, A., Stuart, I. and Harrow, S. (2018) SDL Fish Management Plan - Burra Creek. Report prepared for Mallee CMA.

- In spring and summer 2019, R8 was engaged by VMFRP to conduct targeted surveys for threatened flora and fauna. The results of these surveys have been compiled into a draft report which has been used as the basis for this report.

A summary of previous ecological assessments, including methods, key findings and recommendations is presented in Appendix A, with conclusions and recommendations incorporated throughout this report.

1.5 Purpose of this report

The purpose of this report is to:

- Summarise the findings of an updated desktop assessment to review flora, fauna (native species and habitat) and vegetation communities within 10 km of the project area

- Summarise the previous ecological assessments (Australian Ecosystems, 2016; GHD, 2013; Brown et al, 2013; Lumsden et al, 2007) undertaken for the project

- Describe targeted surveys for flora and fauna species and communities, listed under the Commonwealth EPBC Act and the Victorian FFG Act undertaken by R8 in late 2019 / early 2020
- Provide an inventory of all incidental observations of flora and fauna recorded during 2019 and 2020 surveys undertaken by R8
- Determine the extent of impacts to native vegetation (including large trees) within the proposed construction footprint in accordance with the Guidelines for the removal, destruction or lopping or native vegetation (DELWP 2017a)
- Describe specific threatening processes associated with the project as listed under the FFG Act and EPBC Act
- Determine the likelihood of occurrence of listed threatened flora and fauna species, listed threatened ecological communities and listed migratory species within the proposed construction footprint and inundation areas. Where listed species or communities are identified as occurring or having the potential to occur, determine the likely impact on these listed species and communities by the project (during both the construction and operation phases).
- Undertake an assessment of potential impacts on significant wetlands (e.g. Ramsar sites, nationally important wetlands) and other aquatic ecosystems and species
- Identify potential impacts to ecological values during the construction and operation of the project and recommend mitigation measures to minimise these impacts
- Discuss potential legislative requirements of the proposed works during the construction and operation phase (with respect to potential flora and fauna impacts)

FIGURE 1: Area of Investigation at Burra Creek

VMFRP

Containment Bank - Northern Section A
Laydown B1
Bank 1
Bank 2
Regulator B1
Spillway No1
Containment Bank - Northern Section B
Drop Structure
Spillway No2
Bank 3
Containment Bank - Northern Section C
Spillway No3
Containment Bank - Northern Section D
Bank 4
Bank 5
Containment Bank - B2
Laydown
Laydown
Regulator B2
Spillway B2
Laydown
Hardstand
Hardstand
Spillway No4
Regulator B4
Hardstand B4
Hayesdale-kooloonong Road
Raven Lane
Angle Road
Angle Road
Burra Creek
Wakool Junction Road
Obree Road
Egan Road
Natya Road
Heath Road
Mossop Lane
Murray Valley Highway
Pevensey Lane
Murray River
Etona Lane
Arbuthnot Lane
Goodnight Road
Wanera Lane
Cannally Road
Bingera Creek
Lake Wannah
Lockhart Road
Coonimur Road
Stewart Road
Coonimur-piangil Road
Dunstone Lane
Piangil West Road
Sharrock Lane
Murray Street
Yanga Way
Lea Street
Scott Street
Leon Court
Grant Street
Tooleybuc Road
Murray Street
South Street
Lake Coomaroop
Coomaroop Road
Branch Channel
Burra Channel
Burra Creek
Burra Creek
Burra Creek

Legend

- Area of Investigation
- Development footprint
- Construction footprint
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Cadastre

Kenley
BALRANALD
Natya
Goodnight
SWAN HILL
WAKOOL
Tooleybuc
Piangil
Mallee Highway
Murray Valley Highway
Balranald Road
Unnamed
Murray Street
Lea Street
0 5 10 km

IS297705

N

Name: GDA 1994 MGA Zone 55

0 1,000 2,000

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 2: Inundation Extent at Burra Creek - North

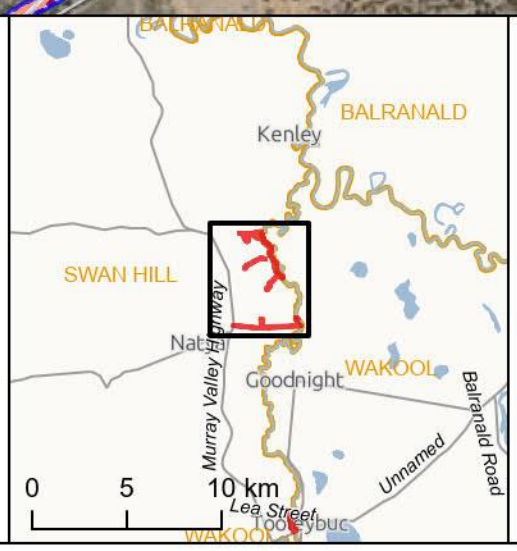
VMFRP

Laydown B1
Regulator B1
Drop Structure
Spillway No1
Bank 1
Bank 2
Raven Lane
Containment Bank - Northern Section A
Containment Bank - Northern Section B
Spillway No2
Bank 3
Containment Bank - Northern Section C
Spillway No3
Containment Bank - Northern Section D
Bank 4
Bank 5
Laydown
Containment Bank - B2
Regulator B2
Laydown
Spillway B2
Spillway No4
Hardstand
Hardstand
Laydown
Murray River
Murray River
Burra Creek
Burra Creek
Branch Channel
Angle Road
Angle Road
Murray Valley Highway
Obree Road
Wakool Junction Road
Natya Road

Legend

- Area of Investigation
- Development footprint
- Construction footprint
- Inundation Area
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre
- 103, Riverine Chenopod Woodland
- 104, Lignum Swamp
- 106, Grassy Riverine Forest
- 295, Riverine Grassy Woodland
- 808, Lignum Shrubland
- 811, Grassy Riverine Forest/Floodway Pond Herbland Complex
- 818, Shrubby Riverine Woodland
- 823, Lignum Swampy Woodland
- 992, Water Body - Fresh

R8



IS297742

N

Name: GDA 1994 MGA Zone 55

0 500 1,000

Metres

DATA SOURCES
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FIGURE 2: Inundation Extent at Burra Creek - South

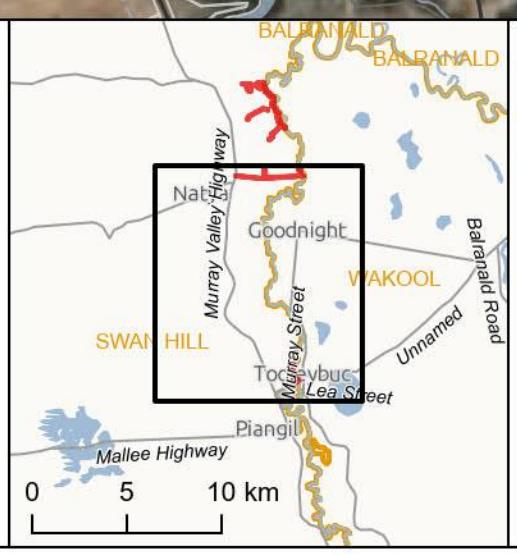
VMFRP

Bank 5 Laydown
Containment Bank - B2
Laydown
Spillway B2
Regulator B2
Laydown
Hardstand
Obree Road
Spillway No4
Hardstand
Egan Road
Natya Road
Burra Channel
Heath Road
Mossop Lane
Murray River
Pevensey Lane
Wakool Junction Road
Arbuthnot Lane
Etona Lane
Goodnight Road
Wanera Lane
Cannally Road
Bingera Creek
Lake Wannah
Burra Creek
Murray Valley Highway
Lockhart Road
Coonimur Road
Burra Creek
Stewart Road
Burra Creek
Hardstand B4
Regulator B4
Sharrock Lane
Coonimur-piangil Road
Dunstone Lane
Piangil West Road
River Street
Murray Street
Lea Street
Lea Street
Scott Street
Yanga Way
Coomaroop Road
Cadell Street
Wakool Street
Grant Street
Tooleybuc Road
Murray Street
Lake Coomaroop
South Street

Legend

- Area of Investigation
- Development footprint
- Construction footprint
- Inundation Area
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Cadastre
- 103, Riverine Chenopod Woodland
- 104, Lignum Swamp
- 810, Floodway Pond Herbland
- 818, Shrubby Riverine Woodland
- 823, Lignum Swampy Woodland
- 992, Water Body - Fresh

R8



IS297742

N

Name: GDA 1994 MGA Zone 55

0 500 1,000

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

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2. Methods

2.1 Assessment areas

The following assessment areas are referred to throughout this report:

- **Development footprint** - this is the area that the project infrastructure (e.g. regulators, drop structures, pump hardstands, containment banks, spillways) will occupy based on the IFR design, along with proposed construction laydown areas. No construction working buffer or access tracks are included in the development footprint
- **Construction footprint** - this includes the development footprint of the project infrastructure as well as the land required to construct the infrastructure, including access tracks
- **Area of investigation** - this includes the development footprint and construction footprint, as well as a substantial buffer around these areas
- **Inundation area** - area of land subject to flooding during managed events, up to a specific design water level

Reference to the project area throughout this report covers the area of investigation and proposed inundation area. The study area includes all land within 10 km of the project area, including private properties and roadsides. The study area covers a more extensive area than the expected zone of impact but this additional information provides context for the significance of any ecological features recorded from the project area (for example, whether they are part of a larger area, or whether impacts could extend to ecological features outside the project area). Biodiversity values in the broader study area and inundation area were only assessed at a desktop level.

2.2 Desktop assessment

A review of available biodiversity databases was undertaken to identify listed flora and fauna with the potential to occur within the project area. The review considered previous records, predicted occurrences of flora, fauna and vegetation communities, and an assessment of potential habitats from aerial imagery and native vegetation mapping.

The following databases and reports were used:

- Protected Matters Search Tool (PMST) for the EPBC Act, maintained by DAWE[4]
- Weeds of National Significance database[5]
- Victorian Biodiversity Atlas (VBA), maintained by DELWP[6]
- NatureKit, spatial database for native vegetation (Ecological Vegetation Class) mapping throughout Victoria, maintained by DELWP[7]
- Native Vegetation Information Management tool (NVIM), maintained by DELWP[8]

[4] http://www.environment.gov.au/epbc/protected-matters-search-tool (accessed on 09/01/2020)
[5] http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html (accessed 09/01/2020)
[6] https://www.environment.vic.gov.au/biodiversity/victorian-biodiversity-atlas (accessed on 09/01/2020)
[7] http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit (accessed on 09/01/2020)
[8] https://nvim.delwp.vic.gov.au/ (accessed on 09/01/2020)

- Australian Ecosystems (2016*). Nyah and Vinifera SDL Project Flora and Fauna Assessment. Detailed Design Stage* (includes Burra Creek sites). Report prepared for Mallee CMA

- Brown, Bryan and Horrocks (2013). *Terrestrial vertebrate fauna surveys of the Burra Creek and Nyah-Vinifera reserves, northern Victoria.* Report prepared for the Mallee CMA

- GHD (2013). *Flora Census Summary Report – Burra, Nyah and Vinifera SDL Sites.* Memorandum prepared for Mallee CMA

- Lumsden et al (2007). *Floodplain Fauna Surveys – Macredie Island and Burra Forest*. Report prepared for the Mallee CMA

A VBA and PMST search was undertaken for a 10 km radius around the project area.

The results of the desktop assessment are presented in the likelihood of occurrence / impact tables contained in Appendix B (Flora – Construction Footprint), Appendix C (Flora - Inundation Area), Appendix D (Fauna - Construction Footprint) and Appendix E (Fauna - Inundation Area).

2.3 Field assessment

2.3.1 Vegetation condition assessment

A field assessment was undertaken for. The work was undertaken on 28-30 October 2019 by R8 Senior Ecologist (Drew King) and Ecologist (Tao Lee) and included:

- Mapping the extent and condition of native vegetation present within the proposed construction footprint including:
  - Defining and mapping the relevant EVCs
  - Undertaking Habitat Hectare (HabHa) Assessments for each Habitat Zone (HZ) not previously assessed
  - Mapping and measuring all Canopy Trees that meet the benchmark for Large Trees not previously measured
- Recording the location of rare or threatened flora or fauna and protected flora where encountered
- Collecting an inventory of incidental observations of both native and non-native flora and fauna encountered during the field assessment, together with their conservation status and origin

Field assessment and mapping of native vegetation within proposed inundation areas was not included in the current scope of works and assessments in this report rely on desktop assessment of native vegetation within inundation areas.

2.3.2 Targeted threatened flora surveys

Field surveys were undertaken on 28-30 October 2019 by R8 Senior Ecologist (Drew King) and Ecologist (Tao Lee). Fieldwork was undertaken in all proposed construction footprints, and targeted surveys for rare or threatened flora were conducted (with particular emphasis on EPBC Act and FFG Act listed threatened flora) to update the results of previous assessments undertaken in the original construction areas (Australian Ecosystems 2016).

The surveys involved two field staff walking parallel linear transects 10 m apart over the extent of the construction footprints, with each ecologist having a 5 m field of view each side of the transect. Rare and threatened flora encountered were GPS marked and details recorded.

2.3.3 Targeted threatened fauna surveys

Field surveys were undertaken on 25 November and 11 December 2019 by R8 Senior Zoologists Alex Holmes and Dan Eyles. The surveys were conducted in the proposed construction footprints to confirm the condition and extent of fauna habitats and to conduct targeted surveys for threatened fauna known to occur in the project area (Lumsden et al 2007; Brown, Bryant & Horrocks 2013 and Australian Ecosystems 2016). Particular focus was given to the eastern subspecies of Regent Parrot (*Polytelis anthopeplus monarchoides*), which is known from River Murray Reserve, has been recorded in the broader study area and is listed under both the EPBC Act and the FFG Act.

A search of the VBA and PMST indicated that 35 fauna species are either known or are predicted to occur within the construction footprints. Of the 35 species, 10 threatened fauna species (eight terrestrial and two aquatic) and one listed migratory species (Fork-tailed Swift) were considered to have the potential to occur in the construction footprints based on habitat requirements and the number and period since last recorded (Appendix D). The eight listed threatened terrestrial fauna species made up the target threatened species list for the surveys and include

- Diamond Dove (*Geopelia cuneata*)
- Grey-crowned Babbler (*Pomatostomus temporalis*)
- Hooded Robin (*Meladryas cucullata*)
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri*)
- Painted Honeyeater (*Grantiella picta*)
- Regent Parrot (*Polytelis anthopeplus monarchoides*)
- Black Falcon (*Falco subniger*), and
- Carpet Python (*Morelia spilota metcalfei*)

Surveys focussed on previously identified threatened fauna species reported in Lumsden *et. al.* (2007), Brown, Bryant and Horrocks (2013), and Australian Ecosystems (2016).

The surveys included:

- Surveys for the EPBC Act and FFG Act listed Regent Parrot and its potential breeding habitat
- Recording all identified fauna, and their observed behaviour (e.g. feeding, roosting, breeding), abundance and conservation status
- Recording pest fauna posing a threat to native vegetation and/or fauna
- Active searching of appropriate fauna habitats (logs, tree hollows, tussocks, deep litter etc.) and food plants (i.e. fruit and/or nectar bearing) for mammals, birds, reptiles and frogs, and
- Assessments of potentially suitable habitat for threatened fauna
- Migratory terrestrial and migratory wetland species were also considered as part of this assessment

See Table 2 below for a summary of survey effort conducted for the project during the 2019 surveys. It should also be noted that methods described in 'Survey guidelines for Australia's threatened birds, Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*' (Department of the Environment, Water, Heritage and the Arts 2010) were consulted and employed for Regent Parrot and Painted Honeyeater.

Table 2: Summary of survey methods and effort employed for fauna surveys

Survey type	Survey effort	Species targeted
Habitat assessment	Conducted over approximately 2-3 person-hours per site, investigating construction footprint through various survey methods.	All
Bird surveys	At least 2 x 20 minute, 2 ha diurnal surveys at each construction footprint (two ecologists distributed across sites undertaking survey concurrently). Approx. 14 surveys undertaken.	Grey-crowned Babbler, Diamond Dove, Painted Honeyeater, Hooded Robin, Major Mitchell's Cockatoo, Regent Parrot, Black Falcon
Active searches	Conducted opportunistically by two ecologists concurrently at each construction footprint for a period of 30-60 mins. Approx. 14 surveys conducted.	Carpet Python
Scat / hair / bone / skin / pellet analysis	Assessed / collected opportunistically	All
Opportunistic observations	Two ecologists over the entire survey period, including two, 8-hour days (including travel) to other construction footprints inside of park. Minimum of 32 person-hours of opportunistic observation.	All

The Regent Parrot was recorded within the broader study area by Lumsden et al (2007), but not in subsequent surveys of the construction footprints by Brown, Bryant & Horrocks (2013) and Australian Ecosystems (2016). This species was recorded incidentally during the 2019 survey, again within the broader study area, approximately 2 km north-west of the Regulator B1 site. A group of six Regent Parrots were observed flying over neighbouring paddocks adjacent to an area of almond plantation.

This species has been previously recorded within 10 km of the project area five times, most recently in 2019 (VBA). According to the National Recovery Plan for Regent Parrots, the construction footprints fall within an area Regent Parrots are likely to occur, however Burra Creek falls outside of the mapped distribution of likely important breeding area (nesting and foraging) (Baker and Hurley 2011).

A precautionary approach was taken and surveys included area searches and assessments for potential nesting habitat according to the EPBC Survey Guidelines for Threatened Birds as described above. If nesting habitat (and breeding activity) was suspected to occur within a construction footprint, further surveys would be conducted to confirm the presence of breeding using methods described previously by Webster and Belcher (2008) with later refined by GHD (2009).

Regent Parrot targeted nest surveys

The Regent Parrot is listed as threatened under the FFG Act and Vulnerable under the EPBC Act. The Regent Parrot typically nests within suitable hollows of large old River Red Gum, with the male initially travelling up to 20 km to forage within Mallee habitats, returning to feed the female (when incubating eggs) and later the nestlings.

There are limited records of this species within 10 km of the proposed construction footprints, and breeding activity has not been previously reported or mapped within the Burra Creek area. As a precautionary measure, potential nesting habitat and nesting activity was investigated in the construction footprints within the prescribed targeted survey period (Magrath et al. 2010).

During the targeted fauna surveys, zoologists closely observed for potential nesting trees and recorded any Regent Parrot activity in the immediate vicinity. No Regent Parrots were observed during targeted surveys (though a group was observed 2 km north-west of the Regulator B1 site), and no trees with potential to provide Regent Parrot nesting habitat were observed at any of the construction footprints.

Timing of surveys for Regent Parrot nest sites

Surveys should be undertaken during the breeding season for Regent Parrots (within the period of September to January, inclusive), with a preference for October through December, depending on seasonal conditions such as winter/spring rainfall. Whilst this survey only included surveys for nesting habitat and not breeding activity for the Regent Parrot, surveys were completed in the optimal period for Regent Parrot breeding activity (November-December). If breeding habitat and breeding activity were suspected, further surveys would be conducted to confirm the presence of breeding using methods described previously by Webster and Belcher (2008) with later explanations provided from GHD (2009).

2.3.4 Flora species inventory

Rare or threatened species within the construction footprints is provided by Australian Ecosystems (2016) which involved detailed vegetation assessments. No additional species were detected in surveys during 2019 and all species recorded over the two surveys are listed in Appendix I.

2.4 Permits

Surveys were completed in accordance with the R8 flora and fauna survey permit conditions issued under the *Wildlife Act 1975* and *National Parks Act 1975*; Research Permit 10009193 and 10008653 administered by DELWP.

One of the permit conditions requires that all flora and fauna data collected during the surveys are submitted to the Victorian Biodiversity Atlas (VBA) and the Atlas of Victorian Wildlife database (which is also a condition of the data-sharing agreement between R8 and DELWP).

In addition, R8 has an operating Animal Ethics Committee (AEC). Approval to undertake the proposed survey methods was obtained from the R8 AEC prior to the commencement of field studies.

2.5 Nomenclature

2.5.1 Flora species

Unless otherwise noted, common and scientific names for flora follow the VBA database (Version 3.2.5).

Flora conservation status was determined in accordance with the Commonwealth EPBC Act, the Victorian FFG Act, and the *Advisory List of Rare or Threatened Plants in Victoria* – 2014 (DEPI, 2014).

2.5.2 Native vegetation

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. For the purpose of the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a), native vegetation is classified into two categories: a **Patch** of vegetation or a **Scattered Tree**:

A **patch** of native vegetation is either:

An area of native vegetation where at least 25% of the total perennial understorey plant cover[9] is native.

Any area with three or more native canopy trees[10] where the drip line[11] 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.

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

Other forms of vegetation include:

Planted native vegetation, i.e. includes non-indigenous native species and areas of revegetation.

Scattered native plants, i.e. patches of vegetation dominated by introduced species where less than 25% of the total perennial understorey plant cover is native.

Non-native vegetation, i.e. vegetation that comprises entirely introduced flora species.

2.5.3 Vegetation communities

Native vegetation in Victoria is mapped in units known as Ecological Vegetation Classes (EVCs). EVCs are described according to a combination of floristic, life form and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC occurs under a common regime of ecological processes within a given biogeographic range, and may contain multiple floristic communities.

Other vegetation types that may occur in Victoria include flora communities listed as threatened under the EPBC Act and/or the FFG Act. These have separate vegetation classification systems, each of which is also separate to the EVC classification system. As such, any single patch of native vegetation occurring in the project area (or anywhere in Victoria) will be classifiable as a particular EVC, and may also be separately classified as a different ecological community under the EPBC Act and/or as another vegetation community under the FFG Act.

2.5.4 Tree Protection Zones

In addition to the native vegetation patches, there may be trees present that whist being situated outside of the construction areas, could be impacted indirectly through encroachment of their Tree Protection Zones (TPZs). When determining whether construction and earthworks near scattered trees, and patches of vegetation containing trees, would result in the loss of the tree, the *Australian Standard AS 4970-2009 – Protection of trees on development sites* is considered (Standards Australia, 2009). This standard specifies Tree Protection Zones[12]

[9] Plant cover is the proportion of the ground cover that is shaded by vegetation foliage when lit directly from above. Areas that include non-vascular vegetation (such as mosses and lichens) but otherwise support no native vegetation are not considered to be patch for the purpose of the Guidelines. However, when non-vascular vegetation is present with vascular vegetation, it does contribute to the cover when determining the percentage of perennial understorey plant cover.

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

[11] The drip line is the outer most boundary of a tree canopy (leaves and/or branches) where the water drips on to the ground.

[12] A Tree Protection Zone is an area around the trunk of the tree which has a radius of 12 x the diameter at breast height to a maximum of 15 metres but no less than 2 metres (DSE 2010).

(TPZs) and Structural Root Zones (SRZs) that should be protected. Where encroachment into the TPZ (above or below ground) is greater than 10 percent, or is inside the SRZ, then the tree is assumed lost (DELWP, 2017b).

Note: The TPZs of a tree are calculated by recording the diameter at breast height (DBH) of a tree at 1.4 m above ground level (and for multi-stemmed trees such as mallee eucalypts, the TPZ is determined by combining the DBH measurements of each individual stem). A second DBH measurement at 1.3 m is also required to determine the size class of a tree (under the Guidelines).

2.5.5 Fauna species and communities

Unless otherwise noted, common and scientific names for fauna follow the VBA database (Version 3.2.5).

Fauna conservation status was determined in accordance with the Commonwealth EPBC Act, the Victorian FFG Act, the *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE, 2013) and the *Advisory List of Threatened Invertebrate Fauna in Victoria* (DSE, 2009).

The EPBC Act and the FFG Act list a number of threatened fauna communities, at a national or state scale, respectively. Fauna communities known or potentially occurring within the project area are only considered if they are listed under one or more of these Acts.

2.5.6 Weeds

The loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants, is a listed key threatening process under the EPBC Act. In addition, invasion of native vegetation by 'environmental weeds', is a listed potentially threatening process under the FFG Act.

During the field surveys, a list of all flora observed within the project area was created. This includes environmental weeds, noxious weeds listed under the CaLP and WONS). All such weed species are listed in Appendix I.

3. Targeted threatened species surveys

3.1 Targeted Threatened Flora Assessment Results

3.1.1 Desktop Assessment and Likelihood of Occurrence

3.1.1.1 Construction footprints

VBA and PMST searches identified 48 listed flora species that have been recorded or modelled to occur within 10 km of the project area, including nine FFG Act listed species, five EPBC Act listed species and 46 species listed as rare or threatened on the Advisory List of Rare and Threatened Plants in Victoria (DEPI 2014).

Each of these 48 species were then assessed for their likelihood of occurrence within the construction footprint (Appendix B) taking into account factors such as the habitat requirements of each species and comparing those to the habitats encountered within the construction footprints, and also the number of recent records within 10 km of the construction footprints. Two FFG Act listed species (Umbrella Wattle (*Acacia oswaldii*) and (Silver Saltbush (*Atriplex rhagodioides*)) and no EPBC Act listed species were assessed as having a likelihood of occurrence of possible or higher in the proposed construction footprints.

Species for which habitat was present or that had previously been located within the construction footprints were targeted during the threatened flora surveys (Appendix B).

3.1.1.2 Inundation area

VBA and PMST searches identified 48 listed flora species that have been recorded or modelled to occur within 10 km of the project area, including nine FFG Act listed species, five EPBC Act listed species and 46 species listed as rare or threatened on the Advisory list of Rare and Threatened Plants in Victoria (DEPI 2014).

Each of these 48 species were then assessed for their likelihood of occurrence within the inundation area (Appendix C) taking into account factors such as potential response to proposed inundation, the habitat requirements of each species and comparing those to the habitats encountered within the inundation areas, and the number of recent records within 10 km of the inundation areas. Two FFG Act listed species (Umbrella Wattle (*Acacia oswaldii*) and (Silver Saltbush (*Atriplex rhagodioides*)) and no EPBC Act listed species were assessed as having a likelihood of occurrence of possible or higher in the proposed inundation areas.

The inundation area included mainly vegetation communities that were classified as swamp or wetland areas only. No dryland communities are proposed to be impacted by the proposed inundation. Adverse impacts were not predicted for any of the flora species for which habitat occurs within the inundation areas.

3.1.2 Field surveys

Targeted surveys for rare or threatened flora species were undertaken in October 2019 at the construction footprints. These areas contained intact native vegetation and it was considered possible that they supported suitable habitat for rare or threatened species.

The surveys did not locate any EPBC Act listed species within the construction footprints. One FFG Act listed species – *Acacia oswaldii* – was identified adjacent to existing access tracks in 2019. Three further rare or threatened species listed on the Advisory list of Rare and Threatened Plants in Victoria (DEPI 2014) were located in 2019. A further two rare or threatened species were observed in construction footprints in 2015 by Australian Ecosystems (2016) but could not be located in 2019. These two species are considered to potentially remain given the dry conditions in 2019. The results are summarised in Table 3.

Table 3: Summary of threatened flora recorded during 2019 surveys

Species name	Conservation status	Location(s)
Acacia oswaldii (Umbrella Wattle)	FFG Act listed DELWP Advisory – vulnerable	Adjacent to access tracks in the north of the area of investigation (two plants) – not considered impacted
Asperula wimmerana (Wimmera Woodruff)	DELWP Advisory – rare	Common throughout area of investigation (50 plants to be removed)
Atriplex pseudocampanulata (Fan Salt-bush)	DELWP Advisory – rare	Previously observed (2015) but not found in 2019 and previous locations not within construction footprints.
Dianella poracea	DELWP Advisory – rare	Adjacent to access tracks in the north of the area of investigation (one plant) – not considered impacted
Picris squarrosa	DELWP Advisory – rare	Previously observed (2015) but not found in 2019. Conservatively assumed to be impacted due to dry conditions in 2019 (one plant).
Senecio cunninghamii var. cunninghamii (Branching Groundsel)	DELWP Advisory – rare	Spillway 2 (five plants)
Sida intricata (Twiggy Sida)	DELWP Advisory – vulnerable	Previously observed (2015) but not found in 2019. Conservatively assumed to be impacted due to dry conditions in 2019 (one plant).

3.2 Targeted Threatened Fauna Assessment Results

3.2.1 Desktop assessment

3.2.1.1 Construction footprints

VBA and PMST searches identified 35 listed fauna species that have been recorded or modelled to occur within 10 km of the project area, including 25 FFG Act listed threatened species, 17 EPBC Act listed threatened species and 10 EPBC Act listed migratory species

Each of these 35 species was then assessed for their likelihood of occurrence (Appendix D), taking into account factors such as the habitat requirements of each species and comparing those to the habitats encountered within the construction footprints, and the recentness of records (i.e. within the last 30 years) within 10 km of the construction footprints. This is discussed further in Section 4, along with an assessment of the likelihood of impacts to species considered likely to occur or known to occur within the construction footprints.

Ten FFG Act listed threatened species, four EPBC Act listed threatened species and one EPBC Act listed migtratory species were assessed as having a likelihood of occurrence of possible or higher in the proposed construction footprints.

Lumsden *et al* (2007) recorded 10 FFG Act listed species within their construction footprints, one of which is also EPBC Act listed (Regent Parrot (*Polytelis anthopeplus monarchoides*)). Brown, Bryant and Horrocks (2013) recorded one FFG Act listed species within their construction footprints; the Hooded Robin (*Melanodryas cucullata*).

3.2.1.2 Inundation area

VBA and PMST searches identified 35 listed fauna species that have been recorded or modelled to occur within 10 km of the project area, including 25 FFG Act listed threatened species, 17 EPBC Act listed threatened species and 10 EPBC Act listed migratory species

Each of these 35 species was then assessed for their likelihood of occurrence (Appendix E), taking into account factors such as the habitat requirements of each species and comparing those to the habitats encountered within the proposed inundation areas, and also the number of recent records within 10 km of the inundation area. This is discussed further in Section 4, along with an assessment of likelihood of impacts to species considered likely to occur or known to occur within the inundation area.

Ten FFG Act listed threatened species, four EPBC Act listed threatened species and one EPBC Act listed migratory species were assessed as having a likelihood of occurrence of possible or higher in the proposed inundation areas.

3.2.2 Field survey results

During field surveys of the construction footprints on 25 November and 11 December 2019, R8 Ecologists identified 45 individual fauna across 11 species (all birds). One threatened fauna species was recorded during these surveys, with a group of six Regent Parrots (EPBC Act listed Vulnerable, FFG Act listed) observed flying in a westerly direction over neighbouring paddocks adjacent to an area of almond plantation, approximately 2 km north-west of Construction Footprint B1 Regulator. A summary of all fauna species recorded during the surveys is provided in Appendix J.

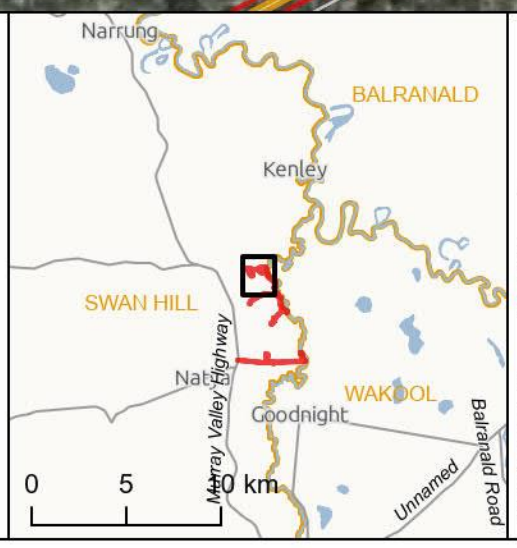
General observations of habitats within the construction footprints consisted of areas of Lignum shrubland and Lignum dominated open woodland with large old River-Red Gum and Black Box trees providing many hollows, cracks, fissures and loose bark which provide many fauna habitat vales. Many trees throughout the project area appear stressed. Fauna habitats broadly align to the EVCs described in Section 5.

Threatened flora and fauna recorded in the vicinity of the area of investigation are mapped in Figure 3.

FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 1 of 8

Legend

- Incidental Flora Records (Australian Ecology 11/2015)
- Threatened Flora & Fauna (VMFRP Field Data 2019/2020)
- Area of Investigation
- Development footprint
- Construction footprint
- Minor Road
- Watercourse Stream
- Waterbody
- Cadastre



IS297742

N

Name: GDA 1994 MGA Zone 55

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Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 2 of 8

VMFRP

Spillway No1

Containment Bank - Northern Section A

Spillway No2

Containment Bank - Northern Section B

Burra Creek

Bank 3

Murray River

Containment Bank - Northern Section C

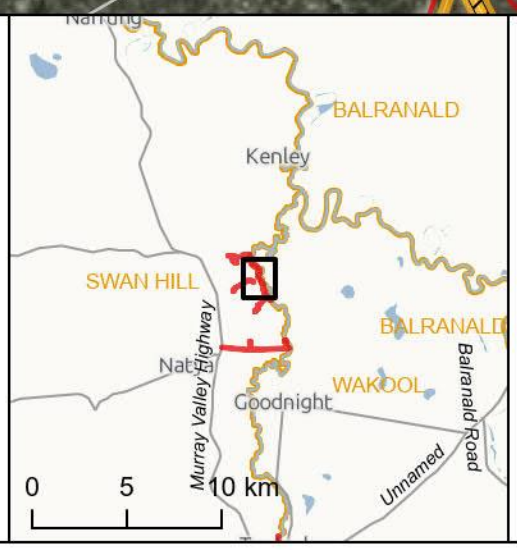
Spillway No3

Obree Road

Containment Bank - Northern Section D

Legend

- Incidental Flora Records (Australian Ecology 11/2015)
- Area of Investigation
- Development footprint
- Construction footprint
- Minor Road
- Watercourse Stream
- Waterbody
- Cadastre



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Name: GDA 1994 MGA Zone 55

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Metres

DATA SOURCES

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FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 3 of 8

VMFRP

Containment Bank - Northern Section C

Spillway No3

Murray River

Containment Bank - Northern Section D

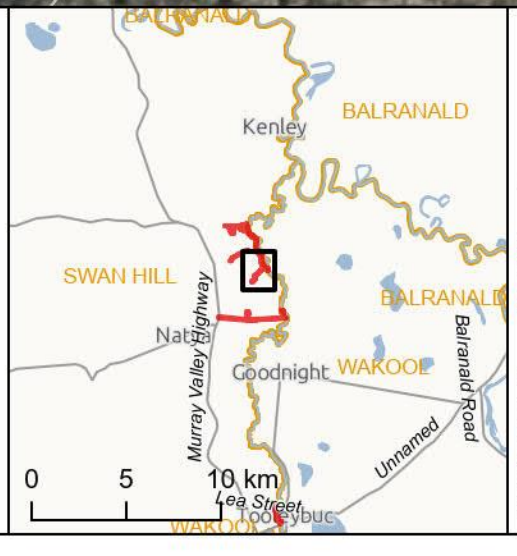
Burra Creek

Obree Road

Bank 4

Legend

- Incidental Flora Records (Australian Ecology 11/2015)
- Threatened Flora & Fauna (VMFRP Field Data 2019/2020)
- Area of Investigation
- Development footprint
- Construction footprint
- Minor Road
- Watercourse Stream
- Waterbody
- Cadastre



IS297742

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Metres

DATA SOURCES
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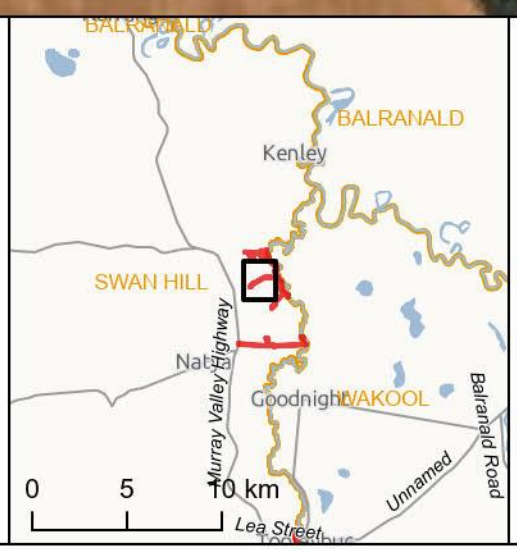
Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 4 of 8

VMFRP

Legend

- Incidental Flora Records (Australian Ecology 11/2015)
- Area of Investigation
- Development footprint
- Construction footprint
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre



IS297742

N

Name: GDA 1994 MGA Zone 55

0 100 200

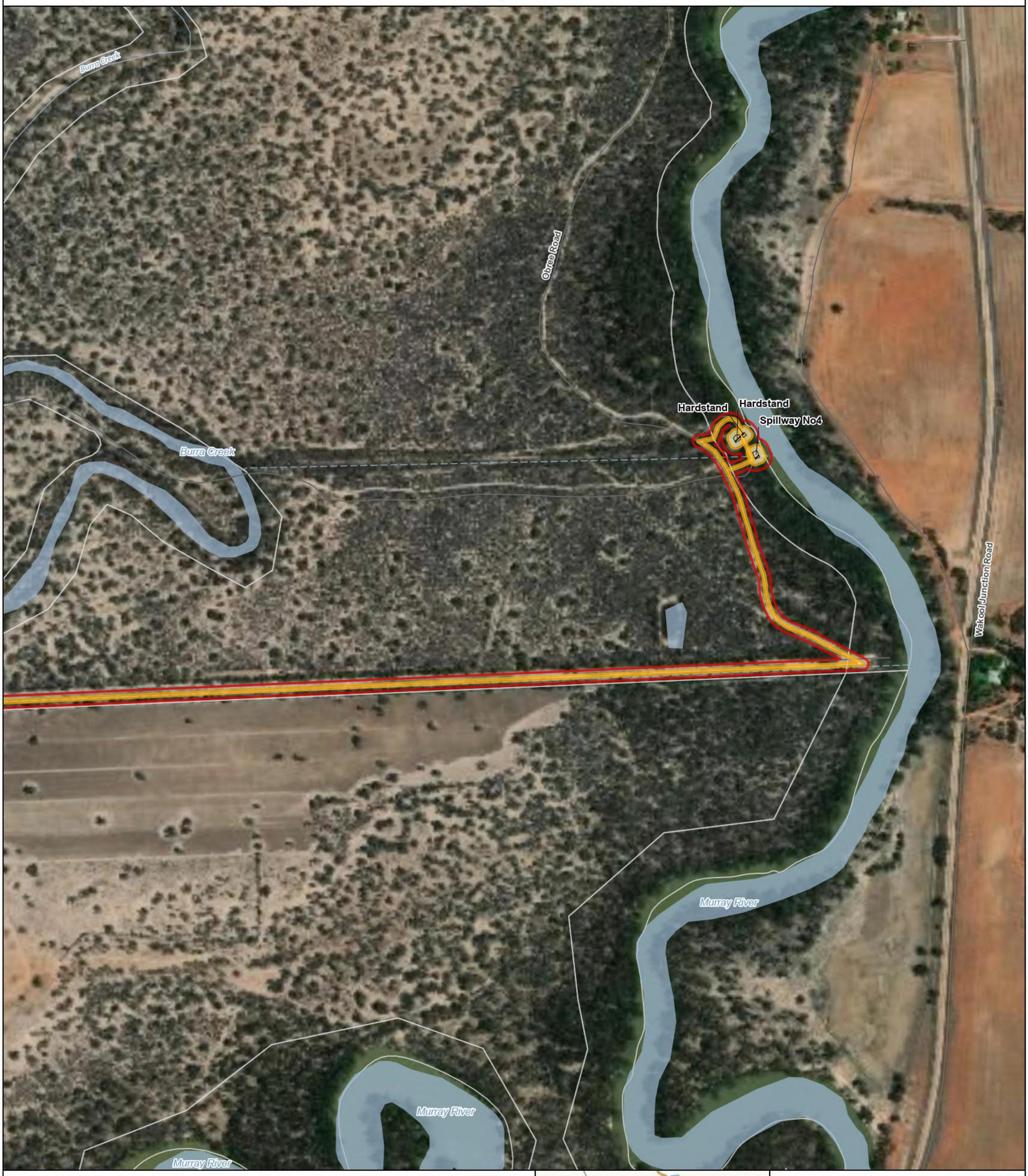
Metres

DATA SOURCES

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

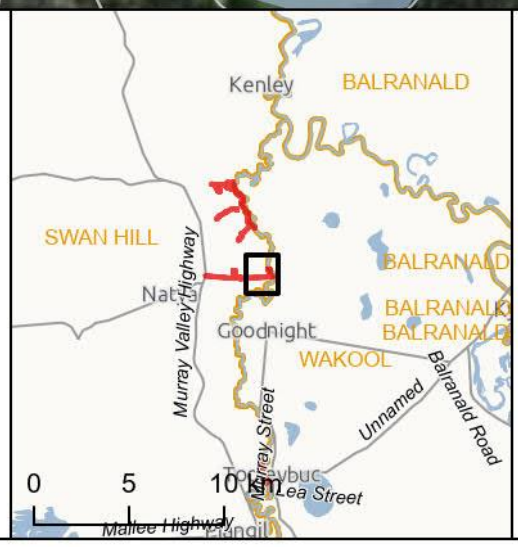
FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 5 of 8

VMFRP



Legend

- Area of Investigation
- Development footprint
- Construction footprint
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre



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Name: GDA 1994 MGA Zone 55

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Metres

DATA SOURCES
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Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 6 of 8

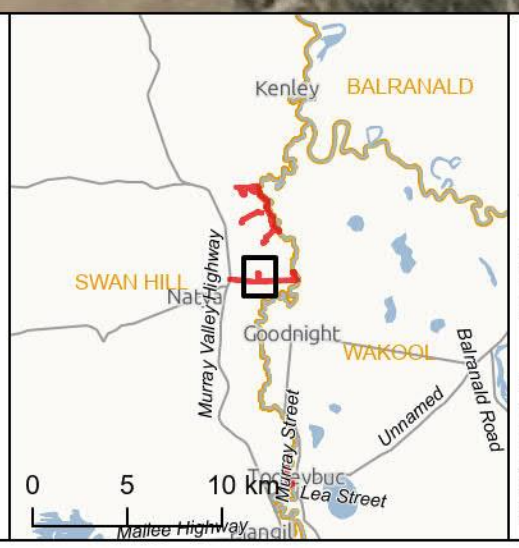
VMFRP

Burra Creek
Burra Creek
Burra Creek
Laydown
Bank 5
Regulator B2
Containment Bank - B2
Spillway B2
Laydown
Laydown

Legend

- Incidental Flora Records (Australian Ecology 11/2015)
- Area of Investigation
- Development footprint
- Construction footprint
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre

R8



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Name: GDA 1994 MGA Zone 55

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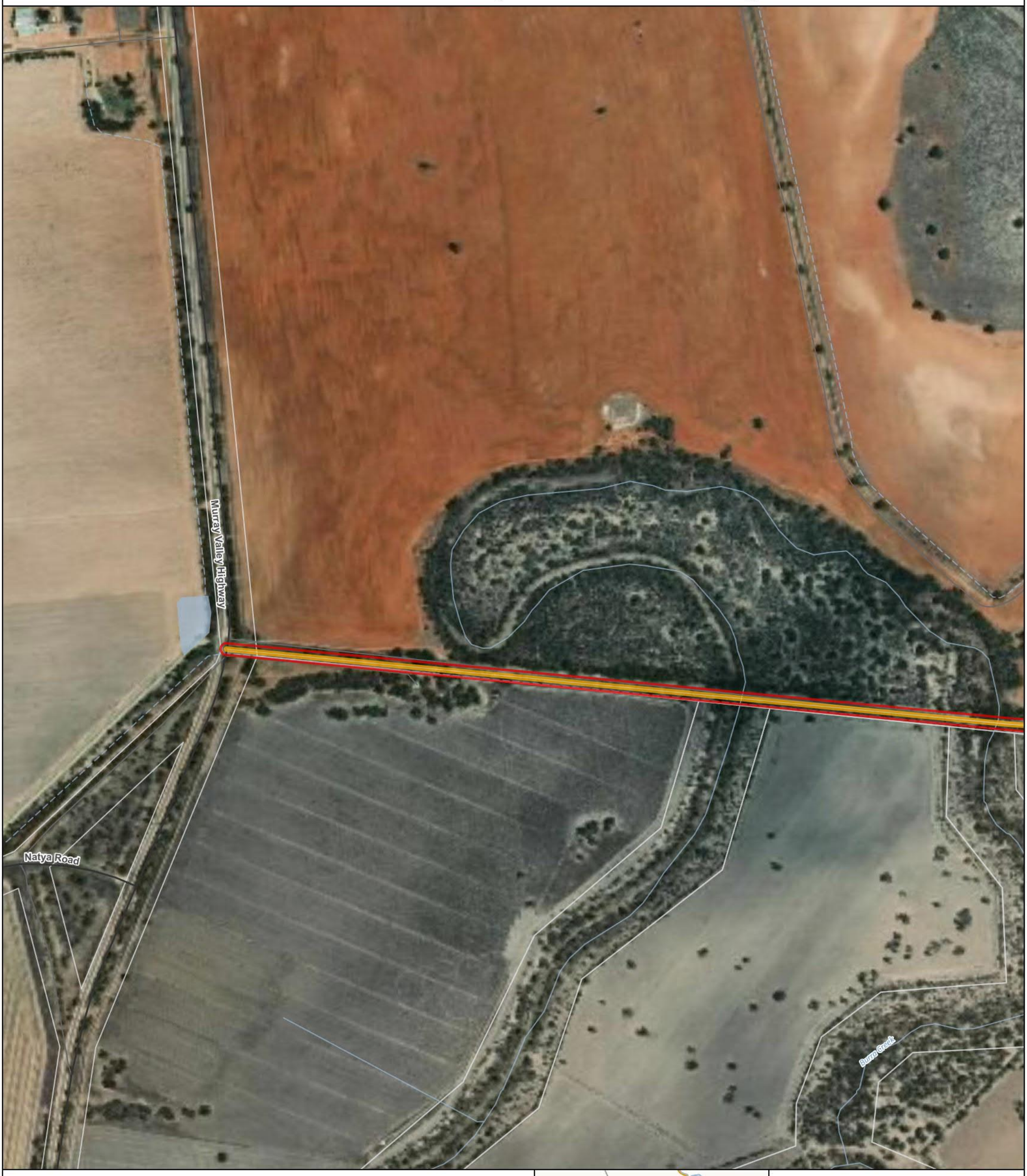
Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

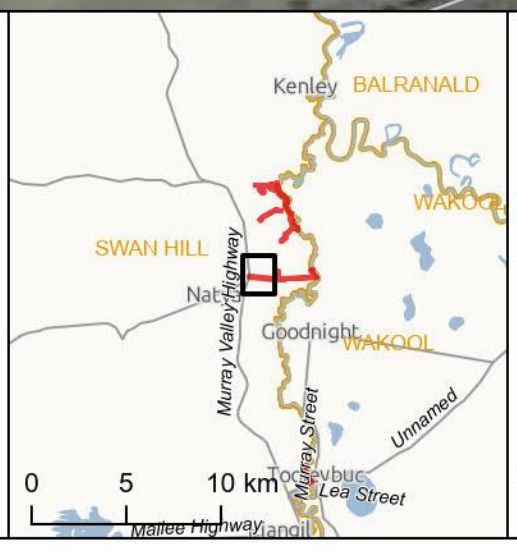
Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 7 of 8 VMFRP



Legend

- Area of Investigation
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre



IS297742

N

Name: GDA 1994 MGA Zone 55

0 100 200

Metres

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Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 3: Flora and Fauna in construction footprints at Burra Creek, Page 8 of 8

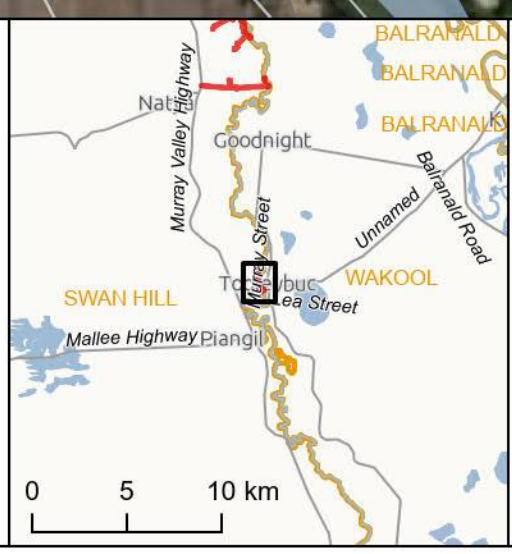
VMFRP

Hardstand B4
Regulator B4
Lockhart Road
Sharrock Lane
Burra Creek
Murray River
Herbert Street
Murray Street
Lea Street
River Street
Yanga Way
Scott Street
Wakool Street
Wood Street
Leon Court
Cadell Street
Grant Street
Jackson Street
Tooleybuc Road

Legend

- Incidental Flora Records (Australian Ecology 11/2015)
- Area of Investigation
- Development footprint
- Construction footprint
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre

R8



IS297742

N

Name: GDA 1994 MGA Zone 55

0 100 200

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

4. Impacts to threatened species and communities

The likelihood of each species or community of conservation significance occurring within the construction footprints and inundation areas was assessed on the basis of the species' or community's history of occurrence and its habitat requirements. For each species or community, the presence of suitable habitat within the construction footprints was determined, along with the condition and approximate extent of suitable habitat within the inundation areas and the broader context of the surrounding landscape. This was coupled with how often and how recently each species or community had been recorded (if at all) within the construction footprints or within 10 km of the construction footprints. Resources utilised to assist in determining likelihood of occurrences included VBA and PMST searches (within a 10 km radius of the construction footprints), as well as the previous reports for the project and the most recent surveys. The basis of the likelihood of occurrence of each threatened species of community within one or more of the construction footprints was specifically:

PRESENT – Species known to occur within one or more construction footprints, or detected during the site visit.

POSSIBLE – Potentially suitable habitat occurs within one or more construction footprints and species' known range encompasses the construction footprints. Species recorded historically in the 10 km search area, within the last 30 years.

UNLIKELY – Species' known range encompasses the construction footprints, but suitable habitat does not occur within construction footprints, or occurs within construction footprints but with generally low quality and quantity. Species recorded historically in the 10 km search area but not within the last 30 years.

HIGHLY UNLIKELY – No historical records of the species within the last 30 years and/or no suitable habitat in the 10 km search area.

4.1 Impacts to threatened vegetation communities

The PMST identified three ecological communities with potential to occur within 10 km of the project area (Table 4). None of these communities is consistent with vegetation mapped or modelled within either the construction footprints or inundation areas.

Table 4: EPBC Act listed threatened ecological communities modelled to occur in PMST search

Community	Conservation status	Likelihood of occurrence
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	**Not Present**. Not detected in 2019 and no matching vegetation communities identified in previous assessments.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	**Not Present**. Not detected in 2019 and no matching vegetation communities identified in previous assessments.
Weeping Myall Woodlands	Endangered	**Not Present**. Not detected in 2019 and no matching vegetation communities identified in previous assessments.

The EVCs previously mapped within the project area also do not correspond with the descriptions of any threatened communities listed under the FFG Act (DELWP 2018).

4.2 Impacts to threatened flora species

4.2.1 EPBC Act listed flora

No species are considered likely to occur or be impacted by either the construction works or proposed inundation.

4.2.2 FFG Act listed threatened flora

The presence of FFG Act listed flora species is identified in Section 3.1.2. One FFG Act listed threatened flora species, *Acacia oswaldii*, has been identified along existing access tracks but is not proposed to be impacted by the construction footprint. There is potential that the proposed inundation will impact further unmapped individuals, however inundation is predicted to be beneficial for this species overall.

4.2.3 FFG Act protected flora species

FFG Act protected flora species include all FFG Act listed threatened species as well as many families, genera, and species that are generally common including all members of the Asteraceae family and most *Acacia* species.

In addition to the species listed in section 4.2.2. The project is likely to impact on the protected flora species previously recorded within the construction footprints as listed below:

- *Acacia stenophylla* (common species with potential impact of ~10 throughout construction footprint)
- *Actinobole uliginosum* (common species with potential impact of ~500 throughout construction footprint)
- *Brachyscome basaltica* (common species with potential impact of ~50 throughout construction footprint)
- *Brachyscome lineariloba* (common species with potential impact of ~50 throughout construction footprint)
- *Calotis hispidula* (common species with potential impact of ~50 throughout construction footprint)
- *Calotis scapigera* (common species with potential impact of ~50 throughout construction footprint)
- *Euchiton sphaericus* (common species with potential impact of ~50 throughout construction footprint)
- *Helichrysum luteoalbum* (common species with potential impact of ~50 throughout construction footprint)
- *Rodanthe sp.* (common species with potential impact of ~500 throughout construction footprint)
- *Senecio cunninghamii var. cunninghamii* (rare species with ~5 as shown on maps)
- *Senecio quadridentatus* (common species with potential impact of ~50 throughout construction footprint)
- *Senecio runciformis* (common species with potential impact of ~50 throughout construction footprint)
- *Vittadinia cuneata var. cuneata* (common species with potential impact of ~100 throughout construction footprint)
- *Xerochrysum bracteatum* (common species with potential impact of ~50 throughout construction footprint)

4.3 Impacts to threatened fauna

Thirty-five fauna species listed under the EPBC Act and/or the FFG Act were identified from the VBA and PMST within 10 km of the construction footprints and inundation areas, or recorded from previous reports conducted within the construction footprints (Brown *et al* 2013, Australian Ecosystems 2016). Of these, ten FFG Act listed threatened species, four EPBC Act listed threatened species and one EPBC Act listed migratory were assessed as having the potential to occur within the proposed construction footprints (see Appendix D and Appendix E for rationale). These species are summarised in Table 5. Impacts to these species are considered further in this Section of the report (Section 4).

Table 5: EPBC Act and FFG Act listed fauna considered possible or known to occur in the project area

Key to status: L – Listed EN / en – Endangered. VU / vu – Vulnerable. nt – Near Threatened. cr – Critically Endangered. Rx – Regionally Extinct

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Black Falcon	*Falco subniger*		L	vu	11	1980	VBA	**Occurrence: Possible.** This species may utilise habitats in construction footprints for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.	**Occurrence: Possible.** This species may utilise habitats in the inundation area for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.
Diamond Dove	*Geopelia cuneata*		L	nt	2	1979	VBA	**Occurrence: Possible.** This species may utilise habitats in construction footprint for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.	**Occurrence: Possible.** This species may utilise habitats in inundation areas for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Fork-tailed Swift	*Apus pacificus*	Mi			1	1980	VBA, PMST	**Occurrence: Possible.** Species may fly over area whilst foraging. **Impact Unlikely.** Species highly mobile and wide ranging, suitable surrounding habitat widespread.	**Occurrence:Possible.** Species may fly over area whilst foraging. **Impact Unlikely.** Species highly mobile and wide ranging, suitable surrounding habitat widespread.
Grey-crowned Babbler	*Pomatostomus temporalis*		L	en	24	2001	VBA	**Occurrence: Present.** This species may utilise habitats in construction footprint for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.	**Occurrence: Present.** This species is likely to utilise habitats across the inundation areas for foraging purposes. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Hooded Robin	*Melanodryas cucullata*		L	nt	2	2013	VBA, Brown *et. al* 2013.	**Occurrence: Possible.** Suitable habitats in construction footprints. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.	**Occurrence: Possible.** Suitable habitats in inundation areas for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*		L	vu	3	2018	VBA	**Occurrence: Possible.** Suitable habitats in construction footprints. **Impacts: Unlikely.** Impact areas do not include trees suitable for nesting, species mobile and wide ranging, and suitable surrounding habitat widespread.	**Occurrence: Possible.** Suitable habitats in inundation areas. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Painted Honeyeater	*Grantiella picta*	VU	L	vu	0	-	PMST	**Occurrence: Possible.** Species not recorded previously but may occasionally utilise habitats in construction footprints for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.	**Occurrence: Possible.** Species not recorded previously but may occasionally utilise habitats in inundation areas for foraging. **Impact: Unlikely.** This species is mobile and wide ranging, and suitable surrounding habitat is widespread. Species likely to benefit from improved habitat condition following environmental water.

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Regent Parrot	*Polytelis anthopeplus monarchoides*	VU	L	vu	10	2019 (This study)	VBA, PMST, R8 (2019)	**Occurrence: Present.** Recent previous records within the project area, with suitable foraging habitat within the construction footprints. Suitable breeding habitat does not occur within the construction footprints. **Impact: Unlikely.** Losses to small area (12.614 ha) of foraging habitat proposed. Species is highly mobile and wide ranging, and suitable surrounding habitat widespread. Important breeding habitat not present within the construction footprints, no species breeding habitat within 30km.	**Occurrence: Present.** Recent previous records within the project area, with suitable foraging habitat across the inundation area. **Impact: Unlikely**. Species is highly mobile and wide ranging, suitable surrounding habitat widespread. Important breeding habitat not present within the inundation area, species likely to benefit from improved habitat condition following environmental water.

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Carpet Python	*Morelia spilota metcalfei*		L	en	2	2002	VBA	**Occurrence: Possible.** Suitable habitat at all construction footprints. **Impact: Possible.** Localised impacts possible, consideration of finalised footprint required, direct impacts (injury, stress, mortality) through habitat clearing should be mitigated. Suitable habitat surrounding and widespread.	**Occurrence: Possible.** Suitable habitat across the inundation areas. **Impact: Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Silver Perch	*Bidyanus bidyanus*	CR	L	vu	0	-	PMST	**Occurrence: Possible.** Suitable habitat present within Murray River but suitable habitat unlikely in Burra Creek. **Impact: Possible.** Localised impacts possible, consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider aquatic fauna. A construction specific aquatic fauna management protocol should be developed for all works around waterways.	**Occurrence: Possible.** No previous records. Silver Perch are a main-channel specialist which is known from the Murray River but unlikely to be present in Burra Creek under existing conditions. May use inundated floodplain wetland for short-term foraging. **Impact: Unlikely.** It is unlikely that the species is present within Burra Creek under existing conditions and as such negative impacts are unlikely. Floodplain inundation may benefit from improved habitat condition following environmental watering.

Common name	Scientific name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact - Construction Areas	Likelihood of Occurrence and Impact - Inundation Area
Murray Cod	*Maccullochella peelii*	VU	L	vu	0	-	PMST	**Occurrence: Possible.** Suitable habitat present within Murray River but suitable habitat unlikely in Burra Creek. **Impact: Possible.** Localised impacts possible, consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider aquatic fauna. A construction specific aquatic fauna management protocol should be developed for all works around waterways.	**Occurrence: Possible.** No previous records. Suitable habitat present within Murray River, unlikely to inhabit Burra Creek. May use inundated floodplain wetland for short-term foraging. **Impact: Unlikely.** It is unlikely that the species is present within Burra Creek under existing conditions and as such negative impacts are unlikely. Floodplain inundation may benefit from improved habitat condition following environmental watering.

4.3.1 Impacts to EPBC Act listed fauna species and communities within the proposed construction footprints

One EPBC Act listed species was observed during the targeted field surveys in 2019; with six Regent Parrots (*Polytelis anthopeplus monarchoides*) (EPBC Act listed Vulnerable) recorded flying in a westerly direction over neighbouring paddocks adjacent to an area of almond plantation, approximately 2 km north-west of Construction Footprint B1 Regulator. This species is known to occur within the project area, based on the species distribution and habitat suitability at the time of the survey.

The Regent Parrot has been recorded within 10 km of the construction footprints ten times, most recently in 2019 (VBA). According to the National Recovery Plan for Regent Parrots (eastern subspecies) (Baker and Hurley 2011), the most easterly distribution of breeding habitat is mapped as likely to occur (or may occur) adjacent to Windomal, which is ~10 km north of the construction footprints. Additionally, Baker and Hurley (2011) state that important foraging habitat during the breeding season occurs within 20 km of nests sites in Mallee Woodlands (Baker and Hurley 2011). Whilst Burra Creek is mapped as an area where Regent Parrots are likely to occur (Baker and Hurley 2011), the Burra Creek project area falls outside of the distribution of important breeding (nesting and foraging) habitat. Given the small number of records within 10 km of the construction footprints, and the lack of suitable breeding habitat surveyed during targeted surveys, this species is considered likely to be an occasional visitor, and likely to utilise habitat within the construction footprints infrequently as non-important foraging habitat.

Impacts to Regent Parrots are expected to be marginal, and will include losses to a small area (~ 12.614 ha) of potential foraging habitat. Furthermore, previous reports by Seran BL&A (2018) found that the Burra Creek project would not likely trigger a significant impact based on the EPBC Act significant impact criteria (DotE 2013). A current full assessment of the EPBC Act significant impact criteria for this species in relation to the proposed works is provided in Appendix G.

The '*National Recovery Plan for the Regent Parrot (eastern subspecies) Polytelis anthopeplus monarchoides*' (Baker-Gabb and Hurley 2011) lists a range of threatening processes including disturbance around nesting colonies. As mentioned above, there are no known nesting colonies in the Burra Creek project area and based on further habitat assessment and survey conducted for this report, there appears to be a continued lack of nesting activity and habitat. Based on current and previous assessment of Regent Parrot habitat in the area of investigation it seems reasonable to suggest that disturbance to known nesting colonies is unlikely.

One of the protection measures outlined in the recovery plan mentioned "the use of environmental water to initially rescue River Red Gum from drought was first undertaken in Victoria in 2002". The recovery plan then mentions that this continued under The Living Murray (TLM) project with important breeding sites for Regent Parrot such as Hattah Lakes being listed as one of six 'icon' sites and targeted for the construction of water regulation structures to provide a more natural watering regime to these wetland ecosystems. The VMFRP project has similar objectives as TLM and will aim to maintain and enhance the condition of River Red Gum habitats and broader floodplain and wetland habitats which are likely to assist with the recovery of the Regent Parrot.

One additional EPBC Act listed bird species is considered possible to occur within the construction footprints and to therefore be impacted: the Painted Honeyeater (*Grantiella picta*). Painted Honeyeater is considered to have potential to utilise habitats within the proposed construction footprints and inundation area. This species has not been previously recorded within 10 km of the construction footprints, but may occasionally forage in these woodland areas. The proposed construction footprints are however not likely to significantly impact any areas of important habitat to this extremely mobile nomadic species, which forages widely over large areas in pursuit of mistletoe and flowering eucalypts. A current full assessment of the EPBC Act significant impact criteria for this species in relation to the proposed works is provided in Appendix G.

Murray Cod (*Maccullochella peelii peelii*) and Silver Perch (*Bidyanus bidyanus*) have a high likelihood of occurrence in the Murray River but a low likelihood of occurrence in Burra Creek as the existing flooding frequency and duration at the Burra Creek site is insufficient to provide aquatic habitat that would support these species. That said, these species have the potential to occur at any of the wet sites on the Murray River, and localised impacts are possible. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider these species. A construction specific aquatic fauna management protocol should be developed for all works around waterways.

4.3.2 Impacts to EPBC Act listed migratory species within the proposed construction footprints

Ten species listed as migratory under the EPBC Act are predicted to occur, or were previously recorded from a VBA/PMST search of a 10 km radius around the project area. One species – the Fork-tailed Swift was considered to have potential to occur within the construction footprint and inundation area, as it may fly over the area whilst foraging, but is considered unlikely to be impacted, as the species is highly mobile, wide ranging, and suitable surrounding habitat is widespread. No other species were considered as likely to occur within the construction footprints during the time of the survey, mostly due to the lack of recent records within the construction footprints and/or a lack of suitable habitat present (see Appendix D and Appendix E for rationale).

It is highly unlikely that the construction footprint supports habitat that would be considered important for migratory species foraging or breeding activity or support an ecologically significant proportion of a population of migratory species, prior to the proposed construction. A current full assessment of the EPBC Act significant impact criteria for listed migratory species in relation to the proposed works is provided in Appendix H.

Restoring a more natural inundation regime at Burra Creek as proposed by the project, is likely to improve the quality of fauna habitats present. Such enhancements correspond to increased productivity of the swamp forest communities, increased vegetation diversity and structure from more drought-tolerant species and increase the overall health and integrity of the area, which will likely improve breeding, foraging and refuge resources for listed migratory species, such as the Glossy Ibis (*Plegadis falcinellus*) and Gull-billed Tern (*Sterna nilotica*).

4.3.3 Impacts to FFG Act listed fauna and communities within the proposed construction footprints

In addition to the four EPBC Act listed species discussed in Section 4.3.1, a further six FFG Act listed species are predicted as having the potential to occur, or have been previously recorded within the construction footprints (VBA, PMST, and Australian Ecosystems 2016). Further analysis of habitat during the current survey resulted in the following species being targeted:

- Black Falcon (*Falco subniger*)
- Diamond Dove (*Geopelia cuneata*)
- Major Mitchell's Cockatoo (*Cacatua leadbeateri*)
- Hooded Robin (*Melanodryas cucullata*)
- Carpet Python (*Morelia spilota metcalfei*)
- Grey-crowned Babbler (*Pomatostomus temporalis*)

Most of the FFG Act listed species possibly occurring in the construction footprints are highly mobile bird species and all have access to large areas of suitable habitat in the immediate surrounding areas in which to disperse. From a landscape perspective, the proposed construction footprints represent an extremely small area of around 12.614 ha, centred on existing tracks and degraded areas, within a very large intact area of over 1,000 ha of high quality native vegetation within the Burra Creek sections of the River Murray Reserve. All structures are proposed to be centred on and adjacent to existing vehicle tracks and areas of previous human disturbance, with many trees already in poor health, these areas largely represent lower quality areas of habitats to those which surround

them. For these reasons the proposed construction impacts are considered unlikely to significantly impact upon threatened fauna species.

Direct impacts as a result of habitat removal, e.g. the removal of hollow bearing trees, should be mitigated for particular species such as the Carpet Python (seeks refuge in hollow-bearing trees). An on-site ecologist with a Management Authorisation under the *Wildlife Act 1975* should be present during vegetation removal to readily relocate any pythons found within larger trees. Additionally, all hollow-bearing trees proposed for removal should be thoroughly inspected prior to removal for refuging wildlife and at risk of harm from felling. A Fauna Management Plan (FMP) or equivalent should be developed and implemented during the works associated with the project to mitigate impacts to all native fauna that may result from removal of vegetation during works.

One FFG Act listed fauna community is considered to have potential to occur within the construction footprints and inundation area: The Victorian Temperate Woodland Bird Community (VTWBC). This community is defined by a group of woodland dependent bird species, characteristically found in a range of woodland types, and over a broad geographic area. The geographic area is defined as the slopes and plains inland of the Great Dividing Range within Victoria. Riverine floodplains associated with the Murray River are not specifically included or excluded from the VTWBC description. Eight bird species characteristic to the community were identified in the desktop assessment (Table 6). Impacts to this community are likely to be negligible as Burra Creek is comprised largely of intact vegetation and the proposed construction of floodplain infrastructure is unlikely to impact on habitat connectivity or remove important habitat for the VTWBC.

Hollow dead or live trees are essential for some species within the VTWBC, which rely on hollow-bearing trees for nesting. Acute, short term impacts to species of this community as a result of the unavoidable removal of hollow-bearing trees should be mitigated. It is recommended that if the removal of hollow-bearing trees is unavoidable, seasonal restrictions should be implemented for vegetation clearing to avoid breeding periods when these species are more vulnerable to impacts. Overall, impacts to this community are likely to be negligible as the project area is comprised of largely intact vegetation and the proposed construction of floodplain infrastructure is unlikely to impact on habitat connectivity or remove habitat important for the VTWBC. The proposed inundation of floodplain and wetland habitats however, is likely to provide important future benefits to the VTWBC particularly under climate change scenarios of longer, drier conditions in a semi-arid environment.

While the project would remove 105 large old trees (trees that are likely to contain suitable refuge hollows for native fauna), most of the large old trees recorded within the project area will remain. Furthermore, numerous hollow bearing trees occur within contiguous habitat outside and adjacent to the project area.

Table 6: Fauna species listed in the VTWBC and previously recorded or predicted to occur (VBA, PMST) within the project area

Common name	Scientific name	Construction footprints (and buffer)	Inundation area (and buffer)
Black-chinned Honeyeater	*Melithreptus gularis*	X	x
Brown-headed Honeyeater	*Melithreptus brevirostris*	X	x
Grey-crowned Babbler	*Pomatostomus temporalis*	X	x
Hooded Robin	*Melanodryas cucullata*	X	x
Jacky Winter	*Microeca fascinans*	X	x
Painted Button-quail	*Turnix varius*	X	x
Painted Honeyeater	*Grantiella picta*	X	x
Red-capped Robin	*Petroica goodenovii*	X	x

4.3.4 Impacts to EPBC Act and FFG Act listed fauna within the proposed inundation area

The project aims to inundate approximately 403 ha of lignum swamp and woodland, riverine forest and woodland, chenopod woodland and wetland habitat (Section 5.2). Although these habitats are currently dry (at the time of surveys) and occupied by terrestrial ground-layer vegetation, historically these water-dependant EVCs would have received more frequent inundation prior to river regulation (Seran BL&A 2018).

Several threatened terrestrial fauna species are either known or have the potential to occur within the inundation area including; Carpet Python (*Morelia spilota metcalfei*), Regent Parrot (*Polytelis anthopeplus*), Painted Honeyeater (*Grantiella picta*), Hooded Robin (*Melanodryas cucullata*), Major Mitchell's Cockatoo (*Lophochroa leadbeateri*), Diamond Dove (*Geopelia cuneata*), Black Falcon (*Falco subniger*) and Grey-crowned Babbler (*Pomatostomus temporalis*) (Appendix E). Each of these species either have a broad foraging/dispersal range and are unlikely to be adversely impacted by short and occasional periods of inundation (e.g. Major Mitchell's Cockatoo, Hooded Robin) or would have the ability to continue utilising these habitats during inundation (e.g. Carpet Python). The application of episodic environmental water would be expected to maintain and enhance the condition of these woodland communities in the face of future water extraction and climate change scenarios rather than a 'do nothing' approach to leaving these habitats to persist in their current ecological state.

Under exisiting conditions, Murray Cod (*Maccullochella peelii peelii)* and Silver Perch (*Bidyanus bidyanus)* are not likely to inhabit Burra Creek or floodplain wetlands (when present). As such, operational impacts are not likely to negatively impact either species. It is unlikely that floodplain inundation will provide habitat for either species, other than for short-term foraging.

From a desktop assessment, ten EPBC Act listed migratory species were predicted to occur within the inundation area and the broader study area (Appendix H). As discussed previously, just one listed migratory species (Fork-tailed Swift) was considered to have potential to occur within the inundation area at the time of the survey given the lack of habitat available (waterbodies, wetlands etc.) and this highly mobile species was not considered likely to be impacted by the proposed works (Section 4.3.2). Restoring a more natural inundation regime at Burra Creek as proposed by the project, is likely to improve the quality of habitat present for water dependant avifauna, with several species of migratory birds including Eastern Great Egret (*Ardea modesta*) and Glossy Ibis (*Plegadis falcinellus*) known to respond to environmental watering (Cook *et al.* 2011 and Wood *et al.* 2018). Such habitat enhancements include increased productivity of floodplain vegetation communities, increased floral diversity and structure by reducing more dominant drought-tolerant species and increase overall health and integrity of the area to improve breeding, foraging and refuge resources for listed migratory species, and other wetland-dependant bird species.

4.3.5 Wetlands of International Importance

While reinstating a wetting and drying regime of appropriate frequency, duration and extent to the broader Burra Creek area is likely to impart significant ecological benefits for the Burra Creek project area, infrastructure projects such as this can also have environmental risks, particularly localised, short-term impacts during the construction phase. According to a PMST Search, the Ramsar listed Hattah-Kulkyne Lakes are located 100-150 km downstream of the project area. An additional three Ramsar wetlands were identified 250-500 km downstream of the Burra Creek project area (Banrock Station Wetland Complex, Riverland and the Coorong, and Lakes Alexandrina and Albert Wetland).

The potential for impacts to the Hattah-Kulkyne Lakes as a result of the project is expected to be negligible (Seran BL&A 2018) (100-150 km downstream). Nevertheless, potential risks to the ecological character of the Hattah-Kulkyne Lakes should be considered in development of the environmental management framework for the project, with a focus on management of potential risks to water quality and potential spread of pest species including carp and other impacts such a sedimentation of waterways/wetlands.

Blackwater events may also occur following floodplain inundation due to breakdown of leaf litter and terrestrial vegetation by bacteria, which releases nutrients into the water, but again, this is not considered a significant risk associated with the works, as black-water events are a natural process. Operation of the proposed works may actually reduce the incidence of black-water events by restoring more frequent floods to the system and reducing the accumulation of leaf litter and nutrient loads between inundation events, therefore blackwater incidence is likely to diminish in the future.

Overall, the project is likely to significantly benefit the environment, by aiming to restore a more natural wetting and drying regime to over 403 ha of wetlands and floodplain. This is expected to increase the extent and condition of habitat for aquatic and floodplain fauna, including waterbirds, fish, frogs, turtles and terrestrial species reliant on floodplain habitats, such as woodland birds, bats, small/medium mammals and reptiles.

4.4 FFG Act threatening processes

Potentially threatening processes are listed in accordance with Section 10 of the FFG Act. There are a number of threatening processes that are relevant to the project that have the potential to be exacerbated by either the construction process or proposed inundation of 403 ha of floodplain and wetlands:

Construction Phase:

- Loss of hollow-bearing trees from Victorian native forests

  A qualified ecologist will need to be on-site to manage the removal of any fauna habitat and capture and translocate fauna observed within the construction footprint. It is still possible that hollow-bearing trees will be removed as part of the project, however the broader objective to inundate 403 ha of lignum swamp and woodland, riverine forest and woodland, chenopod woodland and wetland vegetation is likely to be critical to contribute to the maintenance of hollow-bearing trees into the future.

- The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority
- Increase in sediment input into Victorian rivers and streams due to human activities
- Input of toxic substances into Victorian rivers and streams

  An Environmental Management Framework will be prepared as part of the project that will include measures such as vehicle hygiene protocols to mitigate the potential spread of weeds and *Phytophthora cinnamomi* and measures to minimise sedimentation inputs or toxic substances (e.g. fuel) to waterways.
- Alteration to the natural flow regimes of rivers and streams
- Prevention of passage of aquatic biota as a result of the presence of instream structures

  Any construction activity that requires works within waterways has the potential to temporarily prevent passage of biota and to alter flow regimes. These impacts are likely to be relatively short-term and an aquatic fauna management protocol for the project should be prepared to minimise impacts to aquatic fauna.

Operation Phase:

- Predation of native wildlife by the introduced Cat, *Felis catus*
- Predation of native wildlife by the introduced Red Fox *Vulpes vulpes*
- Soil degradation and reduction of biodiversity through browsing and competition by Feral Goats (*Capra hircus*)

There is potential for the introduction of environmental water to lead to an increase in abundance of feral predators (Cats, Foxes), herbivores (e.g. Goats) and omnivores (e.g. Pigs) due to the associated increase in productivity. Some of the species such as cats, foxes and pigs could potentially prey on migratory waterbirds, woodland birds, small mammals, reptiles and frogs that may respond to the application of water to floodplains/wetlands. An accompanying pest animal management and control program would need to be implemented within the inundation area, however this may require Parks Victoria to expand current pest control programs within the park to target these areas during inundation events.

- Alteration to the natural flow regimes of rivers and streams

The project aims to implement flow regimes which will benefit wetland fish species. The current flow regime of at the Burra Creek site has meant that the natural flow patterns have been significantly altered and now are not sufficient to meet the needs of the Burra Creek floodplain ecosystem. This project aims to meet the flow requirements of various ecological values across the site.

5. Impacts to native vegetation

5.1 Construction footprint

The project will potentially impact on the following EVCs (all within the Murray Fans Bioregion) that have been mapped for this assessment or have been mapped previously (Australian Ecosystems 2016) within the construction footprints (see Appendix F):

- 0.469 ha of Semi-arid Woodland (EVC 97) - Vulnerable
- 1.444 ha of Riverine Chenopod Woodland (EVC 103) - Endangered
- 0.048 ha of Lignum Swamp (EVC 104) -Vulnerable
- 4.255 ha of Grassy Riverine Forest (EVC 106) - Depleted
- 0.333 ha of Floodway Pond Herbland (EVC 810) – Depleted
- 0.089 ha of Riverine Swamp Forest (EVC 814) – Depleted
- 0.139 ha of Riverine Swampy Woodland (EVC 815) – Vulnerable
- 0.098 ha of Shrubby Riverine Woodland (EVC 818) – Least Concern
- 5.735 ha of Lignum Swampy Woodland (EVC 823) – Vulnerable

In total, the construction is expected to impact on 12.614 ha of native vegetation of which 7.129 ha is impacted by the construction footprint of proposed structures, containment banks, hardstands and laydown areas, and 5.482 ha is associated with access tracks. In addition, 105 large old trees (River Red Gum and Black Box) that are mapped are likely to be impacted by the construction activities proposed, however, an assessment by an arborist is recommended to assess potentially impacted trees to advise on methods by which they could be retained. The remainder of the 12.95 ha construction footprint comprises non-native vegetation.

The scope and requirement for works along access tracks is still to be confirmed and will be designed to avoid and minimise native vegetation removal. In some instances these works may be limited to minor maintenance and upgrades that require minimal if any vegetation clearance. As such the current estimate of potential vegetation removal along tracks is conservative.

The vegetation proposed to be impacted comprises River Red Gum (*Eucalyptus camaldulensis*) Forests and Woodlands along the banks of the Murray River which quickly gave way to the Black Box and Lignum swamps on the Burra Creek floodplain which covered the majority of the project area. Overall these woodlands and forests were in moderate to good condition with few weeds and mix of age amongst the overstorey trees, however, tree health was poor in certain areas reflecting the lower inundation regime presently experienced.

Where the project crossed or impacted on Burra Creek, Floodway Pond Herbland was mapped, although no water was present at the time of assessment. Access tracks and laydown areas impact on a small area of degraded Semi-arid Woodland from which the overstorey has largely been cleared and has been invaded by Sea Lavender – one of the few exotic species present within the assessed areas. In its degraded state, this community does not meet the criteria of any threatened ecological communities that it can represent in certain circumstances.

The native vegetation identified for removal has been subject to a habitat hectares assessment and the results are included in the Ensym report included in Appendix K. The identified offset requirement as currently identified is listed in Table 7 below.

Table 7: Native vegetation offsets identified for the project construction footprint

General Offset Units	CMA	Minimum SBS	Large Trees
0.193 General Habitat Units	Mallee CMA	0.615	1
Species Offset Units	**Common/Scientific Name**		**Large Trees**
9.063 species units	Spotted Bowerbird, *Ptilonorhynchus maculatus*		104
10.600 species units	Murray Hardyhead, *Craterocephalus fluviatilis*		
12.389 species units	Freshwater Catfish, *Tandanus tandanus*		
14.702 species units	Darling Lily, *Crinum flaccidum*		
10.166 species units	Bignonia Emu-bush, *Eremophila bignoniiflora*		
9.583 species units	Plains Spurge, *Euphorbia planiticola*		
13.759 species units	Veined Peppercress, *Lepidium phlebopetalum*		
10.875 species units	Hairy Darling-pea, *Swainsona greyana*		
10.430 species units	Small Pop Saltbush, *Atriplex spongiosa*		
11.137 species units	Cotton Sneezeweed, *Centipeda nidiformis*		

Species offsets are not required to be located within any specific CMA or have any matching score required. Large tree offsets may be combined and be located within any of the general or species offsets required.

It is noted that the requirement for species offsets for certain species may be challenged depending on the offset approach adopted for the project. For instance, Darling Lily is raised with DELWP as the known Victorian distribution of the species is limited to areas along the Murray River ~200 km downstream where it merges with the Darling River (RBGV 2019).

5.2 Inundation area

The project will impact on the following EVCs that are modelled to occur within the inundation areas:

- 23.168 ha of Riverine Chenopod Woodland (EVC 103) - Endangered
- 13.542 ha of Lignum Swamp (EVC 104) -Vulnerable
- 0.099 ha of Grassy Riverine Forest (EVC 106) – Depleted
- 3.533 ha of Riverine Grassy Woodland (EVC 295) - Vulnerable
- 26.963 ha of Lignum Shrubland (EVC 808) -Vulnerable
- 1.817 ha of Floodway Pond Herbland (EVC 810) – Depleted
- 0.019 ha of Grassy Riverine Forest/Floodway Pond Herbland (EVC 811) – Depleted
- 34.608 ha of Shrubby Riverine Woodland (EVC 818) – Least Concern
- 182.648 ha of Lignum Swampy Woodland (EVC 823) – Vulnerable
- 115.969 ha of Water Body-Fresh (EVC 992) – no Biodiversity Conservation Status

The EVCs listed above are swampy or riverine vegetation communities that require or are tolerant of inundation and therefore are likely to positively respond to the proposed inundation. It should be noted that the large area of Water Body – Fresh equates to the channel of Burra Creek which has been mapped during field assessment as Floodway Pond Herbland. These classifications are interchangeable along the channel of the creek as it responds to irregular inundation. In addition to the above, 0.561 ha of inundation area is modelled as not containing an EVC.

6. Avoidance, minimisation and mitigation measures

Efforts have been made throughout the planning and design phases for the proposed construction to avoid and minimise impacts to ecological values including native vegetation and fauna habitat, threatened flora, fauna and communities. All areas of native vegetation that are proposed to be impacted are adjacent to existing vehicle tracks and areas of previous human disturbance, and represent inferior areas of habitat to those which surround them. From a landscape perspective, the proposed construction footprints represent a small area within a much larger intact area of high quality native vegetation.

6.1 General mitigation measures

The following should be considered during the construction, planning approval phase and implementation of the project:

- Develop and implement a Flora and Fauna Management Plan as part of the CEMP that contains requirements to avoid, mitigate and manage impacts to flora and fauna values and particularly threatened species, and describes the habitat pre-clearance and clearance process. As a minimum, the management plan must address the requirements and measures described within this technical report
- Avoid where practical, the removal of hollow-bearing trees and large old trees within the construction footprint
- Avoid where possible, areas of native vegetation that support rare and threatened flora species though these are of limited extent within the construction footprint

6.2 Design phase

The following mitigation measures have been and should continue to be implemented during the design phase to minimise and mitigate impacts to threatened flora and fauna identified in previous ecological surveys within the construction footprint (Brown *et al* 2013, Australian Ecosystems 2016):

- Through refinement of the detailed design, the project shall to the extent practicable, minimise the construction footprint and impacts on the environment through:
  - Siting of proposed structures primarily along or immediately adjacent to existing access tracks and other previously disturbed areas
  - Designing containment banks and batters in consultation with Parks Victoria to minimise extent of native vegetation removal and other construction impacts
  - Removal of redundant structures in consultation with Parks Victoria, where the removal is deemed the most appropriate action to minimise adverse environmental, heritage and visual effects

6.3 Construction phase

The following mitigation measures are recommended to minimise and avoid impacts upon the identified threatened flora, fauna and community values (FFG Act listed threatened species).

- Follow the avoid, minimise protocol in determining the construction works footprint at each site (i.e. make every effort to avoid threatened flora species loss as a high priority)
- Areas of remnant native vegetation to be retained are to be delineated from those areas to be removed as 'no-go zones', to avoid encroachment into areas of retained vegetation
- Locations for stockpiles are to be within existing cleared or areas of non-native vegetation where practicable
- Manage potential impacts to tree root zones during construction

- For the protection of threatened flora:
  - Species listed under the FFG Act and EPBC Act not permitted to be removed, are to be fenced off with temporary one metre high orange barrier mesh medium-heavy weight prior to construction commencing
  - Fencing is to be checked on a weekly basis and the population monitored on a monthly basis
  - All staff onsite are to be made aware through inductions and/ or signage of the presence of threatened species and how to identify the species. Locations for stockpiles are to be within existing cleared areas or areas of non-native vegetation where practicable.
- If any threatened flora species additional to those already identified in site plans (i.e. listed as threatened under the EPBC Act or the FFG Act) are found within the construction area, the Project Ecologist is to be notified. The number and location of individuals is to be recorded and DELWP is to be advised.
- Pre-clearance surveys are to be undertaken 24 hrs prior to removal of any patch of native vegetation or hollow-bearing tree
- Avoid hollow bearing tree removal during the breeding season of hollow-dependant species where possible. Where this is not practical, pre-clearance surveys are to be undertaken by a suitably qualified ecologist during the breeding season
- Develop and implement a CEMP, including erosion and sediment control plans, dewatering and water quality management plans, weed and pest hygiene protocols to minimise potential impacts on wetlands and other aquatic ecosystems
- Implement hygiene and weed management measures to manage weeds during and after the construction phase
- Standard vehicle hygiene measures are to be implemented to prevent the spread and introduction of weed species, particularly the weeds of national significance and noxious weeds listed under the *Catchment and Land Protection Act 1994* (CaLP Act), and to prevent the spread or transmission of Chytrid Fungus as per Murray et al (2011).
- On completion of works, temporary construction areas are to be rehabilitated to the satisfaction of Parks Victoria or the relevant landowner/manager. Site rehabilitation measures may include:
  - Re-spreading of stored topsoil followed by monitoring to assess germination in the following year
  - Appropriate weed control measures at the site following the works
  - If the site is not naturally recolonised by locally indigenous species following construction, planting of locally indigenous species appropriate to that particular position in the landscape may be undertaken in the following year
  - Ground debris that is temporarily removed to allow construction activities, is to be reinstated
- All vehicles and plant must only operate on existing tracks and in areas marked as parking areas or construction zones
- Develop and implement an aquatic fauna management protocol to manage impacts to aquatic values – with emphasis on threatened fish species that may be present in vicinity of construction sites. Any construction activities that could lead to entrapment of fauna or temporary loss of habitat (e.g. due to the use of coffer dams and dewatering) should be considered.
- If the capture, handling or translocation of fish is required during construction (e.g. dewatering work sites) or operation of the project, persons undertaking these activities will need to hold the appropriate permit or licence under the *Fisheries Act 1995*. Any capture of fish must be carried out by a qualified aquatic ecologist

6.4 Operation phase

The following mitigation measures are recommended to minimise and avoid impacts upon the identified threatened flora, fauna and community values (FFG Act listed threatened species).

- Implement pest animal management and control within the inundation area (and ideally surrounding areas), however this may require Parks Victoria to expand current pest control programs within the reserve to target these areas during inundation events
- Implement recommended operational regimes and mitigation measures detailed in the Fish Management Plan for the site (ARI, 2018) to enhance outcomes for threatened fish species

7. Legislative and policy requirements

There are a number of ecological values present within the construction footprints as discussed within this report, with the potential to trigger the requirement to obtain permits if impacted. Table 8 below outlines the potential legislative implications for the project that may result from the removal of native vegetation and/or fauna habitat within the Construction Footprints.

Table 8: Summary of probable legislative requirements

Commonwealth legislation	Relevance to project
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	No EPBC Act listed flora or ecological communities were identified during the assessment, nor are they considered likely to occur in the construction footprints or inundation area. No EPBC Act listed fauna were identified within the construction footprints during the field surveys in 2019 by R8 ecologists. The EPBC Act listed Regent Parrot (*Polytelus anthopeplus monarchoides*) was recorded outside the project area, 2 km north of the nearest construction footprint (B1 Regulator), and is mapped as likely to occur within the construction footprints according to the National Recovery Plan for the species (Baker and Hurley 2011). However, the Burra Creek project area falls outside of the mapped distribution of areas important for breeding (nesting and foraging) (Baker and Hurley 2011). Additionally, given the lack of records within 10 km of the construction footprints, this species is likely to be an occasional visitor, to utilise habitat within the construction footprints as non-core foraging habitat. Negative impacts to this species as a result of the proposed works are not expected. A full assessment of the EPBC Act significant impact criteria for this species in relation to the proposed works is provided in Appendix G. One additional bird, the EPBC Act listed Painted Honeyeater (*Grantiella picta*), has the potential to utilise habitats within the proposed construction footprint. This species has not been recorded within 10 km of the proposed construction footprints and is only predicted to occur. The Painted Honeyeater may occasionally forage in mistletoe within the woodland areas of both the construction and inundation footprints. The proposed construction footprints are however not likely to significantly impact any areas of habitat important to this extremely mobile nomadic species, which forages widely over large areas in pursuit of mistletoe and flowering eucalypts. Two fish species, the Murray Cod (*Maccullochella peelii*) and Silver Perch (*Bidyanus bidyanus*) have not been previously recorded within the inundation area, however both are known from the adjacent Murray River. Under current conditions, Burra Creek only becomes fully connected at Murray River flows of greater than 30,000 ML/d, which occurs with a frequency of 1 in 10 years and for a duration of less than one month (Bain, 2013, Ecological Associates, 2014). As such, exisiting conditions mean there are limited opportunities for either species within Burra Creek or the floodplain. Localised impacts to these species are possible. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider aquatic fauna. A construction specific aquatic fauna management protocolshould be developed as part of the CEMP for all works around waterways. Species likely to benefit from improved habitat condition following environmental water. Ten EPBC Act listed migratory species were identified as having the potential to occur within the construction footprint, and within the proposed inundation area (PMST and VBA). Most of these species are either highly unlikely to occur (e.g. Eastern Curlew) or would very rarely use airspace over these footprints(e.g. Fork-tailed Swift). It is highly unlikely that the construction footprint supports habitat that would be considered

	important for migratory species foraging or breeding activity or support an ecologically significant proportion of a population of migratory species. A full assessment of the EPBC Act significant impact criteria for listed migratory species in relation to the proposed works is provided in Appendix H. The Ramsar-listed Hattah-Kulkyne Lakes are located 100-150 km downstream of the project area. It is unlikely that the project will negatively impact on the ecological character of the Ramsar site. Whilst impacts to the Hattah-Kulkyne Lakes are not expected (Seran BL&A 2018), an Environmental Management Plan (EMP) should be developed that identifies potential environmental risks and puts in place mitigation strategies to avoid or minimise these risks (e.g. sediment runoff). It is unlikely that the project will result in a significant impact to a MNES, and an EPBC Act referral is not required, however as a conservative measure, an EPBC referral is planned to be submitted for this project.
Victorian legislation	**Relevance to project**
Environment Effects Act 1978 (EE Act)	The project is not likely to result in the loss of a significant proportion of known remaining habitat or population of a threatened species within Victoria. The project is likely to result in the removal of more than 10 ha of native vegetation (12.614 ha). Vegetation to be removed includes less than 1.5 ha of Endangered EVC. Under the superseded Native Vegetation Framework, the vegetation to be cleared comprises 5.626 ha of very high conservation significance, 6.178 ha of high conservation significance and the remainder as medium conservation significance based on the Biodiversity Conservation Status and assessed vegetation quality. The removal of 10 ha of native vegetation is a trigger for referral under the EE Act where other referral triggers apply.
Planning and Environment Act 1987 (P&E Act)	The construction footprint indicates that 12.614 hectares of native vegetation (including 105 Large Trees) will be impacted for the project. Planning approval will be required under the P&E Act for the removal of any native vegetation unless exemptions (as specified in Clause 52.17 of the Swan Hill Planning Scheme) apply.
Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017) – the Guidelines.	The location mapping for the project area identifies that the impact area is classified as Location Risk 3 and a detailed assessment pathway is triggered. An assessment of impacts according to the Guidelines will need to be developed.
Flora and Fauna Guarantee Act 1988	**Fauna species and communities** No FFG Act listed species were observed at the construction footprints during the field assessment in 2019. However, eight terrestrial fauna species are predicted as possible to occur, or previously recorded within the construction footprints or the broader project area (VBA, PMST, and Australian Ecology 2019): ▪ Black Falcon (*Falco subniger*) ▪ Diamond Dove (*Geopelia cuneata*) ▪ Grey-crowned Babbler (*Pomatostomus temporalis*) ▪ Hooded Robin (*Melanodryas cucullata*) ▪ Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) ▪ Painted Honeyeater (*Grantiella picta*) ▪ Regent Parrot (*Polytelis anthopeplus*)

	▪ Carpet Python (*Morelia spilota metcalfei*). All species except Painted Honeyeater have been recorded within 10 km of one or more of the Construction Footprints, and all are known to utilise habitats such as those found within the Construction Footprints. None of these species is considered likely to be significantly impacted by the proposed construction, although localised impacts on hollow-dependent species such as Carpet Python are possible. All others are highly mobile bird species and all have access to large areas of suitable habitat in the immediate surrounding areas in which to disperse. Two FFG Act listed fish species (also EPBC Act listed), the Murray Cod (*Maccullochella peelii*) and Silver Perch (*Bidyanus bidyanus*) have not been previously recorded within the project area, however both are known from the adjacent Murray River. As described above for the EPBC Act, localised impacts to these species are possible and management measures are recommended. One FFG Act listed fauna community was considered with the potential to occur within the Project Area and the broader inundation extent: The Victorian Temperate Woodland Bird Community (VTWBC). Impacts to this community are likely to be negligible as Burra Creek is comprised largely of intact vegetation and the proposed construction of floodplain infrastructure is unlikely to impact on habitat connectivity or remove important habitat for the VTWBC. The proposed inundation of floodplain and wetland habitats however, is likely to provide important future benefits to the VTWBC particularly under climate change scenarios of longer, dryer conditions in a semi-arid environment. **Flora species and communities** No threatened flora communities listed under the FFG Act are considered likely to occur within the construction footprints or inundation area. One FFG Act listed flora species – *Acacia oswaldii* – is recorded adjacent to existing access tracks, although none are located in the proposed construction footprints. Suitable habitat for one other FFG Act listed flora species Silver Saltbush (*Atriplex rhagodioides)* has been identified in the construction footprints and inundation areas, however this species has not been detected in the 2019 surveys or previous surveys of the construction footprint and is therefore not expected to be impacted. There are fourteen recorded protected flora species that are likely to be impacted by either the construction works or subsequent inundation. A permit to take protected flora will be required for works on public land. It is recommended that efforts should be made to avoid and minimise impacts to any species and/or communities listed as threatened or protected under the FFG Act during the design and construction phases of the project and that any relevant FFG Act Management Plans for relevant species adhered to. It should be noted that the FFG Act has recently been amended and the amended Act will come into effect on 1 June 2020. Amendments include additional obligations for public authorities in relation to biodiversity and adoption of the common assessment approach for listing of threatened species, which may result in the addition or removal of species from the current listings of threatened and protected species that will need to be considered by the project.
Wildlife Act 1975	Any persons engaged to remove, salvage, hold or relocate native fauna during construction must hold a current Management Authorisation under the *Wildlife Act 1975* (e.g. if hollow-bearing trees are removed or fauna are rescued from open trenches during construction). A Management Authorisation (MA) will almost certainly be required for this project as hollow-bearing trees and fauna habitat will

	likely be removed. The MA would be obtained at the time of the construction, and in the name of the ecologist who would handle/relocate the fauna.
Catchment and Land Protection Act 1994	Five weeds listed under the CaLP Act have been recorded within the construction footprints as listed in Appendix I
Fisheries Act 1995	The *Fisheries Act 1995* (Fisheries Act) provides a legislative framework for the regulation, management and conservation of Victorian fisheries. A person must not take fish from marine waters or inland waters; or use or possess recreational fishing equipment in or next to Victorian water unless authorised to do so by a licence. Section 119 of the Fisheries Act requires that a person must not create an obstruction across a watercourse or water body that would obstruct the free passage of fish, leave fish stranded, or destroy immature fish without authorisation under the Act. Design, construction and operation of the project should seek to avoid creating obstructions to fish passage, otherwise authorisation may be required under the Fisheries Act. If the capture, handling or translocation of fish is required during construction (e.g. dewatering work sites) or operation of the project, persons undertaking these activities will need to hold the appropriate permit or licence under the Fisheries Act.
Environment Protection Act 1970	The *Environment Protection Act 1970* empowers the Environment Protection Authority Victoria (EPA Victoria) to implement regulations, maintain State Environment Protection Policies (SEPPs) and protect the environment from pollution and the management of wastes. The *Environmental Protection Act (1970)* allowed for the establishment of the *State Environmental Protection Policy (Waters) (SEPP Waters)*, which applies to all surface waters, estuarine and marine waters and groundwaters across the State (Vic. Gov. 2018). Relevant clauses of this policy must be adhered to. The following clauses (with a brief description of relevant aspects) are applicable to the project. Clause 40 – Management of instream works ▪ A person undertaking works in or adjacent to surface waters must minimise risks to beneficial uses. ▪ Minimise unnatural erosion, sediment re-suspension and other risks to aquatic habitat. ▪ Ensure that existing and new in situ structures do not pose a barrier to fish movement. 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.

8. Recommendations

The proposed Burra Creek project aims to inundate approximately 403 ha of floodplain and wetland habitats that support water dependent vegetation threatened by river regulation, drought and a drying climate.

8.1 Next steps

R8 recommends the following next steps:

- Refine the construction footprint utilising the existing ecological values mapping to avoid and minimise impacts to native vegetation and threatened flora/fauna and communities within the construction footprint where practicable
- Engage with DELWP, discussing the proposed construction footprint and the efforts that have been made to avoid and minimise impacts to native vegetation during the preliminary and refinement phases of the project
- Depending on the extent of impacts to areas of treed vegetation a qualified arborist may need to be engaged to determine the full extent of impacts to native trees (both within and immediately adjacent to the proposed construction footprint). This assessment would take in to account direct impacts to trees (tree removal) and indirect impacts to trees (through encroachment of their TPZs). An arborist assessment would also consider the individual tree location and habit, as well as specific characteristics of certain tree species (e.g. mallee eucalypts) where it's possible that individual trees will survive greater than 10% encroachment of their TPZs or the pruning of over 30% of the existing crown (the standard measures for determining indirect tree losses under the guidelines).
- Engage with DELWP, discussing the proposed approach for obtaining offsets for the project and whether the conservation works exemption or an alternative offset approach may apply to the project. This approach may include the establishment of a vegetation condition monitoring regime within the proposed inundation areas that would identify changes in condition to the vegetation within these areas that results from the environmental watering regime.
- Prepare an Offset Plan for the project to support any application for planning approval to remove native vegetation under the *Planning and Environment Act 1987*
- A CEMP should be developed for the project and implemented in full to further avoid and minimise impacts to areas of ecological value. The CEMP should be prepared once the footprint and construction methods for the proposed works have been finalised, and should include provisions relevant to protecting the ecological values identified within the construction footprints.

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Appendix A. Summary of previous ecological studies

Report	Methods	Key findings	Recommendations
Lumsden, L., Brown, G., Cheers, G. and Palmer, C. (2007). *Floodplain fauna surveys – Macredie Island and Burra Forest*. Report to the Mallee CMA. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment, Melbourne.	▪ Review of existing information ▪ Field surveys November-December 2006: 20 sites Ground dwelling vertebrates Pitfall trapping using ten buckets in Y-array. Targeted searches for frogs and reptiles Baited infrared motion-activated fauna camera traps Bird surveys: Each site surveyed once in early morning and late afternoon Standard 20 minute 2 hectare area search Bat surveys Anabat detectors for micro-bat calls Harp-traps Nocturnal spotlight surveys: Owl call-playback, targeted survey for arboreal mammals and nocturnal birds Recording of incidental observations.	▪ 148 fauna species recorded 100 native bird species (2 exotic bird species) 6 native amphibian species 7 native and 7 exotic terrestrial mammal species 11 bat species 15 native reptile species ▪ Significant and listed species included: 2 records of EPBC Act listed Regent Parrot 12 bird and 2 reptile species listed as threatened under FFG Act 8 bird species and 4 reptile species listed under the DEPI Advisory List of Threatened Vertebrate Fauna in Victoria 2013. Discussions with local landholders and stakeholders, which provided records of a number of less commonly encountered species such as the Carpet Python, Platypus, Water Rat, Feathertail Glider and Bush Stone-curlew.	Report supports the recommendations of Ecological Associates (2007) to 'develop a long-term strategy to remove or modify blockages [from Burra Creek] so that the natural flow path and distribution of water to ecosystems may be restored'. Implementing, or increasing control of foxes, cats, pigs, European Rabbits and Brown Hares and livestock. An education program, targeting the local landholders.
Brown, G., Bryant, D. and Horrocks, G. (2013) *Terrestrial vertebrate fauna surveys of the Burra Creek and Nyah-Vinifera reserves, northern Victoria*	▪ Review of existing information ▪ Field surveys November-December 2013: 4 sites Ground dwelling vertebrates Pitfall trapping using T-array and funnel traps. Baited infrared motion-activated fauna camera traps Bird surveys: each site surveyed once in early morning and late afternoon Standard 20-minute 2-hectare area search Bat surveys Anabat detectors for micro-bat calls Nocturnal spotlight surveys: Owl call-playback, targeted survey for arboreal mammals and nocturnal birds Recording of incidental observations	▪ 186 fauna species recorded 140 native bird species 6 native amphibian species 7 native and 3 exotic terrestrial mammal species 11 bat species 19 native reptile species ▪ Significant and listed species included: The EPBC Act listed Regent Parrot 11 bird and 2 reptile species listed as threatened under FFG Act 8 bird and 4 reptile species listed under the DEPI Advisory List of Threatened Vertebrate Fauna in Victoria 2013	No recommendations

Report	Methods	Key findings	Recommendations
GHD (2013) *Summary Report for the flora census of Burra, Nyah and Vinifera SDL sites* - Memorandum prepared for Mallee CMA.	▪ Review of existing information ▪ Field flora survey November 2013 – 8 sites: 30 m x 30 m quadrats position considered distribution, extent and relative uniformity of each EVC Projected foliage cover recorded for all overstorey and understorey species Photographs of each quadrat Representative photographs of each rare and threatened flora Recording of incidental fauna species ▪ Plant taxonomy: Flora Information System (DSE, 2012) Consideration of the Census of Victoria Vascular Plants (Walsh and Stajsic, 2007)	▪ 5 EVCs sampled, most widespread were: Semi-arid Woodland Lignum Swampy Woodland Floodway Pond Herbland ▪ 79 flora species recorded 64 indigenous species 15 exotic species 2 rare or threated flora species ▪ 2 species listed under DELWP Advisory List: *Senecio cunninghamii var. cunninghamii* (Branching Groundsel) *Eremophila divaricata subsp. divaricata* (Spreading Emu-bush)	No recommendations

Report	Methods	Key findings	Recommendations
Australian Ecosystems (2016) *Nyah and Vinifera SDL Project - Flora and Fauna assessment*.	▪ Desktop review ▪ Flora site assessment (November 2015): Potential footprint traversed Comprehensive observed flora list recorded LOTs mapped Habitat Hectare Assessment EVCs assigned ▪ Fauna site assessment (November 2015): 20 min bird census Nocturnal spotlight surveys (arboreal fauna) Incidental observations	▪ SDL footprint areas: 507 LOTs recorded and eight EVCs Riverine Swamp Forest (EVC 814); Semi-Arid Woodland (EVC 97); Flood Pondway Herbland (810); Grassy Riverine Forest (106); Shrubby Riverine Woodland (EVC 818); Lignum Swamp (EVC 104); Lignum Swampy Woodland (EVC 823); Riverine Chenopod Woodland (EVC 103). ▪ 9 rare or threatened flora: *Alternanthera sp. 1* (Plains) (Plains Joyweed) (pk) *Haloragis glauca f. glauca* (Bluish Raspwort) (pk) *Tetragonia moorei* (Annual Spinach) (pk) *Picris squarrosa* (Squat Picris) (r) *Senecio cunninghamii var. cunninghamii* (Branching Groundsel) (r) *Dianella sp. aff. longifolia* (Riverina) (Pale Flax-lily) (vu) *Asperula wimmerana* (Wimmera Woodruff) (r) *Eremophila divaricata subsp. divaricata* (Spreading Emu-bush) (r) *Cynodon dactylon var. pulchellus* (Native Couch) (pk) ▪ 77 fauna species recorded: 69 native bird species 3 native and 1 exotic terrestrial mammal species 3 native reptile species No conservation significant fauna species, two bird species which form part of the Victorian Woodland Bird Community.	▪ Retain as many large old trees as possible Priority to large hollow bearing trees Include provision of buffers around each tree during construction (radius 12 x DBH to a max of 15m but no less than 2 m from base of trunk) ▪ Complete more detailed assessments of access tracks for any areas that are proposed for any form of development ▪ Salvage of fauna where hollow-bearing trees cannot be avoided during construction ▪ Reduce impacts to Vulnerable, Rare or Threatened flora, salvaging and translocating these species if site cannot be avoided
Jenkin, A., Stuart, I. and Harrow, S. (2018) SDL *Fish Management Plan - Burra Creek.* Report prepared for Mallee CMA.	▪ Review of existing information. ▪ Provide the necessary fish ecology criteria to be incorporated into SDL detailed designs. ▪ Provide the operational requirements that benefit native fish for the SDL site Operating Plans. ▪ Establish prioritised ecological objectives and targets for native fish at the site. ▪ Develop understanding of the context of site operations and to maximise the ecological outcomes on a broader reach scale.	▪ Current conditions for fish are limited to episodic seasonal opportunities following larger River Murray flooding events. ▪ Managed flooding of the forest carries some opportunities for native fish restoration at a local wetland scale	▪ An understanding of the effects that increased floodplain inundation and has on fish population dynamics in the site will be important to monitor. ▪ Ongoing low-level (e.g. annual) monitoring to assess carp and eastern gambusia populations with active management of non-native fish species. ▪ Fish monitoring of drawdown period to ascertain whether fish are able to exit through the downstream B2 and B1 regulators.

Appendix B. Likelihood of occurrence / impact - threatened flora - construction footprint

Likelihood of occurrence:

Not all of the threatened species identified during this assessment are equally likely to occur in the project site, due to the geographic location or context of the site, or the habitat type and condition. For each species, the likelihood of occurrence was evaluated using the following rationale:

PRESENT – Species known to occur within the site, or detected during the site visit.

POSSIBLE – Potentially suitable habitat occurs within construction footprints and species' known range encompasses the construction footprints. Species recorded historically in the 10 km search area, and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the construction footprints, but suitable habitat does not occur within construction footprints, or occurs within construction footprints but with generally low quality and quantity. Species recorded historically in the 10 km search area but generally not within the last 30 years.

HIGHLY UNLIKELY – No historical records of the species and/or no suitable habitat in the 10 km search area.

Key:

L – Listed

EN / en – Endangered

VU / vu – Vulnerable

nt – Near Threatened

CR / cr – Critically Endangered

Rx – Regionally Extinct

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Abutilon otocarpum	Desert Lantern			vu	3	30/06/2010	VBA	**Unlikely** - not detected in the only suitable habitat (Semi-arid Woodland) in the construction footprints during the 2019 or previous surveys.
Acacia loderi	Nealie		L	vu	2	20/04/1990	VBA	**Unlikely** - conspicuous woody species not observed in construction footprints.
Acacia melvillei	Yarran		L	vu	3	12/02/1998	VBA	**Unlikely** - conspicuous woody species not observed in construction footprints.
Acacia oswaldii	Umbrella Wattle		L	vu	8	2019	VBA	**Present** - detected next to access tracks proposed to be used. **Impact** - no removal expected based on assessed construction footprints.
Amaranthus macrocarpus var. macrocarpus	Dwarf Amaranth			vu	1	8/03/1976	VBA	**Possible** - species that responds to summer rains is unlikely to have been detected during 2019 survey. **Impact** – potential impact is likely low given lack of recent records and lack of detection in previous surveys.
Asperula gemella	Twin-leaf Bedstraw			r	1	6/01/2002	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Aperula wimmerana	Wimmera Woodruff			r		2019	This assessment	**Present** - found at a number of locations through the proposed construction footprints. **Impact** ~50 likely to be impacted.
Atriplex pseudocampanulata	Mealy Saltbush			r	1	7/02/1974	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Atriplex rhagodioides	Silver Saltbush		L	vu	12	19/11/2013	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Austrostipa metatoris		VU					PMST	**Unlikely** - species not previously recorded in Victoria.
Bossiaea walkeri	Cactus Bossiaea			en	4	30/06/1975	VBA	**Possible** - species with potential habitat through the construction footprint. **Impact** - potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Bromus arenarius	Sand Brome			r	1	10/11/2004	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** - potential impact is likely low given lack of detection in this and previous surveys.
Caladenia tensa	Rigid Spider-orchid	EN		vu	1	30/09/1995	VBA, PMST	**Unlikely** - lack of suitable habitat in construction footprints.
Calotis cuneifolia	Blue Burr-daisy			r	1	1/08/1970	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Calotis lappulacea	Yellow Burr-daisy			r	1	30/06/2011	VBA	**Possible** - species with potential habitat through the construction footprint. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Centipeda nidiformis	Cotton Sneezeweed			r	1	6/01/2002	VBA	**Possible** - species with potential habitat through the construction footprints. *Centipedia* species detected in Floodway Pond Herbland attributed to more common species. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Chenopodium desertorum subsp. desertorum	Frosted Goosefoot			r	1	27/11/2002	VBA	**Unlikely** - conspicuous woody species not observed in construction footprints.
Convolvulus clementii	Desert Bindweed			vu	1	8/03/2012	VBA	**Unlikely** - lack of suitable habitat in construction footprints.
Cullen pallidum	Woolly Scurf-pea		L	en	1	1/05/1999	VBA	**Unlikely** - lack of suitable habitat in construction footprints.
Cycnogeton dubium	Slender Water-ribbons			r	2	16/12/1988	VBA	**Unlikely** – not detected in suitable habitat (Floodway Pond Herbland) despite suitable conditions at time of assessment (2019).
Cyperus pygmaeus	Dwarf Flat-sedge			vu	1	2/04/1972	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of recent records and lack of detection in this and previous surveys.
Dianella porracea	Riverine Flax-lily			vu	1	2019	This assessment	**Present** - detected next to access tracks proposed to be used. **Impact** – no removal based on assessed construction footprint.
Dodonaea viscosa subsp. angustifolia	Giant Hop-bush			r	1	31/03/2009	VBA	**Unlikely** – not indigenous to local area.
Elacholoma prostrata	Small Monkey-flower			r	1	1/09/1924	VBA	**Unlikely** – not detected in suitable habitat (Floodway Pond Herbland) despite suitable conditions at time of assessment (2019).
Eragrostis setifolia	Bristly Love-grass			vu	1	3/08/2006	VBA	**Possible** - species with potential habitat through the construction footprint. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Eremophila divaricata subsp. divaricata	Spreading Emu-bush			r	1	19/11/2013	2013, 2015	**Possible** - recorded by GHD (2013) and Australian Ecosystems (2016) in areas not impacted in current construction footprint – could not be detected at same locations in 2019.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Geijera parviflora	Wilga		L	en	102	5/07/2003	VBA	**Unlikely** - conspicuous woody species not observed in construction footprints.
Haegiela tatei	Small Nut-heads			vu	1	20/04/1997	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Jasminum didymum subsp. lineare	Desert Jasmine			vu	1	17/12/1961	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** - potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Lepidium monoplocoides	Winged Pepper-cress	EN	L	en			PMST	**Unlikely** – not previously detected in vicinity of project area. No *Lepidium* species detected in 2019.
Maireana georgei	Slit-wing Bluebush			vu	2	11/04/2009	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Marsdenia australis	Doubah			vu	1	17/12/1961	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Olearia minor	Satin Daisy-bush			r	1	1/07/1971	VBA	**Unlikely** - conspicuous woody species not observed in construction footprints.
Picris squarrosa	Squat Picris			r	1	2015	AE (2016)	**Present** – detected in 2015 in construction footprints. Could not be located in 2019 likely due to dry conditions. Assumed present. **Impact** – one plant based on past assessments.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Sarcozona praecox	Sarcozona			r	2	13/09/2013	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Sclerolaena patenticuspis	Spear-fruit Copperburr			vu	1	11/04/2009	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Senecio cunninghamii var. cunninghamii	Branching Groundsel			r	1	19/11/2013	VBA	**Present** - Recorded by GHD (2013).
Senna artemisioides subsp. artemisioides	Silver Cassia			en	1	10/11/2004	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Sida fibulifera	Pin Sida			vu	1	19/11/2013	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** – potential impact is likely low given lack of detection in 2019 and previous surveys.
Sida intricata	Twiggy Sida			vu	2	12/10/2011	VBA	**Present** – detected in 2015 in construction footprints. Could not be located in 2019 likely due to dry conditions. Assumed present. **Impact** – one plant based on past assessments.
Solanum karsense	Menindee Nightshade	VU					PMST	**Unlikely** – not previously detected in vicinity of project area.
Swainsona murrayana	Slender Darling-pea	VU	L	en			PMST	**Unlikely** – not previously detected in vicinity of project area and lack of suitable habitat.
Swainsona swainsonioides	Downy Swainson-pea		L	en	1	1/09/1924	VBA	**Unlikely** – lack of recent records and lack of suitable habitat.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Tecticornia pterygosperma subsp. pterygosperma	Whiteseed Glasswort			r	1	2/08/1967	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** - potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Velleia arguta	Grassland Velleia			r	1	1/11/1968	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** - potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Vittadinia condyloides	Club-hair New Holland Daisy			r	1	12/10/2011	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** - potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Vittadinia cuneata var. morrisii	Fuzzy New Holland Daisy			r	1	28/10/1997	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** - potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.
Vittadinia pterochaeta	Winged New Holland Daisy			vu	2	12/10/2011	VBA	**Possible** - species with potential habitat through the construction footprints. **Impact** - potential impact is likely low given lack of recent records and lack of detection in 2019 and previous surveys.

Appendix C. Likelihood of occurrence / impact - threatened flora – inundation area

Likelihood of occurrence:

This likelihood of occurrence for rare or threatened flora species has been based on a desktop assessment of the inundation area, and detailed assessments of the vegetation and habitat within the inundation areas have not yet been undertaken.

Not all of the threatened species identified during this assessment are equally likely to occur in the project site, due to the geographic location or context of the site, or the habitat type and condition. For each species, the likelihood of occurrence was evaluated using the following rationale:

PRESENT – Species known to occur within the site, or detected during the site visit.

POSSIBLE – Potentially suitable habitat occurs within inundation areas and species' known range encompasses the inundation areas. Species recorded historically in the 10 km search area and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the inundation areas, but suitable habitat does not occur within inundation areas, or occurs within inundation areas but with generally low quality and quantity. Species recorded historically in the 10 km search area but generally not within the last 30 years.

HIGHLY UNLIKELY – No historical records of the species and/or no suitable habitat in the 10 km search area.

Key:

L – Listed

EN / en – Endangered

VU / vu – Vulnerable

nt – Near Threatened

CR / cr – Critically Endangered

Rx – Regionally Extinct

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Abutilon otocarpum	Desert Lantern			vu	3	30/06/2010	VBA	**Unlikely** – lack of habitat in inundation area.
Acacia loderi	Nealie		L	vu	2	20/04/1990	VBA	**Unlikely** – lack of habitat in inundation area.
Acacia melvillei	Yarran		L	vu	3	12/02/1998	VBA	**Unlikely** – lack of habitat in inundation area.
Acacia oswaldii	Umbrella Wattle		L	vu	8	31/03/2009	VBA	**Possible** - detected in area of investigation and suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Amaranthus macrocarpus var. macrocarpus	Dwarf Amaranth			vu	1	8/03/1976	VBA	**Possible** – flooding response species that may not be detected if suitable conditions don't exist. Impact - positive response expected from inundation.
Asperula gemella	Twin-leaf Bedstraw			r	1	6/01/2002	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Asperula wimmerana	Wimmera Woodruff			r		2019	This assessment	**Present** – relatively common in assessed areas. **Impact** – positive response to inundation expected given commonly found on the fringes of ephemeral pools along Burra Creek.
Atriplex pseudocampanulata	Mealy Saltbush			r	1	7/02/1974	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Atriplex rhagodioides	Silver Saltbush		L	vu	12	19/11/2013	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Austrostipa metatoris		VU					PMST	**Unlikely** – Not previously detected in Victoria.
Bossiaea walkeri	Cactus Bossiaea			en	4	30/06/1975	VBA	**Unlikely** – lack of habitat in inundation area.
Bromus arenarius	Sand Brome			r	1	10/11/2004	VBA	**Unlikely** – lack of habitat in inundation area.
Caladenia tensa	Rigid Spider-orchid	EN		vu	1	30/09/1995	VBA, PMST	**Unlikely** – lack of habitat in inundation area.
Calotis cuneifolia	Blue Burr-daisy			r	1	1/08/1970	VBA	**Possible** – Suitable habitat present in inundation area. **Impact** – positive response to inundation expected.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Calotis lappulacea	Yellow Burr-daisy			r	1	30/06/2011	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive response to inundation expected.
Centipeda nidiformis	Cotton Sneezeweed			r	1	6/01/2002	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive response to inundation expected.
Chenopodium desertorum subsp. desertorum	Frosted Goosefoot			r	1	27/11/2002	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Convolvulus clementii	Desert Bindweed			vu	1	8/03/2012	VBA	**Unlikely** – lack of habitat in inundation area.
Cullen pallidum	Woolly Scurf-pea		L	en	1	1/05/1999	VBA	**Unlikely** – lack of habitat in inundation area.
Cycnogeton dubium	Slender Water-ribbons			r	2	16/12/1988	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive response to inundation expected.
Cyperus pygmaeus	Dwarf Flat-sedge			vu	1	2/04/1972	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive response to inundation expected.
Dianella porracea	Riverine Flax-lily			vu	1	01/01/1770	VBA	**Unlikely** – lack of habitat in inundation area.
Dodonaea viscosa subsp. angustifolia	Giant Hop-bush			r	1	31/03/2009	VBA	**Unlikely** – not locally indigenous to inundation area.
Elacholoma prostrata	Small Monkey-flower			r	1	1/09/1924	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive response to inundation expected.
Eragrostis setifolia	Bristly Love-grass			vu	1	3/08/2006	VBA	**Unlikely** – lack of habitat in inundation area.
Eremophila divaricata subsp. divaricata	Spreading Emu-bush			r	1	2015	GHD (2013) AE (2016)	**Present** – previously recorded in inundation area. **Impact** – positive to neutral response to inundation expected.
Geijera parviflora	Wilga		L	en	102	5/07/2003	VBA	**Unlikely** – lack of habitat in inundation area.
Haegiela tatei	Small Nut-heads			vu	1	20/04/1997	VBA	**Unlikely** – lack of habitat in inundation area.
Jasminum didymum subsp. lineare	Desert Jasmine			vu	1	17/12/1961	VBA	**Unlikely** – lack of habitat in inundation area.
Lepidium monoplocoides	Winged Pepper-cress	EN	L	en			PMST	**Unlikely** – not recorded in local area previously.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Maireana georgei	Slit-wing Bluebush			vu	2	11/04/2009	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Marsdenia australis	Doubah			vu	1	17/12/1961	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Olearia minor	Satin Daisy-bush			r	1	1/07/1971	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Picris squarrosa	Squat Picris			r	1	5/06/2013	VBA	**Present** – previously recorded in inundation area. **Impact** – positive response to inundation expected.
Sarcozona praecox	Sarcozona			r	2	13/09/2013	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive response to inundation expected.
Sclerolaena patenticuspis	Spear-fruit Copperburr			vu	1	11/04/2009	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Senecio cunninghamii var. cunninghamii	Branching Groundsel			r	1	19/11/2013	VBA	**Present** – previously recorded in inundation area. **Impact** – positive response to inundation expected.
Senna artemisioides subsp. artemisioides	Silver Cassia			en	1	10/11/2004	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Sida fibulifera	Pin Sida			vu	1	19/11/2013	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Sida intricata	Twiggy Sida			vu	2	12/10/2011	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Solanum karsense	Menindee Nightshade	VU					PMST	**Unlikely** – not recorded in local area previously.
Swainsona murrayana	Slender Darling-pea	VU	L	en			PMST	**Unlikely** – not recorded in local area previously.

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of records	Most recent record	Source	Likelihood of Occurrence / Impact
Swainsona swainsonioides	Downy Swainson-pea		L	en	1	1/09/1924	VBA	**Unlikely** – lack of habitat in inundation area.
Tecticornia pterygosperma subsp. pterygosperma	Whiteseed Glasswort			r	1	2/08/1967	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Velleia arguta	Grassland Velleia			r	1	1/11/1968	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Vittadinia condyloides	Club-hair New Holland Daisy			r	1	12/10/2011	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Vittadinia cuneata var. morrisii	Fuzzy New Holland Daisy			r	1	28/10/1997	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.
Vittadinia pterochaeta	Winged New Holland Daisy			vu	2	12/10/2011	VBA	**Possible** – suitable habitat present in inundation area. **Impact** – positive to neutral response to inundation expected.

Appendix D. Likelihood of occurrence / impact - threatened fauna - construction footprint

Likelihood of occurrence:

Not all of the threatened species identified during this assessment are equally likely to occur in the project site, due to the geographic location or context of the site, or the habitat type and condition. For each species, the likelihood of occurrence was evaluated using the following rationale:

PRESENT – Species known to occur within the site, or detected during the site visit.

POSSIBLE – Potentially suitable habitat occurs within construction footprints and species' known range encompasses the construction footprints. Species recorded historically in the 10 km search area, and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the construction footprints, but suitable habitat does not occur within construction footprints, or occurs within construction footprints but with generally low quality and quantity. Species recorded historically in the 10 km search area but generally not within the last 30 years.

HIGHLY UNLIKELY – No historical records of the species and/or no suitable habitat in the 10 km search area.

Key:

L – Listed

EN / en – Endangered

VU / vu – Vulnerable

nt – Near Threatened

CR / cr – Critically Endangered

Rx – Regionally Extinct

Mi - Migratory

Species Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
BIRDS								
Botaurus poiciloptilus	Australasian Bittern	EN	L	en	0		PMST	**Unlikely.** No previous records. Suitable habitat not present within construction footprints.
Rostratula australis	Australian Painted Snipe	EN	L	cr	0		PMST	**Unlikely.** No previous records. Suitable habitat not present within construction footprints.
Gelochelidon macrotarsa	Australian Gull-billed Tern		L	en	1	1978	VBA	**Unlikely.** Suitable habitat not present within construction footprints.
Falco subniger	Black Falcon		L	vu	11	1980	VBA	**Possible.** Species may utilise habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.
Hydroprogne caspia	Caspian Tern		L	nt	2	1979	VBA	**Unlikely.** Suitable habitat not present within construction footprints.
Tringa nebularia	Common Greenshank	Mi		vu	1	1977	VBA, PMST	**Unlikely.** Just one previous record over 40 years ago. Suitable habitat not present within construction footprints.
Actitis hypoleucos	Common Sandpiper	Mi		vu	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints and inundated habitats also unlikely to provide suitable habitat.
Calidris ferruginea	Curlew Sandpiper	CR, Mi	L	en			PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints and inundated habitats also unlikely to provide suitable habitat.
Geopelia cuneata	Diamond Dove		L	nt	2	1979	VBA	**Possible.** Species may utilise habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.
Numenius madagascariensis	Eastern Curlew	CR, Mi	L	vu	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints and inundated habitats also unlikely to provide suitable habitat.

Species Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Ardea alba modesta	Eastern Great Egret		L	vu	13	1979	VBA	**Unlikely.** Suitable habitat not present within construction footprints, however suitable habitat may exist for this species during inundation events.
Apus pacificus	Fork-tailed Swift	Mi			1	1980	VBA, PMST	**Possible.** Species may fly over area whilst foraging. **Impact Unlikely.** Species highly mobile and wide ranging, suitable surrounding habitat widespread.
Pomatostomus temporalis	Grey-crowned Babbler		L	en	24	2001	VBA	**Possible.** Species may utilise habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.
Melanodryas cucullata	Hooded Robin		L	nt	2	2008	VBA, Brown et al 2013.	**Possible.** Suitable habitat at all sites, species may use habitats to forage. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.
Gallinago hardwickii	Latham's Snipe	Mi		nt	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints.
Lophochroa leadbeateri	Major Mitchell's Cockatoo		L	vu	3	2018	VBA	**Possible.** Suitable habitat at all sites. **Impact Unlikely.** Impact areas do not include trees suitable for nesting, species mobile and wide ranging, suitable surrounding habitat widespread.
Leipoa ocellata	Malleefowl	VU	L	en	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints.
Pezoporus occidentalis	Night Parrot	EN		rx	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints.
Grantiella picta	Painted Honeyeater	VU	L	vu	0		PMST	**Possible.** Species not recorded previously but may occasionally utilise habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.

Species Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Calidris melanotos	Pectoral Sandpiper	Mi		nt	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints.
Pedionomus torquatus	Plains Wanderer	CR	L	cr	1	1948	VBA PMST	**Unlikely.** Previous record 70 years ago. Suitable habitat not present within construction footprints.
Polytelis anthopeplus monarchoides	Regent Parrot	VU	L	vu	10	2019	VBA PMST Lumsden et al 2007, Brown et al 2013, R8 2019	**Possible.** Recent previous records within the project area, with suitable foraging habitat within the construction footprints. **Impact Unlikely.** Losses to small area of foraging habitat proposed to be lost, however the species is highly mobile and wide ranging, suitable surrounding habitat widespread. Important breeding habitat not present within the construction footprints, no species breeding habitat within 30km.
Myiagra cyanoleuca	Satin Flycatcher	Mi			0		PMST	**Unlikely.** Not recorded previously and suitable habitat not present within construction footprints.
Calidris acuminata	Sharp-tailed Sandpiper	Mi			0		PMST	**Unlikely.** Not recorded previously and suitable habitat not present within construction footprints.
Haliaeetus leucogaster	White-bellied Sea-Eagle		L	vu	5	1979	VBA PMST	**Unlikely.** Suitable habitat not present within construction footprints.
Motacilla flava	Yellow Wagtail	Mi					PMST	**Highly Unlikely.** Not recorded previously and suitable habitat not present within construction footprints.
MAMMALS								
Nyctophilus corbeni	South-eastern Long-eared Bat	VU	L	en			PMST	**Unlikely.** Not recorded previously and suitable habitat not present within construction footprints.
Conilurus albipes	White-footed Rabbit-rat	EX	L	ex	1	1760	VBA	**Highly Unlikely.** Last recorded over 250 years ago. Extinct
REPTILES								

Species Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Morelia spilota metcalfei	Carpet Python		L	en	2	2002	VBA	**Possible.** Suitable habitat at all sites. **Impact Possible.** Localised impacts possible, consideration of finalised footprint required. Suitable habitat surrounding and widespread.
AMPHIBIANS								
Litoria raniformis	Growling Grass Frog	VU	L	en	0		PMST	**Unlikely.** No previous records. Suitable habitat not present within construction footprints, however suitable habitat may exist for this species during inundation events. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.
FISH								
Bidyanus bidyanus	Silver Perch	CR	L	vu	0		PMST	**Possible.** Suitable habitat present within Murray River but suitable habitat unlikely in Burra Creek. **Impact Possible.** Localised impacts possible, consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider aquatic fauna. A construction specific aquatic fauna management protocol should be developed for all works around waterways.
Craterocephalus fluviatilis	Murray Hardyhead	EN	L	cr	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints. Species restricted to carefully managed isolated water bodies only.
Galaxias rostratus	Flathead Galaxias	CR		vu	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints. Species unlikely to occur within the project area, including during inundation events.

Species Name	Common Name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Maccullochella peelii	Murray Cod	VU	L	vu	0		PMST	**Possible.** Suitable habitat present within Murray River but suitable habitat unlikely in Burra Creek. **Impact Possible.** Localised impacts possible, consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider aquatic fauna. A construction specific aquatic fauna management protocol should be developed for all works around waterways.
Macquaria australasica	Macquarie Perch	EN	L	en	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints. Species unlikely to occur within the project area, including during inundation events.

Appendix E. Likelihood of occurrence / impact - threatened fauna – inundation area

Likelihood of occurrence:

Not all of the threatened species identified during this assessment are equally likely to occur in the project site, due to the geographic location or context of the site, or the habitat type and condition. For each species, the likelihood of occurrence was evaluated using the following rationale:

PRESENT – Species known to occur within the site, or detected during the site visit.

POSSIBLE – Potentially suitable habitat occurs within inundation areas and species' known range encompasses the inundation areas. Species recorded historically in the 10 km search area, and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the inundation areas, but suitable habitat does not occur within inundation areas, or occurs within inundation areas but with generally low quality and quantity. Species recorded historically in the 10 km search area but generally not within the last 30 years.

HIGHLY UNLIKELY – No historical records of the species and/or no suitable habitat in the 10 km search area.

Key:

L – Listed

EN / en – Endangered

VU / vu – Vulnerable

nt – Near Threatened

CR / cr – Critically Endangered

Rx – Regionally Extinct

MI –Migratory Species

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
BIRDS								
Botaurus poiciloptilus	Australasian Bittern	EN	L	en	0		PMST	**Unlikely.** No previous records. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Rostratula australis	Australian Painted Snipe	EN	L	cr	0		PMST	**Unlikely.** No previous records. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Gelochelidon macrotarsa	Australian Gull-billed Tern		L	en	1	1978	VBA	**Unlikely.** Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Falco subniger	Black Falcon		L	vu	11	1980	VBA	**Possible.** Species may utilise habitats within inundation area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Hydroprogne caspia	Caspian Tern		L	nt	2	1979	VBA	**Unlikely.** Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Tringa nebularia	Common Greenshank	Mi		vu	1	1977	VBA, PMST	**Unlikely.** Just one previous record over 40 years ago. Suitable habitat not present within construction footprints.
Actitis hypoleucos	Common Sandpiper	Mi		vu	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints and inundated habitats also unlikely to provide suitable habitat.
Calidris ferruginea	Curlew Sandpiper	CR, Mi	L	en			PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within inundation area.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Geopelia cuneata	Diamond Dove		L	nt	2	1979	VBA	**Possible.** Species may utilise habitats within inundation area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Numenius madagascariensis	Eastern Curlew	CR, Mi	L	vu	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within inundation area.
Ardea alba modesta	Eastern Great Egret		L	vu	13	1979	VBA	**Unlikely.** Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Apus pacificus	Fork-tailed Swift	Mi			1	1980	VBA, PMST	**Possible.** Species may fly over area whilst foraging.
Pomatostomus temporalis	Grey-crowned Babbler		L	en	24	2001	VBA	**Likely.** Species likely to utilise habitats across the inundation area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Melanodryas cucullata	Hooded Robin		L	nt	2	2008	VBA, Brown et al 2013.	**Possible.** Suitable habitat across inundation area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Gallinago hardwickii	Latham's Snipe	Mi		nt	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Lophochroa leadbeateri	Major Mitchell's Cockatoo		L	vu	3	2018	VBA	**Possible.** Suitable habitat within inundation area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Leipoa ocellata	Mallee fowl	VU	L	en	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within inundation area.
Pezoporus occidentalis	Night Parrot	EN		rx	0			**Highly Unlikely.** No previous records. Suitable habitat not present within inundation area.
Grantiella picta	Painted Honeyeater	VU	L	vu	0		PMST	**Possible.** Species not recorded previously but may occasionally utilise habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Calidris melanotos	Pectoral Sandpiper	Mi		nt	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within construction footprints.
Pedionomus torquatus	Plains Wanderer	CR	L	cr	1	1948	VBA PMST	**Unlikely.** Previous record 70 years ago. Suitable habitat not present within inundation area.
Polytelis anthopeplus	Regent Parrot	VU	L	vu	10	2019	VBA PMST Lumsden et al 2007, Brown et al 2013, R8 2019	**Likely.** Recent previous records within the project area, with suitable foraging habitat across the inundation area. **Impact Unlikely.** Species is highly mobile and wide ranging, suitable surrounding habitat widespread. Important breeding habitat not present within the inundation area, species likely to benefit from improved habitat condition following environmental water.
Myiagra cyanoleuca	Satin Flycatcher	Mi			0		PMST	**Unlikely.** Not recorded previously and suitable habitat not present within construction footprints.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Calidris acuminata	Sharp-tailed Sandpiper	Mi			0		PMST	**Unlikely.** Not recorded previously and suitable habitat not present within construction footprints.
Haliaeetus leucogaster	White-bellied Sea-Eagle		L	vu	5	1979	VBA PMST	**Unlikely.** Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Motacilla flava	Yellow Wagtail	Mi					PMST	**Highly Unlikely.** Not recorded previously and suitable habitat not present within construction footprints.
MAMMALS								
Nyctophilus corbeni	South-eastern Long-eared Bat	VU	L	en			PMST	**Unlikely.** Not recorded previously. Suitable habitat present within inundation extent, if species present would likely benefit from environmental water when present and indirectly from improved habitat condition following environmental water.
Conilurus albipes	White-footed Rabbit-rat	EX	L	ex	1	1760	VBA	**Highly Unlikely.** Last recorded over 250 years ago. Extinct.
REPTILES								
Morelia spilota metcalfei	Carpet Python		L	en	2	2002	VBA	**Possible.** Suitable habitat across inundation extent. **Impact Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
AMPHIBIANS								
Litoria raniformis	Growling Grass Frog	VU	L	en	0		PMST	**Unlikely.** No previous records. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Would likely benefit from environmental water when present and indirectly from improved habitat condition following environmental water.
FISH								

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (assessed if species is possible or present)
Bidyanus bidyanus	Silver Perch	CR	L	vu	0		PMST	**Possible.** No previous records. Suitable short-term foraging habitat may be formed during inundation events. **Impact Unlikely.** Species likely to benefit from improved habitat condition following environmental water. Unlikely to be an existing population in Burra Creek.
Craterocephalus fluviatilis	Murray Hardyhead	EN	L	cr	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat not present - mostly recorded in saline lakes with relatively low turbidity.
Galaxias rostratus	Flathead Galaxias	CR		vu	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat of still or gently flowing water on the margins of lakes, billabongs and streams not present.
Maccullochella peelii	Murray Cod	VU	L	vu	0		PMST	**Possible.** No previous records. Suitable short-term foraging habitat may be formed during inundation events. **Impact Unlikely.** Species likely to benefit from improved habitat condition following environmental water. Unlikely to be an existing population in Burra Creek.
Macquaria australasica	Macquarie Perch	EN	L	en	0		PMST	**Highly Unlikely.** No previous records. Suitable habitat of clear water, deep, rocky holes and cover not present.

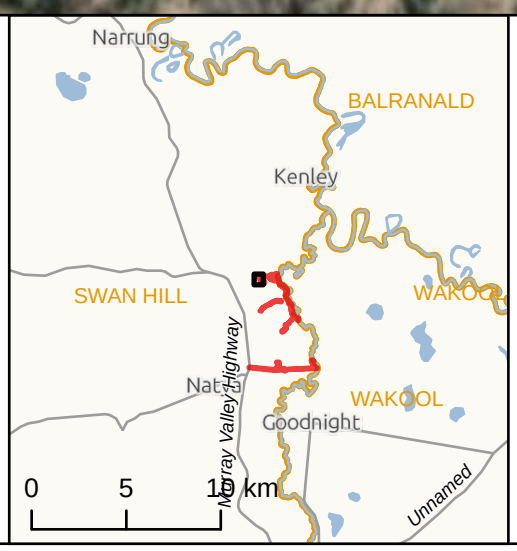
Appendix F. Ecological values mapped in construction footprints

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 1 of 24

Angle Road
Raven Lane
Raven Lane

Legend

- Area of Investigation
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ7,810,Flood Pondway Herbland
- HZ8,823,Lignum Swampy Woodland
- 104,Lignum Swamp
- 103, Riverine Chenopod Woodland
- Minor Road
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
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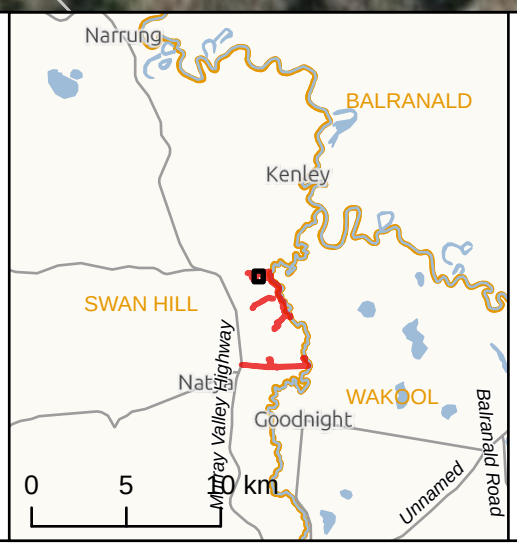
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 2 of 24

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ2,106,Grassy Riverine Forest
- HZ3,823,Lignum Swampy Woodland
- HZ4,810,Flood Pondway Herbland
- HZ7,810,Flood Pondway Herbland
- HZ8,823,Lignum Swampy Woodland
- HZ9,103,Riverine Chenopod Woodland
- 103,Riverine Chenopod Woodland
- RI_LD,97,Semi-arid Woodland
- 97,Semi-arid Woodland
- HZ7,810,Flood Pondway Herbland
- HZ8,823,Lignum Swampy Woodland
- 103, Riverine Chenopod Woodland
- RI_LD,97,Semi-arid Woodland
- Minor Road
- Watercourse Stream
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

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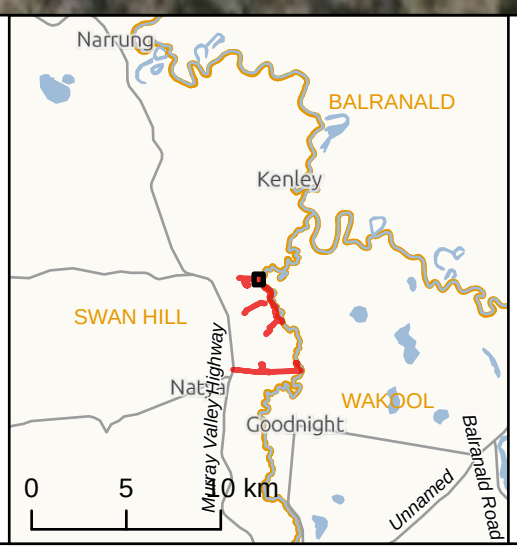
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 3 of 24

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ1,106,Grassy Riverine Forest
- HZ2,106,Grassy Riverine Forest
- HZ3,823,Lignum Swampy Woodland
- HZ4,810,Flood Pondway Herbland
- HZ9,103,Riverine Chenopod Woodland
- NA,990,Open Water
- 103,Riverine Chenopod Woodland
- RI_LD,97,Semi-arid Woodland
- 97,Semi-arid Woodland
- HZ1,106,Grassy Riverine Forest
- HZ10,823,Lignum Swampy Woodland
- HZ3,823,Lignum Swampy Woodland
- 103, Riverine Chenopod Woodland
- RI_LD,97,Semi-arid Woodland
- Minor Road
- Watercourse Stream
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

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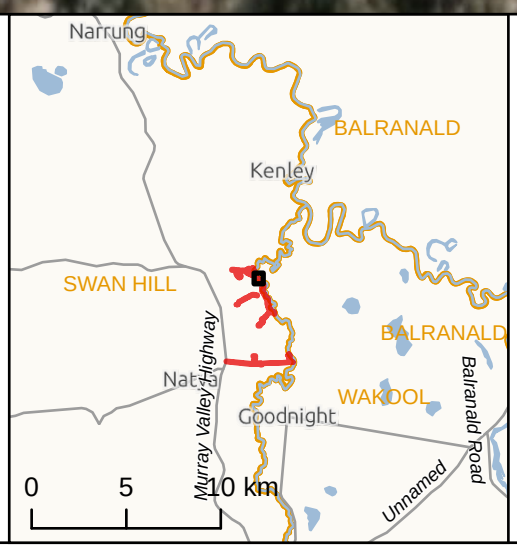
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 4 of 24

Murray River

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- HZ1,106,Grassy Riverine Forest
- HZ1,823,Lignum Swampy Woodland
- HZ2,106,Grassy Riverine Forest
- HZ3,814,Riverine Swamp Forest
- HZ3,823,Lignum Swampy Woodland
- HZ1,106,Grassy Riverine Forest
- Minor Road
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

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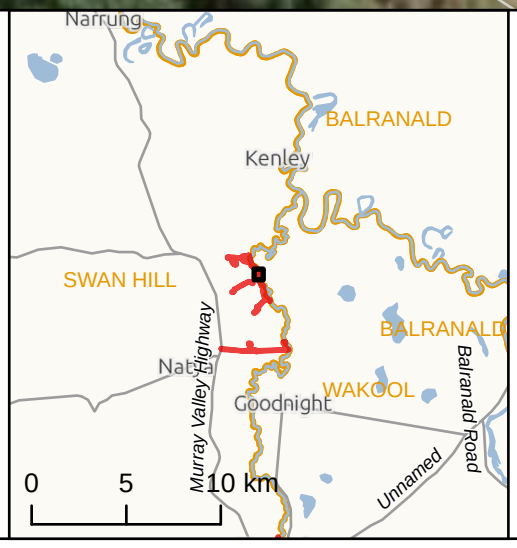
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 5 of 24

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ1,823,Lignum Swampy Woodland
- HZ2,106,Grassy Riverine Forest
- GRF,106,Grassy Riverine Forest
- 823, Lignum Swampy Woodland
- Minor Road
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

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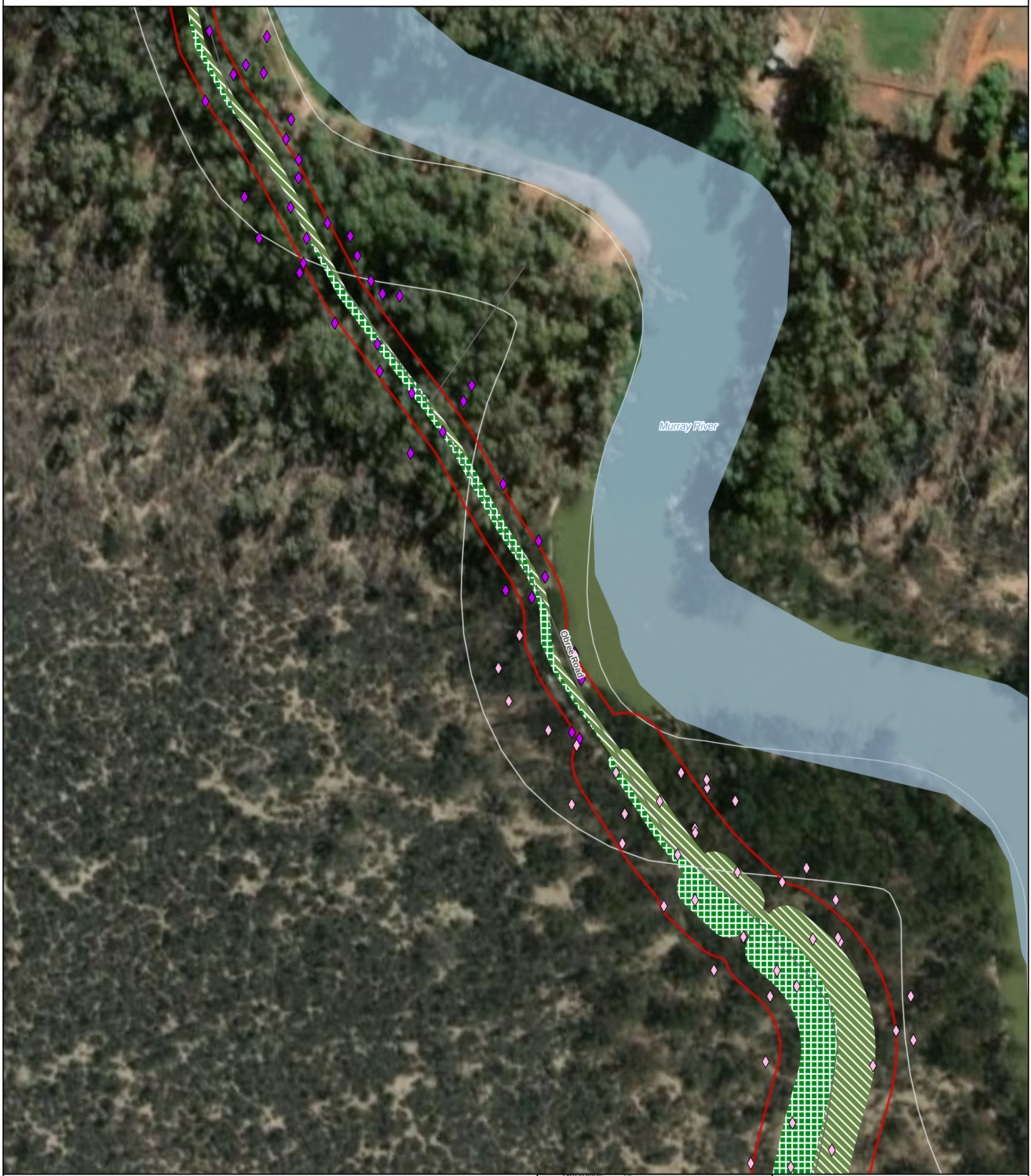
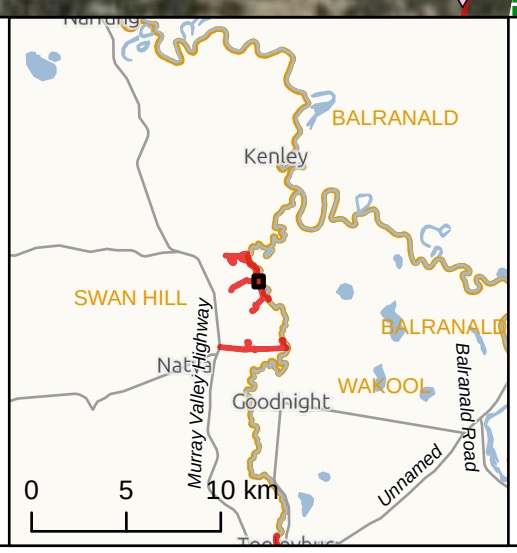
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 6 of 24



Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- CanopyTrees (VMFRP Field Data 2019/2020)
- GRF,106,Grassy Riverine Forest
- LSW,823,Lignum Swampy Woodland
- GRF,106,Grassy Riverine Forest
- 823, Lignum Swampy Woodland
- Minor Road
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

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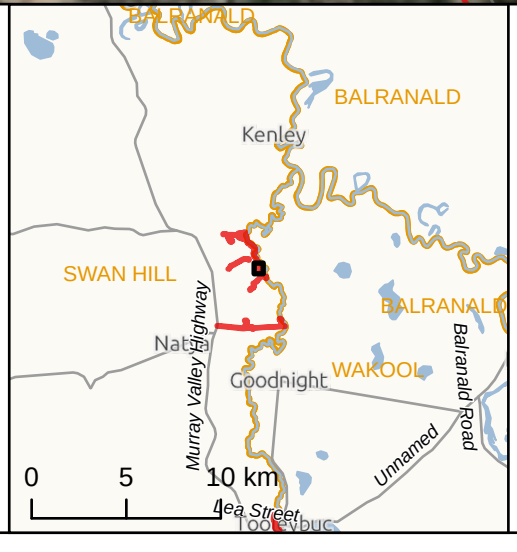
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 7 of 24

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- GRF,106,Grassy Riverine Forest
- LSW,823,Lignum Swampy Woodland
- GRF,106,Grassy Riverine Forest
- 823, Lignum Swampy Woodland
- Minor Road
- Watercourse Stream
- Waterbody
- Cadastre



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IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

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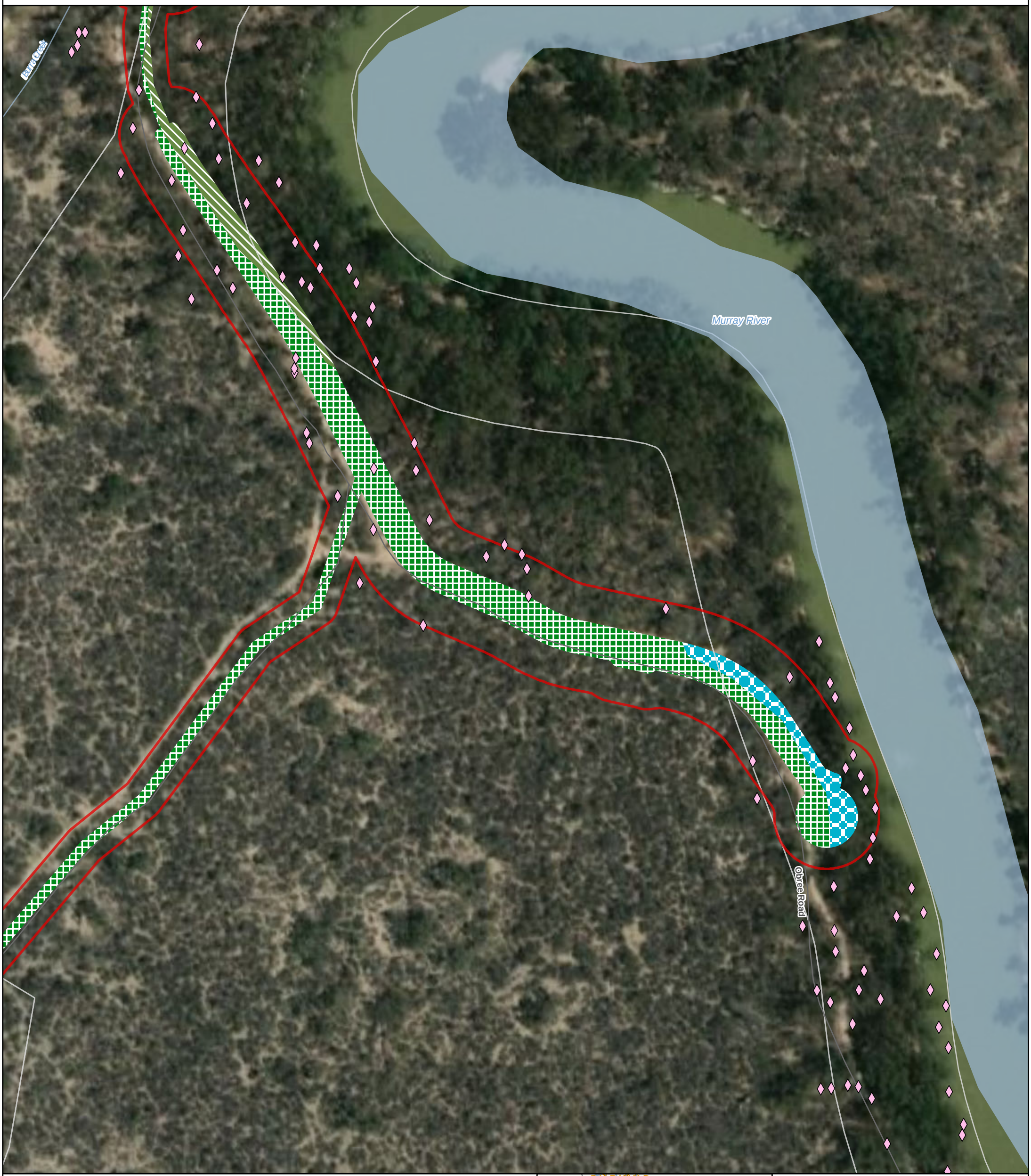
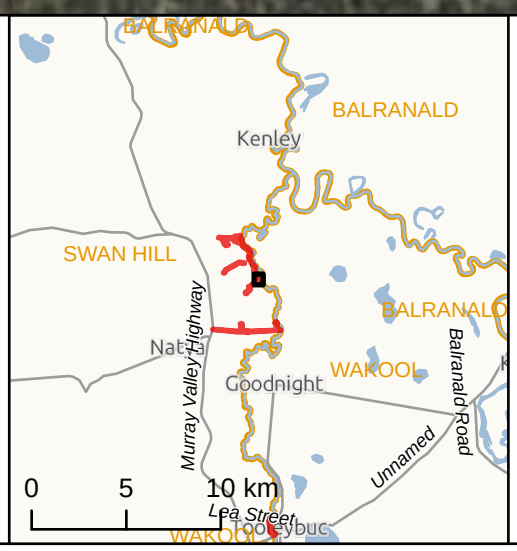


Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- GRF,106,Grassy Riverine Forest
- LSW,823,Lignum Swampy Woodland
- 818,Shrubby Riverine Woodland
- GRF,106,Grassy Riverine Forest
- 823, Lignum Swampy Woodland
- Minor Road
- Watercourse Stream
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

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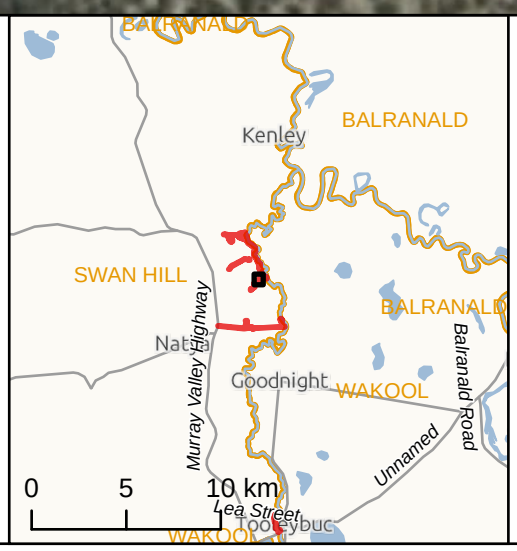
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 9 of 24

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- LSW,823,Lignum Swampy Woodland
- FPH,810,Flood Pondway Herbland
- 823, Lignum Swampy Woodland
- 103, Riverine Chenopod Woodland
- Minor Road
- Watercourse Stream
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
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FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 10 of 24

Legend

- Area of Investigation
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ5,815,Riverine Swampy Woodland
- 823, Lignum Swampy Woodland
- 103, Riverine Chenopod Woodland
- Minor Road
- Watercourse Stream
- Cadastre

VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

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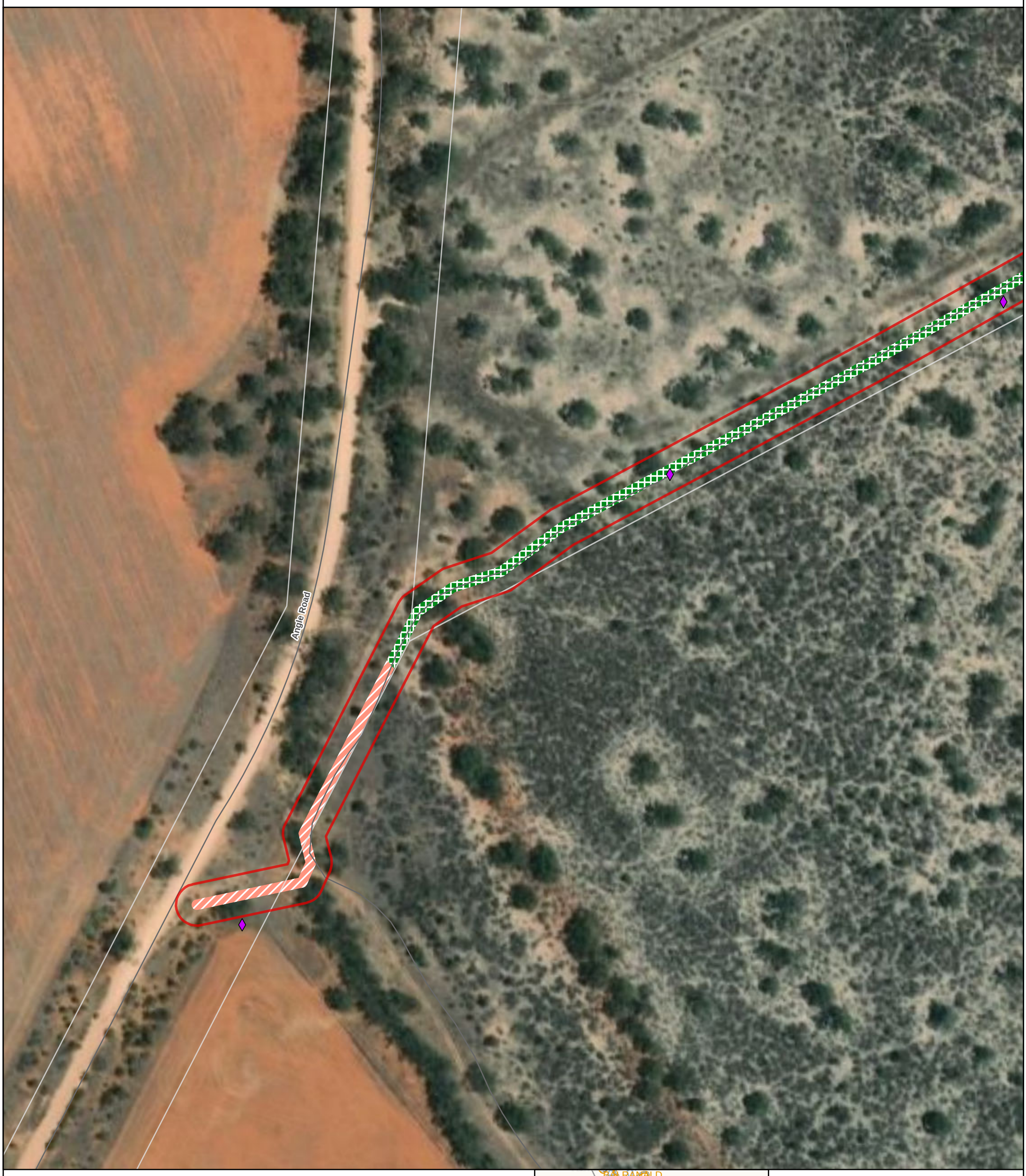
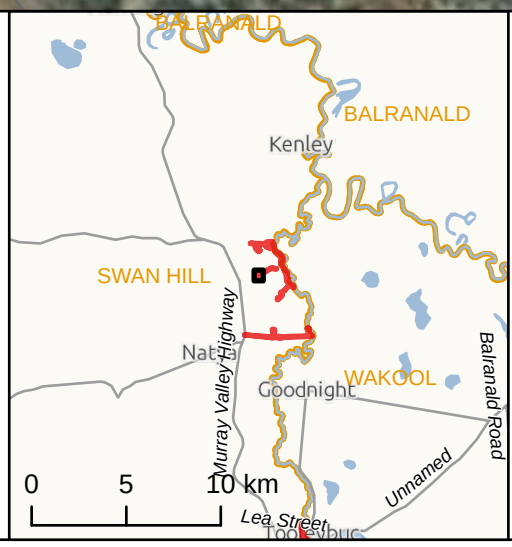
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 11 of 24



Legend

- Area of Investigation
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ12,103,Riverine Chenopod Woodland
- HZ13,823,Lignum Swampy Woodland
- Minor Road
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
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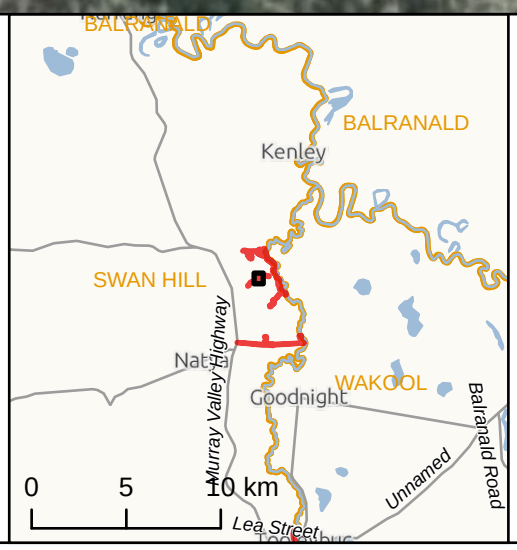
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 12 of 24

Legend

- Area of Investigation
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ13,823,Lignum Swampy Woodland
- Minor Road
- Watercourse Stream
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

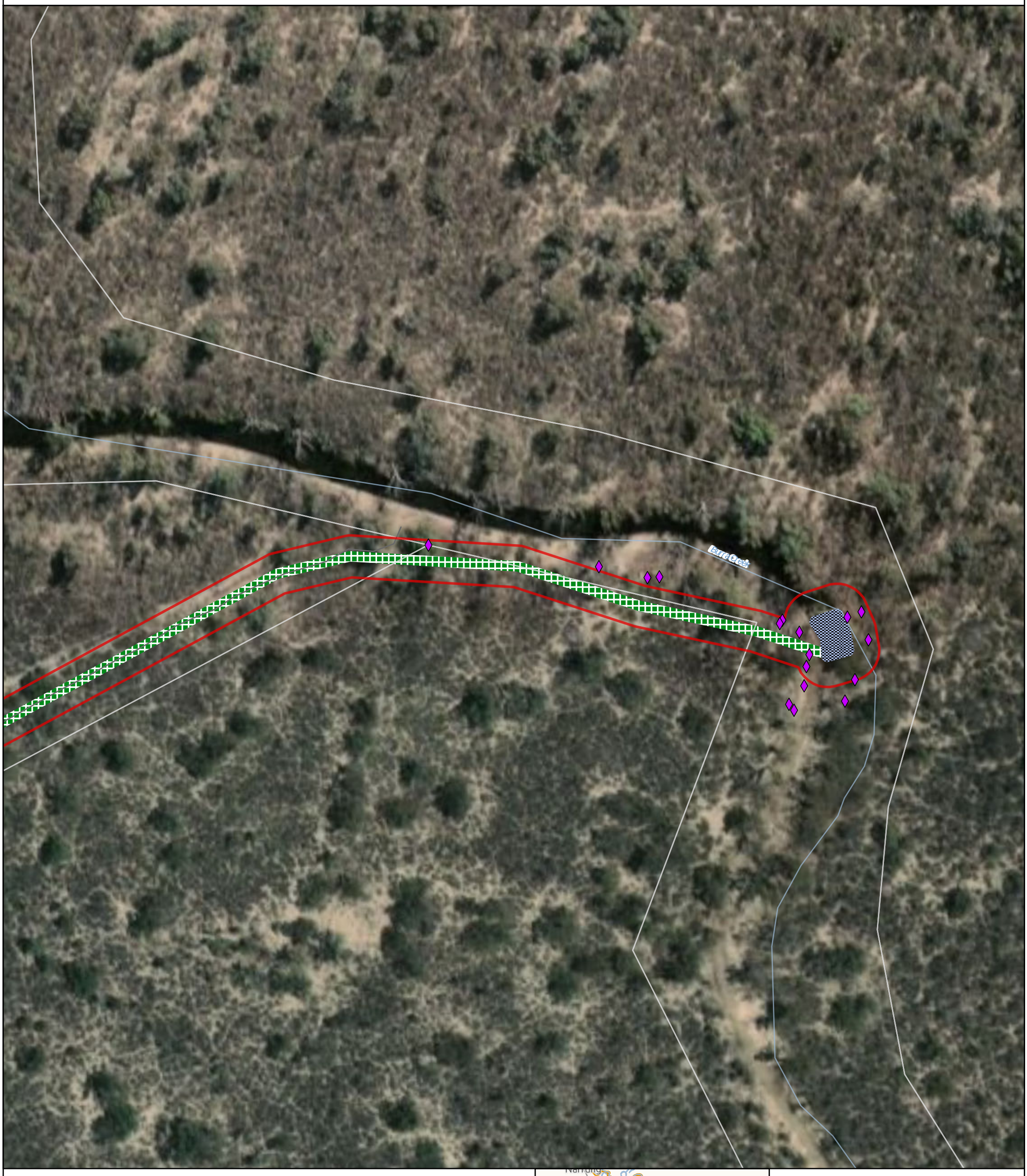
0 40 80

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

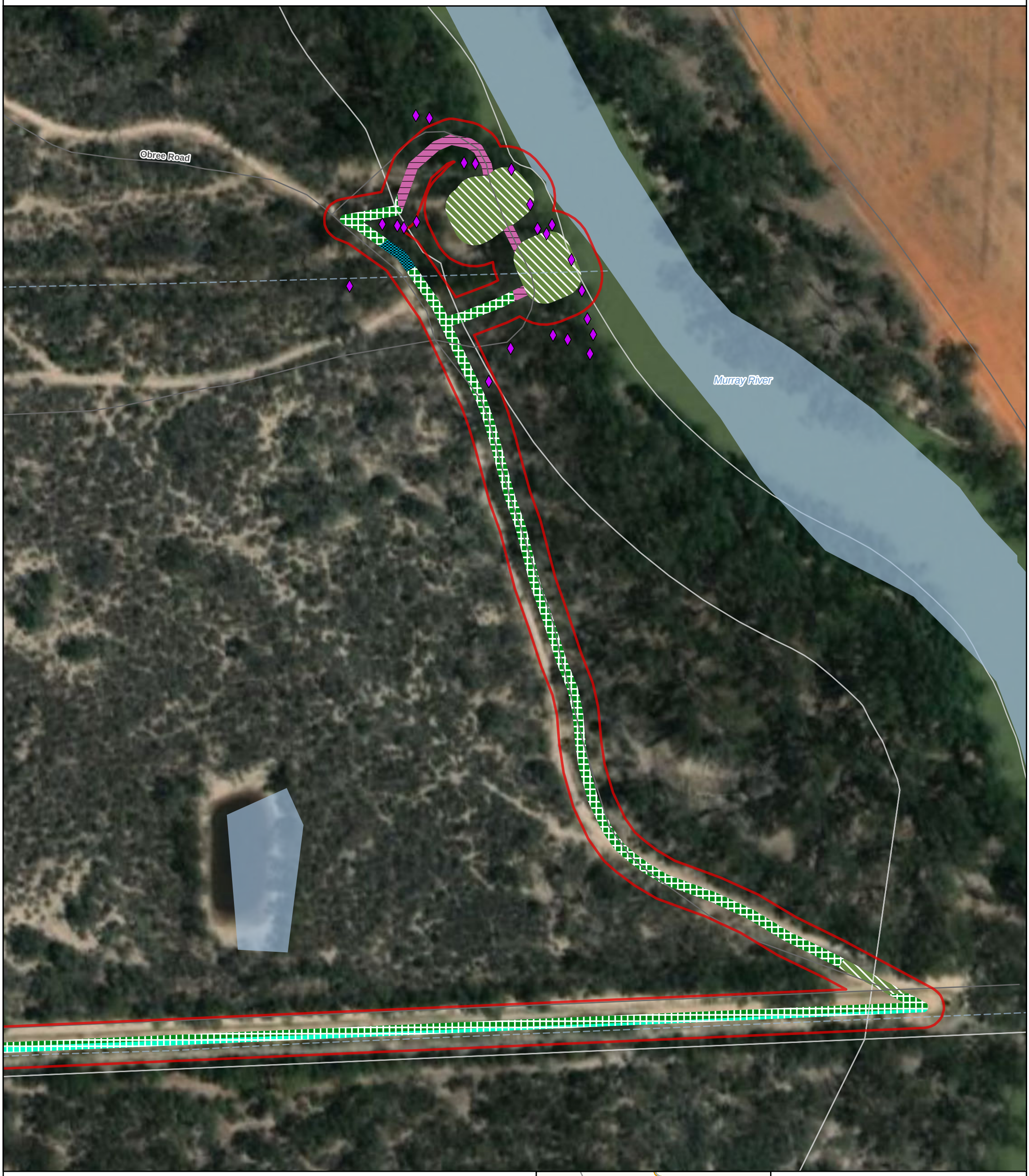
Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 13 of 24



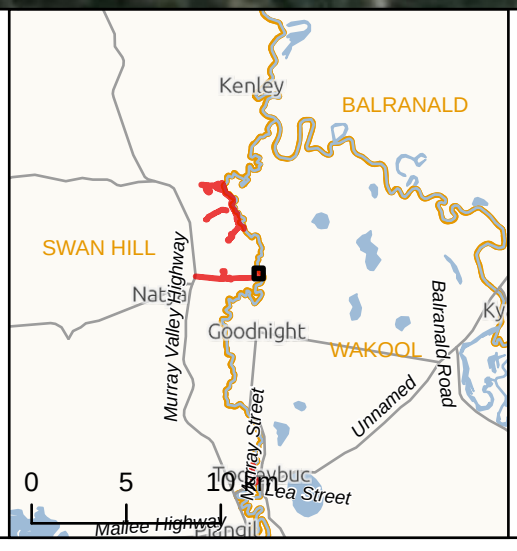
Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 14 of 24



Legend

- Area of Investigation
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ4,106,Grassy Riverine Forest
- DC,823,Lignum Swampy Woodland
- FPH,810,Flood Pondway Herbland
- GRF,106,Grassy Riverine Forest
- HZ4,106,Grassy Riverine Forest
- 823, Lignum Swampy Woodland
- Minor Road
- Channel / Drain
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

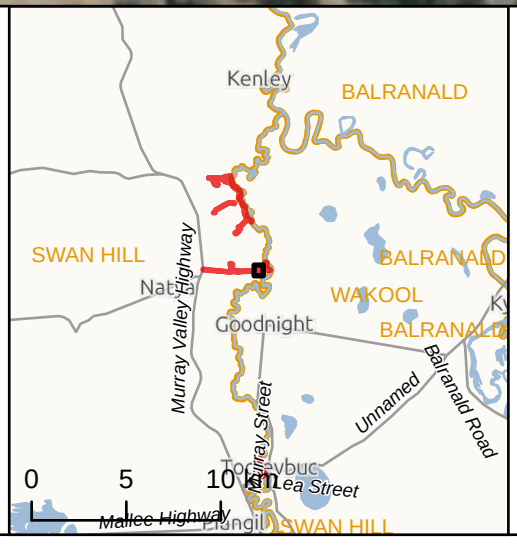
DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 15 of 24

Legend

- Area of Investigation
- DC,823,Lignum Swampy Woodland
- 823, Lignum Swampy Woodland
- Minor Road
- Channel / Drain
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

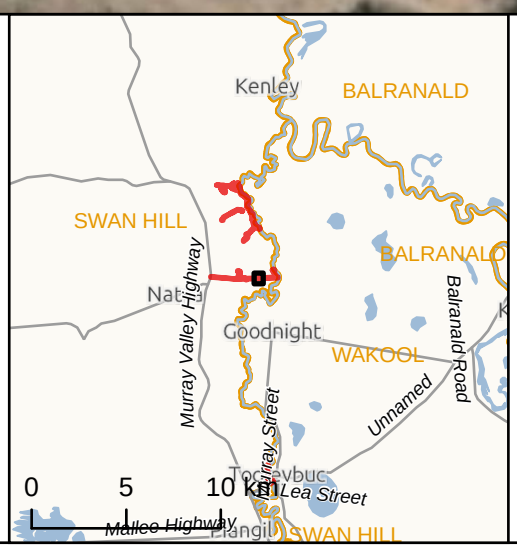
DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 16 of 24

Legend

- Area of Investigation
- DC,823,Lignum Swampy Woodland
- 823, Lignum Swampy Woodland
- Minor Road
- Channel / Drain
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

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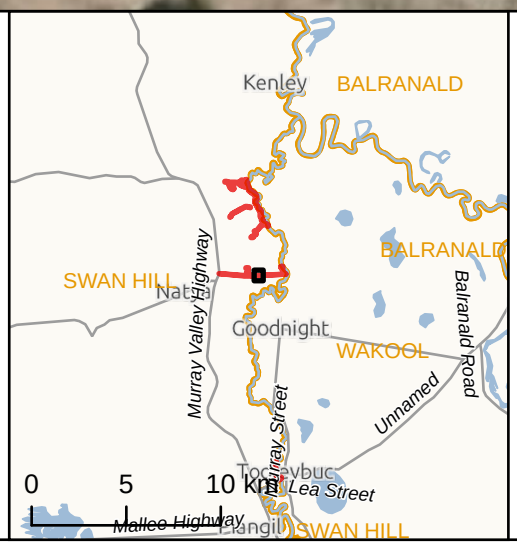
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 17 of 24

Legend

- Area of Investigation
- CanopyTrees (VMFRP Field Data 2019/2020)
- DC,823,Lignum Swampy Woodland
- 823, Lignum Swampy Woodland
- Non-native vegetation
- Minor Road
- Channel / Drain
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

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Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

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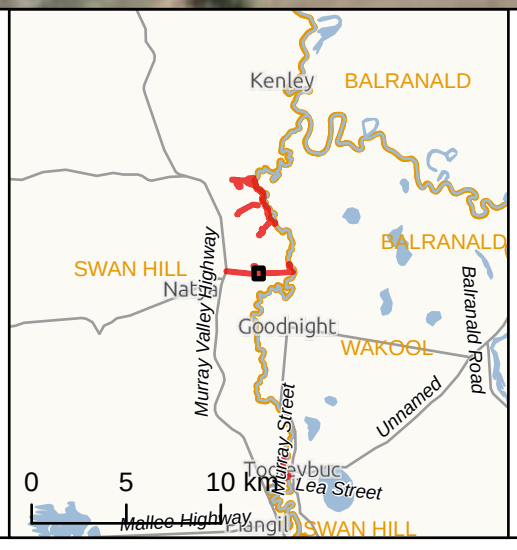
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 18 of 24

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ DC,823,Lignum Swampy Woodland
- HZ1,823,Lignum Swampy Woodland
- HZ2,103,Riverine Chenopod Woodland
- HZ3,106,Grassy Riverine Forest
- HZ4,810,Flood Pondway Herbland
- DC,823,Lignum Swampy Woodland
- HZ3,106,Grassy Riverine Forest
- 823, Lignum Swampy Woodland
- 103, Riverine Chenopod Woodland
- Non-native vegetation
- Minor Road
- Channel / Drain
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

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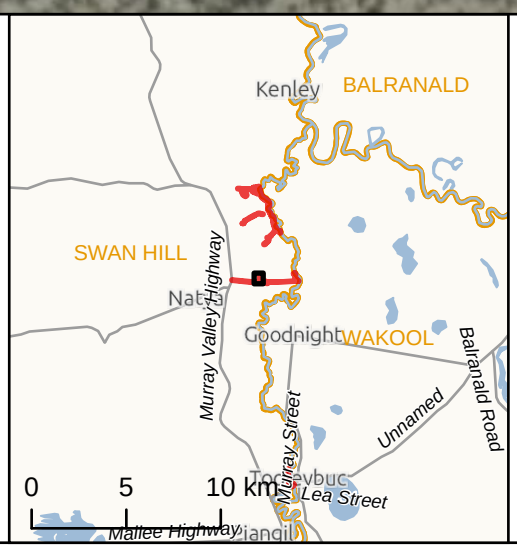
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 19 of 24

Legend

- Area of Investigation
- CanopyTrees (VMFRP Field Data 2019/2020)
- HZ2,56,Floodplain Riparian Woodland
- DC,823,Lignum Swampy Woodland
- FPH,810,Flood Pondway Herbland
- GRF,106,Grassy Riverine Forest
- 103, Riverine Chenopod Woodland
- Non-native vegetation
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

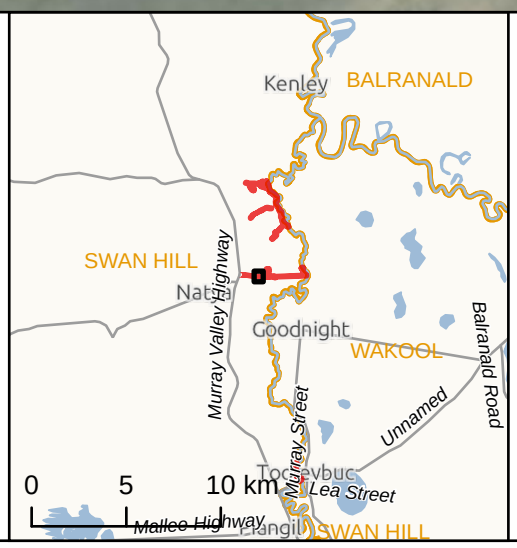
DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 20 of 24

Legend

- Area of Investigation
- DC,823,Lignum Swampy Woodland
- FPH,810,Flood Pondway Herbland
- GRF,106,Grassy Riverine Forest
- Minor Road
- Channel / Drain
- Watercourse Stream
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

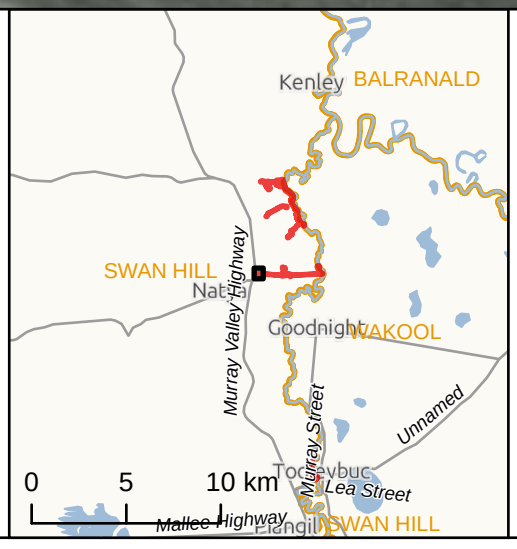
FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 21 of 24

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 22 of 24

Legend

- Area of Investigation
- DC,823,Lignum Swampy Woodland
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

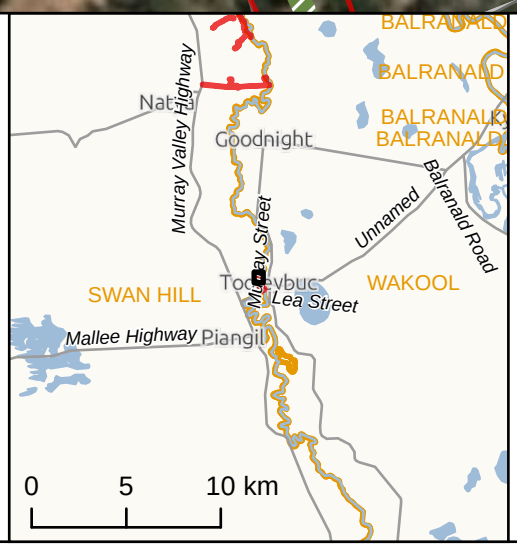
DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 23 of 24

Legend

- Area of Investigation
- Large Old Trees (Australian Ecology 11/2015)
- HZ1,106,Grassy Riverine Forest
- Non-Intact Vegetation (<25% cover of native vegetation)
- HZ3,106,Grassy Riverine Forest
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

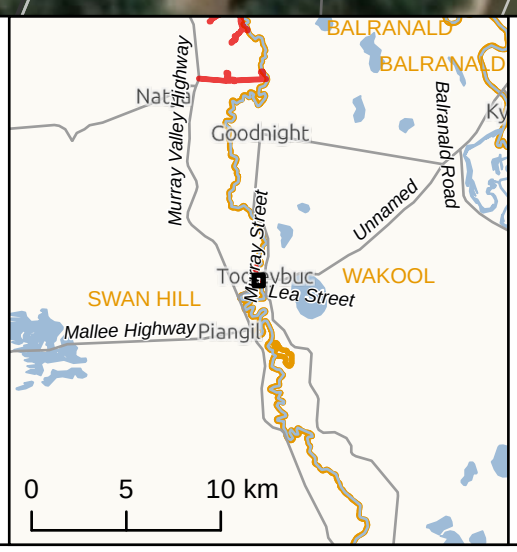
DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

FIGURE 4: Ecological values mapped in the construction footprints at Burra Creek, Page 24 of 24

Legend

- Area of Investigation
- Non-Intact Vegetation (<25% cover of native vegetation)
- HZ3,106,Grassy Riverine Forest
- Major Road
- Minor Road
- Channel / Drain
- Waterbody
- Cadastre



VMFRP

IS297742

Name: GDA 1994 MGA Zone 55

0 40 80

Metres

DATA SOURCES
© Commonwealth of Australia (Geoscience Australia) 2006 Geodata Topo 250k Series 3; Vicmap Data © State of Victoria 2019; Jacobs & GHD 2020.

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Burra\Burra_EcologyReport.aprx

Appendix G. Significance assessment for EPBC Act listed fauna

Below are the significant impact criteria for species listed under the EPBC Act as vulnerable. The criteria are addressed below for the EPBC Act Vulnerable (VU) listed Regent Parrot (eastern) (*Polytelis anthopeplus monarchoides*) and Painted Honeyeater (*Grantiella picta*), and any potential impacts to these species from the proposed works.

NB – What is an important population of a species?

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

Key source populations either for breeding or dispersal

Populations that are necessary for maintaining genetic diversity, and/or

Populations that are near the limit of the species' range.

Regent Parrot (eastern) (*Polytelis anthopeplus monarchoides*) - EPBC Act – Vulnerable, FFG Act – Listed, Victorian Advisory List - Vulnerable
Lead to a long-term decrease in the size of an important population of a species
The Regent Parrot is well known and frequently recorded throughout Hattah-Kulkyne National Park, with a number of well-known breeding populations along the Murray River at the southern park boundary Messenger's/Oatey's Regulator), more than 60 km north-west of the Project Area. The Burra Creek project area occurs within areas where Regent Parrots are known to occur, however falls outside of areas mapped as breeding habitat (Baker and Hurley 2011). The proposed construction footprints represent a very small, low quality area of foraging habitat for this highly mobile species, and is very unlikely to lead to a long-term decrease in the size of an important population of this species.
Reduce the area of occupancy of an important population
The proposed construction footprints are centred on existing tracks and degraded areas. This will not significantly reduce the area of occupancy of this population as the structures will be established on already disturbed tracks and levees.
Fragment an existing important population into two or more populations
The proposed construction footprints represent very small, isolated and discreet areas of habitat within an extensive area of suitable habitat for this highly mobile species, and will not fragment the existing population into two or more populations. Previous similar and larger impacts in this area for The Living Murray projects did not negatively impact Regent Parrot nesting extent and success.
Adversely affect habitat critical to the survival of a species
The proposed construction footprints fall outside areas mapped as breeding habitat for the Regent Parrot (approximately 10 km north) (Baker and Hurley 2011, Seran 2018). The proposed construction footprints will not adversely affect habitat critical to the survival of this species, as construction footprints represent very small, isolated and discreet areas of habitat within an extensive area of suitable habitat for this highly mobile species. The proposal does not plan to remove any potential nesting habitat.
Disrupt the breeding cycle of an important population
The nearest potential areas of breeding habitat for the Regent Parrot occur approximately 10 km north of the construction footprints (Baker and Hurley 2011, Seran 2018).

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The proposed construction footprints represent very small (~12.614ha), isolated and discreet areas of habitat within an extensive area of suitable habitat (over 407 ha). Areas mapped as likely important habitat for this species within the National Recovery Plan occurs approximately 10 km north of the proposed construction footprint (Baker and Hurley 2011). The proposed construction works will not impact known or potential nesting trees or suitable foraging habitat during the breeding season, and therefore will not significantly modify, destroy, remove, isolate or decrease the availability or quality of Regent Parrot habitat within the area.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Weed infiltration is possible from the proposed works, within the limited areas of construction. Appropriate systems must be set in place and followed to minimise the possibility of weed dispersal and exotic predator control, and will be included in a Construction Environmental Management Plan (CEMP). Impacts to this species from invasive species have not been identified as a threatening process previously and are highly unlikely in this case.
Introduce disease that may cause the species to decline
The proposed construction works are not expected to introduce any avifauna diseases to the Regent Parrot populations of the study area (the greatest chance for this to occur would be transmittal of disease from captive birds to wild birds, with a very low chance of this occurring), particularly with hygiene protocols for vehicles/machinery/staff that will be further described in a CEMP that will be prepared for the project.
Interfere substantially with the recovery of the species.
The proposed construction activities will not interfere substantially with the recovery of the species, as this species and its breeding and foraging habitats will not be impacted by the proposed works, directly or indirectly. The project is likely to enhance habitat for this species, by promoting healthy woodlands for foraging (Seran BL&A 2018).

Painted Honeyeater (*Grantiella picta*) EPBC Act – Vulnerable, FFG Act – Listed, Victorian Advisory List - Vulnerable
Lead to a long-term decrease in the size of an important population of a species
The Painted Honeyeater has not been previously recorded within 10km of the construction footprint or inundation area, but has the potential to utilise habitats within these areas, and may occasionally forage in mistletoe within areas of woodland. The proposed construction footprints are however not likely to significantly impact any areas of important habitat to this extremely mobile nomadic species, which forages widely over large areas in pursuit of mistletoe and flowering eucalypts. The proposed construction footprint represents a very small, low quality area of foraging habitat for this highly mobile species, and is considered extremely unlikely to lead to a long-term decrease in the size of an important population of this species. The area does not represent core habitat or range for this species.
Reduce the area of occupancy of an important population
The proposed construction footprints are centred on existing tracks and degraded areas. This will not significantly reduce the area of occupancy of any population as the structures will be established on already disturbed tracks and levees. The area does not represent core habitat or range for this species.

Fragment an existing important population into two or more populations
The proposed construction footprints represent very small, isolated and discreet areas of habitat within an extensive area of potentially suitable habitat for this highly mobile species, and will not fragment an existing population into two or more populations. The area does not represent core habitat or range for this species.
Adversely affect habitat critical to the survival of a species
The proposed construction footprints represents a very small, isolated and discreet areas of habitat within an extensive area of potentially suitable, but largely marginal habitat for this highly mobile species, and will not fragment an existing population into two or more populations. The area does not represent core habitat or range for this species.
Disrupt the breeding cycle of an important population
The proposed construction footprints represents a very small, isolated and discreet areas of habitat within an extensive area of potentially suitable, but largely marginal habitat for this highly mobile species, and it is extremely unlikely to disrupt the breeding cycle of any population of this species. The area does not represent core habitat or range for this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The proposed construction footprints represents a very small, isolated and discreet areas of habitat within an extensive area of potentially suitable, but largely marginal habitat for this highly mobile species, and it is extremely unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. The area does not represent core habitat or range for this species. The proposed construction works will not impact known or potential nesting trees or suitable foraging habitat, and therefore will not significantly modify, destroy, remove, isolate or decrease the availability or quality of Painted Honeyeater habitat within the area.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Weed infiltration is possible from the proposed works, within the limited areas of construction. Appropriate systems must be set in place and followed to minimise the possibility of weed dispersal and exotic predator control, and will be included in a Construction Environmental Management Plan (CEMP). Impacts to this species from invasive species have not been identified as a threatening process previously and are highly unlikely in this case.
Introduce disease that may cause the species to decline
The proposed construction works are not expected to introduce any avifauna diseases to the Painted Honeyeater populations of the study area (the greatest chance for this to occur would be transmittal of disease from captive birds to wild birds, with a very low chance of this occurring), particularly with hygiene protocols for vehicles/machinery/staff that will be further described in a CEMP that will be prepared for the project.
Interfere substantially with the recovery of the species.
The proposed construction activities will not interfere substantially with the recovery of the species, as this species and its breeding and foraging habitats will not be impacted by the proposed works, directly or indirectly. The project is likely to enhance habitat for this species, by promoting healthy woodlands suitable for foraging (Seran BL&A 2018).

Murray Cod (*Maccullochella peelii*) - EPBC Act – Vulnerable, FFG Act – Listed, Victorian Advisory List - Vulnerable
Lead to a long-term decrease in the size of an important population of a species
The Murray Cod is not known from the Burra Creek site but is known to occur in the Murray River where localised impacts are possible. The proposed Construction Footprints are in predominantely dry areas, and it is considered unlikely that the proposed actions will lead to a long-term decrease in the size of an important population of this species. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider this species. A construction specific aquatic fauna management protocol as part of the CEMP should be developed for all works around waterways. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.
Reduce the area of occupancy of an important population
The proposed Construction Footprints are in predominantely dry areas, and it is considered unlikely that the proposed actions will lead to a reduction in the area of occupancy of an important population of this species. Murray Cod may benefit from improved habitat conditions following environmental watering –short-term foraging habitat in floodplain wetlands is likely to be created during inundation events. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider this species. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways.
Fragment an existing important population into two or more populations
The proposed Construction Footprints are in predominantely dry areas, and will not fragment an existing population into two or more populations. Murray Cod may benefit from improved habitat conditions following environmental watering –short-term foraging habitat in floodplain wetlands is likely to be created during inundation events. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider this species. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways.
Adversely affect habitat critical to the survival of a species
The proposed Construction Footprints are in predominantely dry areas, and it is considered unlikely that the proposed Construction Footprints will remove any potential critical habitat, or adversely affect habitat critical to the survival of this species. Murray Cod may benefit from improved habitat conditions following environmental watering –short-term foraging habitat in floodplain wetlands is likely to be created during inundation events. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider this species. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways.
Disrupt the breeding cycle of an important population
The proposed Construction Footprints are predominately in dry areas, and construction will occur within these dry areas, which would not disrupt the breeding cycle of any populations of this species present. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The proposed Construction Footprints are in predominantely dry areas and will not impact known breeding areas or areas considered high quality habitat, and therefore will not significantly modify, destroy, remove, isolate or decrease the availability or quality of Murray Cod habitat within the area. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider this species. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Eleven alien fish species are now established in the Murray-Darling River system, with Carp *Cyprinus carpio*, Redfin Perch *Perca fluviatilis*, Goldfish *Carassius auratus* and Eastern Gambusia *Gambusia holbrooki* the most widespread (NMCRT, 2010). These species are already established in the vicinity of the project site. The construction phase of the project is not likely to lead to an increase in these species. Inundation of floodplain habitat during the operational phase has a high likelihood of increasing carp populations within wetland habitat and also in aquatic habitat that remains following flood events. Wetlands are not the preferred habitat for the species and the inundation events would mimic natural over-bank flows. The impact of operation would create conditions that are likely to benefit carp. However, as an existing population of Murray Cod is unlikely to exist on the Burra Creek site, it is unlikely that and increase in carp numbers would impact the species. Following recommended mitigation measures (see ARI, 2018) to control carp may minimise their colonisation.
Introduce disease that may cause the species to decline
The likelihood of the introduction of disease during the construction phase is minimal if standard hygiene protocols are implemented.
Interfere substantially with the recovery of the species.
The proposed construction activities will not interfere substantially with the recovery of the species, as this species and its breeding and foraging habitats will not be impacted by the proposed works, directly or indirectly. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.

EPBC Act listed Critically Endangered Species:

Silver Perch (*Bidyanus bidyanus*) - EPBC Act – Citically Endangered, FFG Act – Listed, Victorian Advisory List - Vulnerable
Lead to a long-term decrease in the size of a population
Silver Perch are not known from the Burra Creek site but is known to occur in the Murray River, where localised impacts are possible. The proposed Construction Footprints are in predominantely dry areas, and it is considered unlikely that the proposed actions will lead to a long-term decrease in the size of an important population of this species. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider these aquatic fauna. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.
Reduce the area of occupancy of the species
The proposed Construction Footprints are in predominantely dry areas, and it is considered unlikely that the proposed actions will lead to a reduction in the area of occupancy of an important population of this species. Silver Perch may benefit from improved habitat conditions following environmental watering –short-term foraging habitat in floodplain wetlands is likely to be created during inundation events. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider these aquatic fauna. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.
Fragment an existing important population into two or more populations
The proposed Construction Footprints are in predominantely dry areas, and will not fragment an existing population into two or more populations. Silver Perch may benefit from improved habitat conditions following environmental watering –short-term foraging habitat in floodplain wetlands is likely to be created during inundation events. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider this species. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways.
Adversely affect habitat critical to the survival of a species
The proposed Construction Footprints are in predominantely dry areas, and it is considered unlikely that the proposed Construction Footprints will remove any potential critical habitat, or adversely affect habitat critical to the survival of this species. Silver Perch may benefit from improved habitat conditions following environmental watering –short-term foraging habitat in floodplain wetlands is likely to be created during inundation events. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider this species. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways.

Disrupt the breeding cycle of a population
The proposed Construction Footprints are predominately in dry areas, and construction will occur within these dry areas, which would not disrupt the breeding cycle of any populations of this species within these areas. A construction specific aquatic fauna management protocol should be developed for all works around waterways. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The proposed Construction Footprints are in predominantely dry areas and will not impact known breeding areas or areas considered high quality habitat, and therefore will not significantly modify, destroy, remove, isolate or decrease the availability or quality of Silver Perch habitat within the area. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints must consider these aquatic fauna. A construction specific aquatic fauna management protocol should be developed as part of the CEMP for all works around waterways. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered of critically endangered species' habitat
Eleven alien fish species are now established in the Murray-Darling River system, with Carp *Cyprinus carpio*, Redfin Perch *Perca fluviatilis*, Goldfish *Carassius auratus* and Eastern Gambusia *Gambusia holbrooki* the most widespread (NMCRT, 2010). These species are already established in the vicinity of the project site. The construction phase of the project is not likely to lead to an increase in these species. Inundation of floodplain habitat during the operational phase has a high likelihood of increasing carp populations within wetland habitat and also in aquatic habitat that remains following flood events. Wetlands are not the preferred habitat for the species and the inundation events would mimic natural over-bank flows. That said, the impact of operation would create conditions that are likely to benefit carp. However, as an existing population of Silver Perch is unlikely to exist on the Burra Creek site, it is unlikely that and increase in carp numbers would impact the species. Following recommended mitigation measures (see ARI, 2018) to control carp may minimise their colonisation.
Introduce disease that may cause the species to decline
Silver Perch are highly susceptible to several diseases including Epizootic Haematopoietic Necrosis Virus (EHNV) (Langdon 1989). The likelihood of the introduction of disease during the construction phase is minimal if standard hygiene protocols are implemented. The return of environmental watering to the construction footprint will restore and enhance important ecological values, including suitable habitat for this species, and many other species reliant of periodic flooding.
Interfere with the recovery of the species.
The proposed construction activities will not interfere substantially with the recovery of the species, as this species and its breeding and foraging habitats will not be impacted by the proposed works, directly or indirectly. This species is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water.

Appendix H. Significance assessment for EPBC Act listed migratory species

Below are the significant impact criteria for EPBC Act listed migratory species used to determine whether there is a likelihood of a significant impact.

Important information regarding migratory species includes the following (taken from DAWE Significant Impact Guidelines 2013):

What is important habitat for a migratory species?

An area of 'important habitat' for a migratory species is:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

What is an ecologically significant proportion?

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).

What is the population of a migratory species?

'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
Ten migratory species were identified as having the potential to occur within the construction footprint (PMST and VBA). Most of these species are either highly unlikely to occur (e.g. Eastern Curlew) or would very rarely use airspace over these footprints (e.g. Fork-tailed Swift). It is highly unlikely that the construction footprints supports habitat that would be considered important for migratory species foraging or breeding activity or support an ecologically significant proportion of a population of migratory species. Within the proposed construction footprints, it is considered unlikely that the proposed Burra Creek project will result in the introduction of invasive species that might be harmful to migratory species. A Construction Environmental Management Plan will be developed for the project that will include measures such as vehicle hygiene protocols to mitigate the potential spread of weeds. There is potential for the introduction of environmental water to lead to an increase in abundance of feral predators (cats, foxes), herbivores (e.g. goats) and omnivores (e.g. pigs) due to the associated increase in productivity. Some of the species such as cats and foxes could potentially prey on migratory waterbirds. An accompanying feral animal management and control program would need to be implemented within the inundation extent, however this may simply require Parks Victoria to expand current pest control programs within the park. Given that the proposed construction footprints do not provide important habitat for listed migratory species, it is considered unlikely that the planned works would disrupt the lifecycle of an ecologically significant proportion of a population of a migratory species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species
Within the proposed construction footprints it is unlikely that the proposed Burra Creek project will result in the introduction of invasive species that might be harmful to migratory species. A Construction Environmental Management Plan will be developed for the project that will include measures such as vehicle hygiene protocols to mitigate the potential spread of weeds. There is potential for the introduction of environmental water to lead to an increase in abundance of feral predators (cats, foxes), herbivores (e.g. goats) and omnivores (e.g. pigs) due to the associated increase in productivity. Some of the species such as cats and foxes could potentially prey on migratory waterbirds. An accompanying feral animal management and control program would need to be implemented within the inundation extent, however this may simply require Parks Victoria to expand current pest control programs within the park.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.
Given that the proposed construction footprints do not provide important habitat for listed migratory species, it is unlikely that the planned works would disrupt the lifecycle of an ecologically significant proportion of a population of a migratory species.

Appendix I. Flora recorded during surveys (November 2015, October 2019)

Scientific name	Common name	Origin	EPBC Act	FFG Act	DELWP Advisory
Acacia oswaldii	Umbrella Wattle			L	v
Acacia salicina	Willow Wattle				
Acacia stenophylla	Eumong				
Actinobole uliginosum	Flannel Cudweed				
Ajuga australis	Austral Bugle				
Alectryon oleifolius subsp. canescens	Cattle Bush				
Alternanthera denticulata s.s.	Lesser Joyweed				
Alternanthera sp. 1 (Plains)	Plains Joyweed				k
Amyema miquelii	Box Mistletoe				
Amyema miraculosa subsp. boormanii	Fleshy Mistletoe				
Amyema preissii	Wire-leaf Mistletoe				
Asparagus officinalis	Asparagus	Introduced			
Asperula wimmerana	Wimmera Woodruff				r
Asphodelus fistulosus	Onion Weed	Introduced			
Aster subulatus	Aster-weed	Introduced			
Atriplex leptocarpa	Slender-fruit Saltbush				
Atriplex lindleyi subsp. inflata	Corky Saltbush				
Atriplex pseudocampanulata	Mealy Saltbush				r
Atriplex semibaccata	Berry Saltbush				
Austrostipa scabra subsp. falcata	Rough Spear-grass				
Avena barbata	Bearded Oat	Introduced			
Boerhavia dominii	Tah-vine				
Brachyscome basaltica var. gracilis	Woodland Swamp-daisy				
Brachyscome lineariloba	Hard-head Daisy				
Bromus diandrus	Great Brome	Introduced			
Bromus rubens	Red Brome	Introduced			
Bulbine semibarbata	Leek Lily				
Calandrinia spp.	Purslane				
Callitris gracilis	Slender Cypress-pine				
Calocephalus sonderi	Pale Beauty-heads				
Calotis hispidula	Hairy Burr-daisy				
Calotis scapigera	Tufted Burr-daisy				

Scientific name	Common name	Origin	EPBC Act	FFG Act	DELWP Advisory
Carduus tenuiflorus	Winged Slender-thistle	Introduced (CALP)			
Carex tereticaulis	Poong'ort				
Centaurea melitensis	Malta Thistle	Introduced			
Centipeda cunninghamii	Common Sneezeweed				
Centipeda minima subsp. minima s.s.	Spreading Sneezeweed				
Chenopodium nitrariaceum	Nitre Goosefoot				
Chondrilla juncea	Skeleton Weed	Introduced (CALP)			
Cirsium vulgare	Spear Thistle	Introduced (CALP)			
Convolvulus remotus	Grass Bindweed				
Conyza bonariensis	Flaxleaf Fleabane	Introduced			
Cotula bipinnata	Ferny Cotula	Introduced			
Crassula colorata	Dense Crassula				
Crassula sieberiana s.l.	Sieber Crassula				
Cuscuta campestris	Field Dodder	Introduced			
Cynodon dactylon var. pulchellus	Native Couch				k
Cyperus difformis	Variable Flat-sedge				
Cyperus eragrostis	Drain Flat-sedge	Introduced			
Cyperus exaltatus	Tall Flat-sedge				
Damasonium minus	Star Fruit				
Dianella poracea	Pale Flax-lily				r
Dodonaea viscosa subsp. angustissima	Slender Hop-bush				
Duma florulenta	Tangled Lignum				
Eclipta platyglossa subsp. platyglossa	Yellow Twin-heads				
Ehrharta longiflora	Annual Veldt-grass	Introduced			
Einadia nutans	Nodding Saltbush				
Eleocharis acuta	Common Spike-sedge				
Eleocharis pusilla	Small Spike-sedge				
Emex australis	Spiny Emex	Introduced			
Enchalyna tomentosa var. tormentosa	Ruby Saltbush				

Scientific name	Common name	Origin	EPBC Act	FFG Act	DELWP Advisory
Enneapogon avenaceus	Common Bottle-washers				
Enteropogon acicularis	Spider Grass				
Eragrostis infecunda	Southern Cane-grass				
Eremophila divaricata subsp. divaricata	Spreading Emu-bush				r
Eucalyptus camaldulensis	River Red-gum				
Eucalyptus largiflorens	Black Box				
Eucalyptus socialis	Grey Mallee				
Euchiton sphaericus	Annual Cudweed				
Euphorbia drummondii	Flat Spurge				
Exocarpos strictus	Pale-fruit Ballart				
Fumaria spp.	Fumitory	Introduced			
Glinus lotoides	Hairy Carpet-weed				
Goodenia glauca	Pale Goodenia				
Goodenia heteromera	Spreading Goodenia				
Goodenia pinnatifida	Cut-leaf Goodenia				
Hakea leucoptera subsp. leucoptera	Silver Needlewood				
Hakea tephrosperma	Hooked Needlewood				
Haloragis glauca f. glauca	Bluish Raspwort				
Helichrysum luteoalbum	Jersey Cudweed				
Heliotropium supinum	Creeping Heliotrope	Introduced			
Helminthotheca echioides	Ox-tongue	Introduced			
Hordeum hystrix	Introduced				
Juncus aridicola	Tussock Rush				
Juncus usitatus	Billabong Rush				
Lachnagrostis filiformis s.l.	Common Blown-grass				
Lactuca serriola	Prickly Lettuce	Introduced			
Leiocarpa websteri	Stalked Plover-daisy				
Leontodon taraxacoides subsp. taraxacoides	Hairy Hawkbit	Introduced			
Limonium lobatum	Winged Sea-lavender	Introduced			
Lobelia concolor	Poison Pratia				
Lolium rigidum	Wimmera Rye-grass	Introduced			
Lycium ferocissimum	African Box-thorn	Introduced (CALP)			

Scientific name	Common name	Origin	EPBC Act	FFG Act	DELWP Advisory
Lythrum hyssopifolia	Small Loosestrife				
Maireana brevifolia	Short-leaf Bluebush				
Maireana decalvans s.l.	Black Cotton-bush				
Maireana erioclada	Rosy Bluebush				
Marrubium vulgare	Horehound	Introduced (CALP)			
Marsilea drummondii	Common Nardoo				
Marsilea hirsuta	Short-fruit Nardoo				
Medicago minima	Little Medic	Introduced			
Menkea australis	Fairy Spectacles				
Mentha australis	River Mint				
Mesembryanthemum nodiflorum	Small Ice-plant	Introduced			
Millotia perpusilla	Tiny Bow-flower				
Myosurus australis	Mousetail				
Onopordum spp.	Farting Donkey	Introduced			
Opuntia robusta	Wheel Cactus	Introduced (CALP)			
Opuntia stricta	Common Prickly-pear	Introduced (CALP)			
Oxalis perennans	Grassland Wood-sorrel				
Paspalidium jubiflorum	Warrego Summer-grass				
Pentameris airoides subsp. airoides	False Hair-grass	Introduced			
Persicaria lapathifolia	Pale Knotweed				
Persicaria prostrata	Creeping Knotweed				
Phalaris spp.	Canary Grass	Introduced			
Phyla canescens	Fog-fruit	Introduced			
Picris squarrosa	Squat Picris				r
Pittosporum angustifolium	Weeping Pittosporum				
Plantago cunninghamii	Clay Plantain				
Poa fordeana	Forde Poa				
Polygonum aviculare s.l.	Prostrate Knotweed	Introduced			
Polygonum plebeium	Small Knotweed				
Portulaca oleracea	Common Purslane				
Potamogeton sulcatus	Furrowed Pondweed				

Scientific name	Common name	Origin	EPBC Act	FFG Act	DELWP Advisory
Pseudoraphis spinescens	Spiny Mud-grass				
Psilocaulon granulicaule	Wiry Noon-flower	Introduced			
Reichardia tingitana	False Sow-thistle	Introduced			
Rhagodia spinescens	Hedge Saltbush				
Rhodanthe spp.	Sunray				
Rorippa palustris	Marsh Yellow-cress	Introduced			
Rumex brownii	Slender Dock				
Rumex tenax	Narrow-leaf Dock				
Rytidosperma setaceum var. setaceum	Bristly Wallaby-grass				
Salsola tragus	Prickly Saltwort				
Sclerolaena diacantha	Grey Copperburr				
Sclerolaena muricata var. villosa	Grey Roly-poly				
Sclerolaena obliquicuspis	Limestone Copperburr				
Senecio cunninghamii var. cunninghamii	Branching Groundsel				r
Senecio glossanthus s.l.	Slender Groundsel				
Senecio quadridentatus	Cotton Fireweed				
Senecio runcinifolius	Tall Fireweed				
Sida corrugata	Variable Sida				
Sida intricata	Twiggy Sida				
Silene nocturna	Mediterranean Catchfly	Introduced			
Sisymbrium irio	London Rocket	Introduced (CALP)			
Solanum esuriale	Quena				
Solanum nigrum s.l.	Black Nightshade	Introduced			
Sonchus oleraceus	Common Sow-thistle	Introduced			
Spergula spp.	Corn Spurrey	Introduced			
Sphaeromorphaea australis	Spreading Nut-heads				
Stelligera endecaspinis	Star Bluebush				
Stemodia florulenta	Blue Rod				
Tetragonia moorei	Annual Spinach				
Teucrium racemosum s.l.	Grey Germander				
Trifolium tomentosum var. tormentosum	Woolly Clover	Introduced			

Scientific name	Common name	Origin	EPBC Act	FFG Act	DELWP Advisory
Typha domingensis	Narrow-leaf Cumbungi				
Verbena supina	Trailing Verbena	Introduced			
Vittadinia cuneata var. cuneata	Fuzzy New Holland Daisy				
Vittadinia dissecta var. hirta	Dissected New Holland Daisy				
Vulpia myuros Rat's-tail	Fescue	Introduced			
Wahlenbergia fluminalis	River Bluebell				
Walwhalleya proluta	Rigid Panic				
Xanthium spinosum	Bathurst Burr	Introduced (CALP)			
Xerochrysum bracteatum	Golden Everlasting				
Zygophyllum aurantiacum subsp. aurantiacum	Shrubby Twin-leaf				
Zygophyllum glaucum	Pale Twin-leaf				

KEY

L Listed as threatened under the FFG Act

P Protected under the FFG Act

R Restricted weed under the CaLP Act

en Listed as endangered under the Victorian Rare or Threatened Species (VROT) List

vu Listed as vulnerable under the Victorian Rare or Threatened Species (VROT) List

r Listed as rare under the Victorian Rare or Threatened Species (VROT) List

k Listed as poorly known under the Victorian Rare or Threatened Species (VROT) List

* Introduced species

Appendix J. Fauna species recorded during R8 surveys

Summary of the fauna species recorded during surveys on 25 November and 11 December 2019.

Key:

V – Vulnerable under EPBC Act

L – Listed under FFG Act

vu – Victorian Advisory List

Common Name (Scientific Name)	Number	Comments
25 November 2019		
Australian Wood Duck (*Chenonetta jubata*)	8	
Common Bronzewing (*Phaps chalcoptera*)	2	
Sacred Kingfisher (*Todiramphus sanctus*)	1	
Sulphur-crested Cockatoo (*Cacatua galerita*)	4	
Crimson Rosella (Yellow) (*Platycercus elegans flaveolus*)	1	
Regent Parrot (*Polytelis anthopeplus*)	6	vu / L / V
Purple-backed Fairywren (*Malurus assimilis*)	4	
Noisy Miner (*Manorina melanocephala*)	6	
White-plumed Honeyeater (*Ptilotula penicillata*)	2	
Pied Butcherbird (*Cracticus nigrogularis*)	2	
11 December 2019		
Purple-backed Fairywren (*Malurus assimilis*)	2	
Noisy Miner (*Manorina melanocephala*)	6	
Grey Shrikethrush (*Colluricincla harmonica*)	1	

Appendix K. Native Vegetation Removal Report (NVRR)

Scenario test – native vegetation removal

This report provides offset requirements for internal testing of different proposals to remove native vegetation. **This report DOES NOT support an application to remove, destroy or lop native vegetation under Clause 52.16 or 52.17 of planning schemes in Victoria.** A report must be obtained from the Department of Environment, Land, Water and Planning (DELWP).

Date of issue: **14/04/2020**
Time of issue: **6:27 pm**

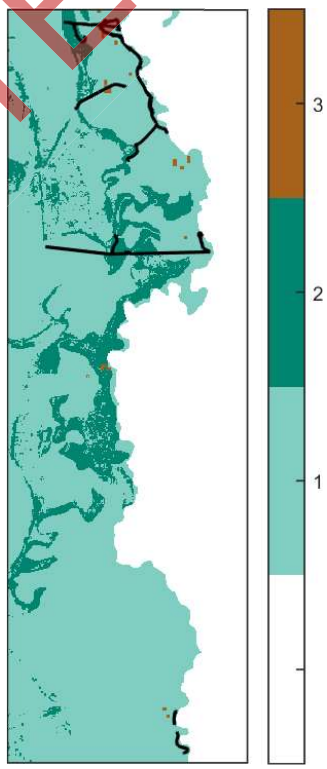
Report ID: Scenario Testing

Project ID	Burra_Ensym

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	12.614 ha
Extent of past removal	0.000 ha
Extent of proposed removal	12.614 ha
No. Large trees proposed to be removed	105
Location category of proposed removal	Location 3 The native vegetation is in an area where the removal of less than 0.5 hectares could have a significant impact on habitat for one or more rare or threatened species.The native vegetation is also in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map); and a wetland designated under the Convention on Wetlands of International Importance (the Ramsar Convention); and a wetland listed in the Directory of Important Wetlands of Australia; and an internationally important site for Migratory Shorebirds of the East Asian-Australasian Flyway.

1. Location map



Scenario test – native vegetation removal

Offset requirements if a permit is granted

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

General offset amount[1]	0.193 general habitat units
Vicinity	Mallee Catchment Management Authority (CMA) or Swan Hill Rural City Council
Minimum strategic biodiversity value score[2]	0.615
Large trees*	1 large tree
Species offset amount[3]	9.063 species units of habitat for Spotted Bowerbird, *Ptilonorhynchus maculatus* 10.600 species units of habitat for Murray Hardyhead, *Craterocephalus fluviatilis* 12.389 species units of habitat for Freshwater Catfish, *Tandanus tandanus* 14.702 species units of habitat for Darling Lily, *Crinum flaccidum* 10.166 species units of habitat for Bignonia Emu-bush, *Eremophila bignoniiflora* 9.583 species units of habitat for Plains Spurge, *Euphorbia planiticola* 13.759 species units of habitat for Veined Peppercress, *Lepidium phlebopetalum* 10.875 species units of habitat for Hairy Darling-pea, *Swainsona greyana* 10.430 species units of habitat for Small Pop Saltbush, *Atriplex spongiosa* 11.137 species units of habitat for Cotton Sneezeweed, *Centipeda nidiformis*
Large trees*	104 trees
*** The total number of large trees that the offset must protect**	105 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 mapped at the site.

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

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

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

3 The species offset amount(s) required is the sum of all species habitat units in Appendix 1.

Scenario test – native vegetation removal

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.

This report DOES NOT support an application to remove, destroy or lop native vegetation under Clause 52.16 or 52.17 of planning schemes in Victoria.

If you wish to remove the mapped native vegetation you must submit the related shapefiles to the Department of Environment, Land, Water and Planning (DELWP) for processing, by email to ensymnvrtool.support@delwp.vic.gov.au. DELWP will provide a *Native vegetation removal report* that is required to meet the permit application requirements in accordance with *Guidelines for the removal, destruction or lopping of native vegetation* (Guidelines).