Victorian Murray Floodplain Restoration Project

Flora and Fauna Assessment - Hattah Lakes North Floodplain Restoration Project

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Lower Murray Urban and Rural Water Corporation

Victorian Murray Floodplain Restoration Project

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Contents

Executive Summary

Project understanding and study area

The Hattah Lakes North Floodplain Restoration 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 wetting and drying regime across more than 14,000 ha of Murray River floodplain and wetlands of high ecological value in Victoria 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.

The Hattah Lakes North Floodplain Restoration Project (the project) involves the construction of three regulating structures (K10 Regulator, K10 Causeway Regulator, Bitterang Regulator), and approximately 1.8 km of raised access tracks (containment banks) to facilitate managed inundation of up to 1,130 ha of floodplain habitats at Hattah Lakes North. The project aims to restore a more natural wetting and drying regime and improve ecological condition in the following areas:

The project is designed to build on the benefits of an extensive package of environmental works completed in 2013 under The Living Murray (TLM) program, which allow the delivery of water to approximately 6,000 ha of the central and southern Hattah Lakes floodplain. The project proposes to use natural flood events and releases from the TLM works to facilitate environmental watering of River Red Gum forest and woodlands, Black Box woodlands and episodic wetlands on the northern Hattah Lakes floodplain.

The purpose of this report is to provide a consolidated ecological assessment report of the project area (construction area and inundation area), which involves summarising previous ecological assessment reports prepared for the project area (Australian Ecosystems 2014; GHD 2014; Australian Ecosystems 2015; GHD 2018), as well as outlining the results of the most recent assessments undertaken by R8 in August 2019 (targeted surveys for rare and threatened species at the three infrastructure sites) and January 2020 (ground truth vegetation mapping within inundation areas and to assess potential vegetation impacts at three additional passing bays).

Results

Native vegetation and fauna habitat was identified within the construction areas that has the potential to be impacted by the proposed works. In total, 18.94 hectares of native vegetation (including 27 Large Trees and patches of vegetation) is proposed to be impacted by the works at Hattah North. This vegetation comprises eight different Ecological Vegetation Classes (EVCs), across 21 distinct habitat zones.

A desktop assessment of the 1,130 ha inundation extent was conducted by the R8 team. Two non-water dependent communities were modelled as occurring within the proposed inundation area, and therefore had the potential to receive environmental water. However, the vegetation in these areas was ground-truthed and the on-ground inspection confirmed that these communities had been incorrectly mapped, with Semi-arid Woodland and Mallee vegetation only observed at higher elevations above the floodplains where environmental water will not penetrate during periods of inundation.

One vegetation community listed under the *Commonwealth Environment Protection and Biodiversity Conservation* (EPBC Act) *Act 1999* was identified: *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* (Endangered). The patches of Semi-arid Woodland (EVC 97) that were identified on site that met the criteria to be considered the EPBC Act-listed community were also likely to meet the criteria to be classified as the FFG Act-listed community: Semi-arid Shrubby Pine-Buloke Woodland Community. The current footprints associated with the construction areas avoid impacts to these communities.

One fauna species listed under the *Commonwealth Environment Protection and Biodiversity Conservation (EPBC Act) Act 1999* occurs within the study area, Regent Parrot (*Polytelis anthopeplus monarchoides*) (Vulnerable under EPBC Act 1999).

Additional fauna species (and communities) listed under the EPBC Act or the FFG Act were not recorded during the current survey. However, an assessment of likelihood of occurrence identified the following listed fauna species/communities as possibly occurring (or previously known) within the construction areas at the time of the assessment:

- One additional EPBC Act listed species (the Painted Honeyeater *Grantiella picta*)
- Eight FFG Act listed fauna species (including the Regent Parrot and Painted Honeyeater in addition to Apostelbird *Struthidea cinerea*, Diamond dove *Geopelia cuneata*, Hooded Robin *Meladryas cucullata*, Major Mitchell's Cockatoo *Lophochroa leadbeateri*, Black Falcon *Falco subniger* and Carpet Python *Morelia spilota metcalfei*)
- Nine DELWP Advisory-listed fauna species including all species listed above in addition to the Lace Monitor (*Varanus varius*)
- One FFG Act listed fauna community (Victorian Temperate Woodland Bird Community)

Impacts to EPBC Act and FFG Act listed fauna species/communities considered possible within the construction areas are unlikely to occur with mitigation measures outlined in Section 9 implemented in full.

The Ramsar Wetland Hattah-Kulkyne National Park is located adjacent to the construction areas. It is unlikely that the project will negatively impact on the character of the Ramsar site. No EPBC Act-listed plant species were identified within the study area. However, rare or threatened flora were recorded in, or close to, the construction areas including:

- Three *Flora and Fauna Guarantee (FFG) Act 1988* listed threatened flora species
- 11 flora species considered rare or threatened in Victoria (DELWP advisory)
- 14 flora species listed as protected under the FFG Act

VMFRP has utilised the results of this ecology report (and other specialist reports) to determine footprints within the construction areas that avoid and minimise impacts to areas of ecological value. Particular efforts have been made during the detailed design phase of the project to avoid and minimise impacts to patches of native vegetation containing habitat for rare or threatened species and large trees (particularly hollow bearing large trees).

Legislation

There are a number of ecological values present within the study site 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 1988* is required where works may impact threatened and/or protected flora and native vegetation that threatened fauna are likely to use. 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.
- Planning approval to remove native vegetation under the Mildura 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 1999* has been developed, as although it has been suggested that it is unlikely that a significant impact will occur on Regent Parrot and/or the Hattah Ramsar site (see Appendix B for an assessment of each Matter of National Environmental Significance (MNES) against Significant Impact Criteria), there is potential for impact to Tree Protection Zones (TPZ) of potential Regent Parrot nest trees depending on the final project footprint (including setdown areas and tracks) and a precautionary approach to refer the project has been adopted.

Recommendations and next steps

Additional steps that could be taken to further avoid and minimise impacts to ecological values during the construction and implementation of the project have been outlined in Section 10.

The following steps are recommended for the project:

- Develop specific mitigation measures related to the works and incorporate these into a project specific CEMP.
- Liaise with DELWP to confirm an approved approach for obtaining offsets for the project. Preliminary discussions with DELWP (Penny Croupcamp, *pers. comm*) have indicated that DELWP in principal agree with the project achieving some or all of the required offsets through the benefits of environmental watering at the park. If additional offsets are required to be purchased, i.e. for particular rare or threatened species, they would need to be purchased via an accredited offset broker and incorporate in an Offset Plan for the project.
- Obtain planning approval for the removal of native vegetation under the Mildura Planning Scheme.
- Obtain a permit for removal of flora listed as threatened and/or protected under the FFG Act.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 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
DAWE	Commonwealth Department of Agriculture, Water and Environment (formerly DOEE)
DBH	Diameter at Breast Height
DELWP	Department of Environment, Land, Water and Planning (formerly DEPI)
DEPI	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*
EMP	Environmental Management Plan
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
MDB	Murray Darling Basin
MNES	Matters of National Environmental Significance
Mallee CMA	Mallee Catchment Management Authority
MRCC	Mildura Rural City Council
PMST	Protected Matters Search Tool
R8	R8 Joint Venture by GHD and Jacobs
SDL	Sustainable Diversion Limits
sp.	Species
spp.	More than one species
subsp.	Subspecies
RobP	Robinvale Plains Bioregion
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
VROTS	Species listed on DELWP's *Advisory List of Rare or Threatened Plants in Victoria*
WoNS	Weed of National Significance

1. Introduction

1.1 Project overview

The Hattah Lakes North Floodplain Restoration 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 wetting and drying regime across more than 14,000 ha of Murray River floodplain and wetlands of high ecological value in Victoria through the construction of new infrastructure and modification of existing infrastructure.

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The Hattah Lakes North Floodplain Restoration Project (the project) involves the construction of three regulating structures (K10 Regulator, K10 Causeway Regulator, Bitterang Regulator), and approximately 1.8 km of raised access tracks (containment banks) to facilitate managed inundation of up to 1,130 ha of floodplain habitats at Hattah Lakes North. The project aims to restore a more natural wetting and drying regime and improve ecological condition in the following areas:

- **Chalka North Area** - inundation of up to 420 ha of the Chalka Creek North floodplain, particularly the area north of Oatey's Regulator through construction of the K10 Regulator, K10 Causeway Regulator and a series of containment banks, which are designed to facilitate watering to a maximum inundation level of 43.5 mAHD (equivalent to flooding associated with river flows greater than 120,000 ML/day).
- **Lake Boolca Area** - inundation of up to 710 ha of floodplain north of the Bitterang Containment Bank through to Lake Boolca through construction of the Bitterang Regulator supported by temporary pumping, which is designed to facilitate watering to a maximum inundation level of 45.0 mAHD (via gravity) / 45.1 mAHD (via pumping) (equivalent to flooding associated with river flows greater than 140,000 ML/day).

The project is designed to build on the benefits of an extensive package of environmental works completed in 2013 under The Living Murray (TLM) program, which allow the delivery of water to approximately 6,000 ha of the central and southern Hattah Lakes floodplain. The project proposes to use natural flood events and releases from the TLM works to facilitate environmental watering of River Red Gum forest and woodlands, Black Box woodlands and episodic wetlands on the northern Hattah Lakes floodplain. The northern Hattah Lakes, particularly the Lake Boolca Area, are at a higher elevation than the central and southern Hattah Lakes, and are among the last parts of the Hattah Lakes floodplain to be inundated during a natural flooding event.

The project involves the following ancillary activities:

- Establishment of a claypit (approx. 3.5 ha, 2 m deep) on the privately-owned Kulkyne Station to source fill material for regulator and containment bank construction.
- Construction of three passing bays along River Track south of the proposed K10 Causeway Regulator. This section of River Track will be used by construction vehicles to access a temporary pump site at the Murray River to be used to source construction water.
- Except for the three passing bays along River Track, no other access track upgrade or widening works are proposed as the existing tracks are considered suitable for use by construction traffic having previously been used for construction of TLM works (LMW *pers comm*). Some minor track maintenance works, such as grading and applying additional road base to the surface (pothole filling), may be required during construction of the project. However, maintenance works would not extend outside the current track width.

1.2 Project location

The project is located on the western bank of the Murray River between Robinvale and Red Cliffs, approximately 75 km south of Mildura, in north west Victoria. The main components of the project (K10 Regulator, K10 Causeway Regulator, Bitterang Regulator) are located within the Hattah-Kulkyne National Park and the Murray Kulkyne Park, which are managed by Parks Victoria. Hattah-Kulkyne National Park has an area of 49,975 ha and Murray-Kulkyne Park has an area of 4,555 ha[1]. Together, these two national parks extend from the Murray River in the east to the Calder Highway in the west. The proposed Kulkyne Station Claypit is located on private land, known as Kulkyne Station, between the River Track and the Murray River, and is surrounded by the national parks.

The project is situated in the northernmost part of the Hattah Lakes floodplain complex, which is comprised of approximately 20 lakes and surrounding woodlands that receive water from the Murray River via Chalka Creek. Twelve of the Hattah Lakes are listed under the Ramsar Convention as wetlands of international importance and on the Directory of Important Wetlands[2]. The nearest lakes included in these wetland listings are Lake Bitterang (approx. 1.0 km south of Bitterang Regulator) and Lake Cantala (approx. 3.5 km south of a River Track Passing Bay, 5.2 km south of the K10 Causeway Regulator and 6.0 km south east of the Bitterang Regulator). The project does not involve any construction works within the boundary of the Hattah-Kulkyne Lakes Ramsar site or the Hattah Lakes wetlands that are listed on the Directory of Important Wetlands. The project would not involve any discharges of managed floodwaters to these internationally and nationally important wetlands.

The project is located entirely in the Rural City of Mildura and the Mallee CMA region. The proposed construction areas are located within the Robinvale Plains bioregion, along with most of the proposed inundation area. A small portion of the proposed inundation area extends into the Lowan Mallee (to the west) and Murray Mallee (to the north) bioregions.

The project site includes infrequently flooded higher floodplain terraces dominated by *Eucalyptus largiflorens* (Black Box) or chenopod shrublands along with more frequently flooded terraces and creeklines that largely support *Eucalyptus camaldulensis* (River Red-gum) (Australian Ecosystems, 2015). There are limited areas of deep siliceous sands (Lowan Sands) which are dominated by semi-arid woodland and shrub-land (Australian Ecosystems, 2015).

The location of the proposed construction areas (K10 Regulator, K10 Causeway Regulator, Bitterang Regulator, Kulkyne Station Claypit, River Track Passing Bays (North, Central, South) is shown in Figure 1. The location of the proposed inundation area is shown in Figure 2. An overview of the proposed construction areas is provided in Table 1.

[1] *National Parks Act 1975*
[2] Includes Lakes Arawak, Bitterang, Brockie, Bulla, Cantala, Konardin, Hattah, Kramen, Lockie, Mournpall, Yelwell and Yerang.

Table 1 Overview of construction footprints

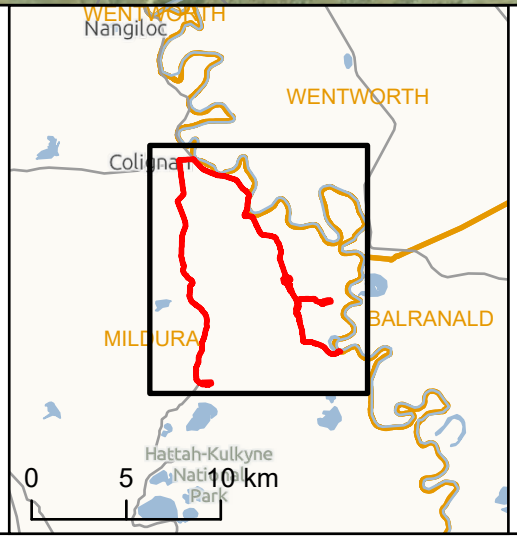
Proposed Construction Area	Overview	Total Construction Area (ha)
Bitterang Regulator	Situated along Eagles Nest Track within the existing Bitterang Containment Bank construction for TLM works. The construction area encompasses areas of cleared and young regrowth of *Eucalyptus largiflorens* (Black Box) woodland and a depression that has been shallowly excavated within the last several years (former borrow area used for TLM works).	3.62
K10 Regulator	Situated along River Track on the border of Hattah-Kulkyne National Park and Murray-Kulkyne Park. The construction area encompasses part of Chalka Creek and its associated floodways, terraces and clay pans.	8.41
K10 Causeway Regulator	Situated along River Track on the border of Hattah-Kulkyne National Park and Murray-Kulkyne Park. The construction area encompasses relatively open *Eucalyptus largiflorens* (Black Box) woodlands and part of an ephemeral floodway dominated by *Eucalyptus camaldulensis* (River Red-gum).	3.67
Kulkyne Station Claypit	Situated on private land (Kulkyne Station) between River Track and the Murray River. The proposed claypit is located immediately adjacent to and north of the borrow area used for TLM works. The construction area encompasses relatively open Lignum Shrubland.	3.52
River Track Passing Bays	The three passing bays are situated along River Track in Hattah-Kulkyne National Park. The passing bay locations have been chosen as they represent areas that have been subject to historic disturbance, and are relatively open areas of vegetation.	0.08

FIGURE 1: Construction footprint at Hattah North

VMFRP

Legend

- Indicative Construction Area
- Investigation Area
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Cadastre
- Public Land Management



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N

Name: GDA 1994 MGA Zone 55

0 500 1,000

Meters

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

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FIGURE 2: Inundation Extent at Hattah North

VMFRP

Gibbs Road
Murray River
Lewis Road
Kulkyne Way
Mallee Cliffs Road
Bengellow Creek
Valencia Grove
Boonoonar Road
Reed Road
Kulkyne Way
Murray River
Brown Road
Browns Road
Regent Drive
Sandy Lane
Wonga Avenue
Mournpall Track
Chalka Creek
MURRAY - KULKYNE PARK
Goosefoot Track
Dry Lakes Track
Dumosa Track
K10 Regulator
Murray River
Boolca Track
Lake Boolca
Raak Track
Clay Pit
K10 Causeway
Regulator
Passing Bay North
HATTAH - KULKYNE NATIONAL PARK
Moonah Track
River Track
Passing Bay Central
Passing Bay South
Murray River
Chalka Creek
Kulkyne Track
Gantdla Creek
Bitterang Regulator
Red Ochre Track
Mournpall Track
Bitterang Track
Eagles Nest Track
Lake Cantala
Lake Bitterang
Lake Cantala

Legend

- Indicative Construction Area
- Investigation Area
- Maximum VMFRP Inundation Area
- Rail Station
- Railway
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Cadastre
- Public Land Management

R8

WENTWORTH
Nangiloc
WENTWORTH
Colignan
MILDURA
EALRANALD
Hattah-Kulkyne National Park
0 5 10 km

IS297701

N

Name: GDA 1994 MGA Zone 55

0 500 1,000

Meters

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

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1.3 Previous ecological assessments

Ecological and biodiversity information has been collected for the project over a number of years. Previous ecological studies for the project that were reviewed as part of this assessment, considered slightly different assessment areas to those described below in Section 3.1. Over time, the extent and impacts associated with the construction footprint at each site has been revised with the overall intent of avoiding and minimising impacts to native vegetation and fauna habitat.

This following previous studies undertaken for the project have been used to help inform the current report:

- *SDL Offsets - Fauna Survey - Hattah North and Belsar Yungera 2013* (GHD, 2014):

  In 2013, GHD was engaged by Mallee CMA to undertake baseline fauna surveys across the northern Hattah Lakes floodplain.

- *Hattah North and Belsar Yungera Islands Flora Census 2013* (Australian Ecosystems, 2014):

  In 2013, Australian Ecosystems was engaged by Mallee CMA to undertake baseline flora surveys across the northern Hattah Lakes floodplain.

- *Hattah North SDL Project Flora and Fauna Assessment – Detailed Design Stage Final Report* (Australian Ecosystems, 2015):

  In 2015, Australian Ecosystems was engaged by Mallee CMA to undertake ecological surveys assessing the native vegetation and fauna habitat within the proposed construction areas, along with a rapid assessment of a network of 25-30 km of roads and tracks. The construction areas assessed in this study were based on concept designs developed for the project between 2012 and 2014.

- *SDL Targeted Flora and Fauna Surveys, Hattah North Ecological Assessment* (GHD, 2018):

  In 2017, GHD was engaged by Mallee CMA to undertake additional surveys to identify ecological values within extended buffers around the construction areas, and to conduct targeted surveys for threatened flora and fauna. The construction areas assessed in this study were based on detailed designs developed for the project in 2016.

- In August 2019, R8 was engaged by VMFRP to conduct targeted surveys for threatened flora and fauna in accordance with recommendations by GHD (2018) within reduced construction areas for the K10 Regulator, K10 Causeway Regulator and Bitterang Regulator. The results of these surveys were compiled into a draft report, which has been used as the basis for this report.

- In January 2020, R8 was engaged by VMFRP to undertake additional surveys for the project to assess the vegetation and fauna habitat in the proposed passing bay construction areas (not previously assessed). Ground-truthing of vegetation was also undertaken in areas proposed to be inundated where modelled vegetation mapping (DELWP 2005) indicates that there are non-water dependent ecosystems present (i.e. Mallee vegetation or Semi-arid woodland). The results of these surveys are included in 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.

1.4 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 2014; GHD 2014; Australian Ecosystems 2015; GHD 2018; R8 2019) undertaken for the project.

- Describe the outcomes of field surveys undertaken by R8 in January 2020 to ground-truth vegetation within specific areas of the proposed inundation area that are mapped by DELWP (2005) (extant EVC mapping) as non-water dependent vegetation types (e.g. Mallee and Semi-arid Woodland) and update EVC mapping in these areas.
- Describe the findings of field surveys undertaken by R8 in January 2020 to determine vegetation and fauna habitat within the three proposed passing bays.
- Describe targeted surveys for populations of flora and fauna and communities, listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) undertaken by R8 in 2019.
- 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 areas 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 migratory species and listed threatened ecological communities within the proposed construction and inundation areas. Where listed threatened species, migratory species or ecological communities are identified as occurring or having the potential to occur, determine the likely impact on these listed species and ecological 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).

2. Limitations and assumptions

This report has been prepared by R8 for VMFRP and may only be used and relied on by VMFRP for the purpose agreed between R8 and VMFRP as set out in Section 1.3 of this report.

R8 otherwise disclaims responsibility to any person other than VMFRP arising in connection with this report. R8 also excludes implied warranties and conditions, to the extent legally permissible.

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.

- *Were limited to an ecological assessment of 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.*
- *Were limited to terrestrial vertebrate fauna. Freshwater and marine fauna or invertebrate fauna were considered at a desktop level only.*
- *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.*
- *Assumed there will be no impacts to native vegetation outside the proposed construction footprint provided by VMFRP.*
- *Did not include a detailed assessment of planning implications with relation to legislation outside of those considered from an ecological perspective.*
- *Included flora investigations as part of the ecological assessment during late winter and mid-summer, which is not always an optimal time of year for conducting botanical assessments in the Mallee region, although timing suitability can vary depending on rainfall (surveys later in spring could be appropriate following previous rainfall). Some native flora are difficult or impossible to locate or identify at this time of year, due to a lack of reproductive material and/or the seasonal nature of some species (in particular, annuals and geophytes). Additional native species are likely to be recorded at the site later (in spring) or at other times of the year. Therefore, it is considered possible that additional rare or threatened flora may be present, but were not detected during the survey because of the timing of the survey, however, extensive previous surveys and database records partially offset this limitation.*
- *Included a field investigation as part of the ecological assessment during late winter/early spring which is an adequate time of year for conducting fauna assessments in the Mallee region. However, we did not conduct assessments which would be optimal for detecting other fauna species, e.g. February-March for juvenile and hence more readily detectable small mammals and reptiles. This was beyond the scope of this assessment. It should also be noted that we also did not conduct trapping (i.e. pitfall, Elliot and funnel trapping).*
- *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 January 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.*
  - *The inundation extent at this stage has been assessed at a desktop level only, with some ground-truthing to refine the accuracy of the native vegetation mapping.*

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. R8 has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by R8 described in Section 1.3 of this report. R8 disclaims liability arising from any of the assumptions being incorrect.

R8 has prepared this report on the basis of information provided by VMFRP and others (including government authorities) who provided information to R8 which R8 has not independently verified or checked beyond the agreed scope of work. R8 does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Maps in this report displaying site information should not be relied on for the detailed design during the construction process.

2.1 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)

3. Methods

3.1 Assessment areas

The following assessment areas are referred to throughout this report:

- **Construction Footprint** = The specific areas proposed for construction works at the three regulator sites (K10 Regulator, K10 Causeway Regulator and Bitterang Regulator), the Kulkyne Station Claypit and three passing bays along River Track (see Figure 1). These construction areas encompass the design footprint of proposed structures, along with a working buffer around these structures, and provision for access and laydown areas. These areas were comprehensively assessed in detail for threatened flora and fauna.
- **Inundation Extent** = The proposed inundation area of approximately 1,130 ha across Chalka North and Lake Boolca (see Figure 2). Distinct locations within the inundation area identified through DELWP's modelled 2005 EVC extents as non-water dependent EVCs were field-assessed to confirm the absence of non-water dependent EVCs. The inundation area was not assessed in detail as part of this assessment (e.g. no detailed vegetation assessments or targeted surveys for threatened flora or fauna were undertaken). Based on investigations undertaken by Ecological Associates (2007, 2014 and 2015) to determine the proposed hydrological regime and ecological objectives for the proposed environmental watering, it is assumed that operation of the project to deliver the required hydrological regime would not result in adverse impacts to ecological values within the proposed inundation areas.
- **Study Area** = The area within an approximate 10 km radius around the proposed construction areas and inundation area. This area was not surveyed in detail but is used for the desktop assessment of databases and provides a context to the proposed construction areas and inundation area.

3.2 Desktop assessment

A review of available biodiversity databases was undertaken to identify terrestrial and aquatic flora and fauna with the potential to occur within the construction footprint and inundation extent. 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[3]
- Weeds of National Significance database[4]
- Victorian Biodiversity Atlas (VBA), maintained by DELWP[5]
- NatureKit, which provides GIS mapping, maintained by DELWP[6], including modelled mapping of extant and pre-1750 Ecological Vegetation Classes (EVCs), Current Wetlands, Location Mapping and known threatened species records
- Native Vegetation Information Management tool (NVIM), maintained by DELWP[7]
- Hattah North and Belsar Yungera Islands Flora Census 2013 (Australian Ecosystems 2014)
- SDL Offsets - Fauna Survey - Hattah North and Belsar Yungera (GHD 2014)
- Hattah North SDL Project Flora and Fauna Assessment, Detailed Design Stage (Australian Ecosystems 2015)
- SDL Targeted Flora and Fauna Surveys, Hattah North, Ecological Assessment (GHD 2018)

[3] http://www.environment.gov.au/epbc/protected-matters-search-tool (accessed on 09/01/2020)
[4] http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html (accessed 09/01/2020)
[5] https://www.environment.vic.gov.au/biodiversity/victorian-biodiversity-atlas (accessed on 09/01/2020)
[6] http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit (last accessed by GHD November 2017)
[7] https://nvim.delwp.vic.gov.au/ (accessed on 09/01/2020)

A VBA and PMST search was undertaken for the study area, which comprises a 10 km radius around the proposed construction areas and inundation area.

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

3.3 Field assessments

The results of a number of field assessments conducted by R8 in 2019 and 2020 have been incorporated into this report. The methods used for each of these field assessments is described below. A summary of methods used for field assessments undertaken as part of previous ecological studies is provided in Appendix A.

3.3.1 Vegetation condition assessment

A field assessment was undertaken for three additional areas where work has been proposed for the installation of three new passing bays along existing tracks. The work was undertaken on 14 January 2020 by R8 Senior Botanist (Zoe Jellie) and Botanist (Greg Cranston) and included:

- Mapping the extent and condition of native vegetation present within the proposed alignment including:
  - Defining and mapping the relevant EVCs within the proposed construction footprint
  - Estimating the cover and health of plants
  - Undertaking Habitat hectare (HabHa) Assessments for each Habitat Zone (HZ) (as described below)
  - Mapping and measuring all Canopy Trees that meet the benchmark for Large Trees
  - Recording the location of any 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.
- Identifying the presence of significant weed species including those declared under relevant state and national legislation, policy or strategy, e.g. *Catchment and Land Protection Act 1994 (CALP Act)* and National Weeds Strategy.

The results of the vegetation condition assessment undertaken in 2020 have been combined with the existing Vegetation Quality Assessment (Habitat Hectare Assessment) results undertaken during previous surveys. The results have been used to prepare a consolidated Native Vegetation Report, outlining the impacts (and offsets) associated with the combined construction areas.

3.3.2 Ground-truthing of modelled mapping within the inundation area

Field surveys were undertaken on January 13 and 14 2020 by R8 Botanists Zoe Jellie and Greg Cranston. The fieldwork was undertaken after a desktop review to identify areas within the proposed inundation areas that contained modelled vegetation mapping (DELWP 2005) indicating the presence of non-water dependent ecosystems, including Semi-arid Woodland and Mallee vegetation communities. Approximately 40 ha was identified for assessment, across over 30 discrete locations within the inundation areas. These areas were accessed on foot, a determination was made of the EVC present in each of these intercept areas, and photos were taken of each location and the correct EVC mapped.

The purpose of this targeted field assessment was to determine presence or absence of non-water dependent ecosystems and did not include a Vegetation Quality Assessment, which is likely to be undertaken as to inform the project's native vegetation offset management strategy and/or as part of monitoring undertaken as part the project's monitoring and evaluation framework currently being developed.

3.3.3 Targeted threatened flora assessments

Field surveys were undertaken on 22-23 August 2019 by R8 Botanist (Greg Cranston) and Ecologist (Shelley Thompson). Field surveys were undertaken at the proposed K10 Regulator, K10 Causeway Regulator and Bitterang Regulator construction areas, including targeted surveys for rare or threatened flora (with particular emphasis on EPBC Act and FFG Act listed threatened flora), to update the results of assessments undertaken in the previous construction areas (Australian Ecosystems 2015, GHD 2018). Further targeted survey was not conducted at the claypit due to access constraints and extensive previous survey conducted by Australian Ecosystems 2015 and GHD 2018.

The surveys involved two field staff walking parallel linear transects 10 m apart over the extent of the construction areas, 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.

The location of threatened flora recorded during these surveys was then combined with records of threatened flora recorded during previous surveys by Australian Ecosystems (2015) and GHD (2018) to produce consolidated mapping of threatened flora records within and nearby to proposed construction areas.

3.3.4 Flora species

An inventory of both native and non-native flora incidentally recorded in the construction footprints at each site, together with conservation status, origin and weed status was compiled (Appendix A). Observations were recorded of existing or potential threats, impacts and management requirements that may arise during construction.

3.3.5 Targeted threatened fauna assessments

Field surveys were undertaken on 22, 26 and 29 August and 2 September 2019 by R8 Senior Zoologists (Alex Holmes, Dan Eyles) and Ecologist (Shelley Thompson). Field surveys were undertaken at the proposed K10 Regulator, K10 Causeway Regulator and Bitterang Regulator construction footprints to confirm the condition and extent of fauna habitats and to conduct targeted surveys for threatened fauna known to occur in the construction footprints (GHD 2014, Australian Ecosystems 2015, GHD 2018). Particular focus was given to the eastern subspecies of Regent Parrot (*Polytelis anthopeplus monarchoides*) which is well known from Hattah-Kulkyne National Park, has been recorded at all study sites and is listed under both the EPBC Act and the FFG Act. Further targeted survey was not conducted at the claypit due to access constraints, extensive previous survey conducted by Australian Ecosystems 2015 and GHD 2018 and low probability that threatened fauna are using this area.

A search of the VBA and PMST indicated that 34 fauna species are either known or are predicted to occur within the construction area. Of the 34 species, nine were considered to have the potential to occur in the construction areas based on habitat requirements and number and recency of nearby records (Appendix B). These nine species made up the target threatened species list for the surveys and include Apostlebird (*Struthidea cinerea*), Diamond Dove (*Geopelia cuneata*), Hooded Robin (*Meladryas cucullata*), Major Mitchell's Cockatoo (*Lophochroa leadbeateri*), Painted Honeyeater (*Grantiella picta*), Regent Parrot (*Polytelis anthopeplus monarchoides*), Black Falcon (*Falco subniger*), Carpet Python (*Morelia spilota metcalfei*) and Lace Monitor (*Varanus varius*).

Fauna surveys were conducted within the K10 Regulator, K10 Causeway Regulator, and Bitterang Regulator construction footprints. Surveys focussed on previously identified threatened fauna reported in GHD 2017 spring fauna surveys (GHD 2018), Australian Ecosystems 2015 and GHD 2013 spring fauna survey (GHD 2014). Additionally, the surveys included:

- Targeted surveys of the Nationally and State listed Regent Parrot using the prescribed Two Hour Point Survey (THPS) technique
- Recording all identified fauna, and their observed behaviour (e.g. feeding, roosting, breeding), abundance and conservation status

- Pest fauna posing a threat to native vegetation and/or fauna
- Active searching of appropriate 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 habitat assessments for threatened fauna
- Habitat assessments for threatened fauna were completed

Migratory terrestrial or migratory wetland species were considered as part of this assessment.

See Table 2 below for a summary of survey effort conducted at Hattah North. 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 Hattah North fauna survey

Survey type	Survey effort	Species targeted
Habitat assessment	Conducted over approximately 2-3 person-hours per site, investigating construction area through various survey methods	All
Bird surveys	At least 3-4 20 minute, 2 ha diurnal surveys at each construction area (three ecologists distributed across site undertaking survey concurrently). Approx 36 surveys undertaken	Apostlebird, Diamond Dove, Hooded Robin, Major Mitchell's Cockatoo, Painted Honeyeater, Regent Parrot, Black Falcon
Two Hour Point Survey	Described below, three observers concurrently conducting THPS at locations, 36 THPS conducted	Regent Parrot (and other opportunistic observations)
Active searches	Conducted opportunistically by at three ecologists concurrently at each construction area for a period of 30-60 mins. Approx 12 surveys conducted	Carpet Python, Lace Monitor
Scat / hair / bone / skin / pellet analysis	Assessed / Collected opportunistically	All
Opportunistic observations	Three ecologists over the entire survey period, including four 8-hour including travel to other construction areas inside of park Minimum of 96 person-hours of opportunistic observation	All

3.3.6 Regent Parrot targeted nest surveys

The Regent Parrot is listed as threatened under the FFG Act 1988 and EPBC Act 1999. The Regent Parrot typically nests within suitable hollows of 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 records of this species at all three of the proposed construction sites within the study area. Breeding activity has been observed within the broader Hattah Lakes area (Lake Mournpall, Lake Hattah, Lake Bulla), Chalka Creek (north and south arms), Sextons Bend, 'The Boiler', Retail Bend, Messengers and Oateys (Webster and Belcher 2005, GHD 2009). Potential Regent Parrot breeding habitat has been identified [redacted] and targeted for further investigation.

Surveys were completed on August 22, 26, 29, and September 2 2019, using the Two Hour Point Survey (THPS) technique adapted from GHD (2009), GHD (2011a, b) and Robertson and Hurley (2010). Surveys were undertaken by two ecologists experienced in Regent Parrot survey and behaviour. The survey techniques are specific to the detection of Regent Parrot nesting activity and were developed and refined with the Living Murray Hattah Lakes Floodplain Management Project in recent years. Surveys were completed at 10 permanent observation points established across the survey site [redacted] where suitable habitat has been identified for Regent Parrot nesting (Figure 3). At least two THPS were completed at each permanent site during the survey period.

Two Hour Point Surveys (THPS) are an effective technique to locate and confirm Regent Parrot nests. The technique was developed by GHD (2009) (One Hour Point Survey) and later tested and modified by Robertson and Hurley (2010) and involves experienced observers stationed quietly for two hours at each observation point. The locations of the 10 THPS were selected [redacted] to effectively cover all of the proposed development area and its immediate surrounds.

During the two (2) hour survey, the observer closely observes the trees and records all Regent Parrot activity in the immediate vicinity. During a THPS, the following information was documented as a minimum:

- Start and finish time
- Location (confirmed using GPS)
- Observer Name/s and number of observers
- Weather details
- Details of Regent Parrot activity

The priority was to record any behaviour that is most closely associated with Regent Parrot breeding activity, including:

- Use of hollows by male and/or female birds
- Adults feeding nestlings
- Copulation between individuals
- Hollow inspection
- Males feeding females
- Defending a tree or hollow by a pair of birds

Suspected breeding activity is documented and the position recorded using a handheld GPS. Nests are listed as 'confirmed' only using the strict criteria outlined below. Some behaviours described above are deemed insufficient on their own to 'confirm' nesting activity, they are indicative that nesting is likely to be occurring. As these surveys were completed very early in the breeding season for Regent Parrot, activity is likely to be beginning, nestlings are unlikely, and subsequent surveys at the same location may confirm the presence of a nest.

3.3.7 Criteria used to confirm an active Regent Parrot nest

The criteria used to confirm that a hollow contains an active Regent Parrot nest are similar to those used and described previously by Webster and Belcher (2008) with later explanations provided from GHD (2009). Nesting is therefore said to be **confirmed** if any **one** or more of the following was recorded:

- A male Regent Parrot is observed entering and/or leaving a hollow

Note: Evidence indicating the presence of breeding can be confirmed by observing a male perched in a potential nest tree softly calling to a female who then emerges from a hollow and subsequently is fed by the male. Alternatively, observing a male escorting a female to a tree and the female entering a hollow and remaining inside after the male leaves the area is strong evidence of an active nest. Conclusive proof of nesting can be provided by direct observation of the hollow chamber revealing eggs or nestlings or observing nestlings at the entrance to a hollow.

- A pair of Regent Parrots is observed entering and/or leaving a hollow

Note: A pair of Regent Parrots observed aggressively defending a tree could potentially be defending a nest hollow. Observations suggest that the pair may perch near the nest hollow and defend the area from other birds/ pairs of birds when these birds perch too closely. The defending pair of birds will sometimes perch in a nearby tree, but often appear to return to the same tree particularly when other birds approach. Close observation of these birds may eventually result in the observation of one or both birds attending the nest, although aggressive behaviour on its own is not sufficient to confirm an active nest.

Later in the breeding season both male and female Regent Parrots may leave the nest to forage prior to returning to feed their nestlings. The parents may feed the nestlings by briefly (5 -10 seconds) dipping their foreparts into the nest to feed the nestlings, which are often heard begging in between feeds.

- A female is observed entering a hollow after being fed by a male

Note: A female Regent Parrot that has been observed within a tree hollow (i.e. clearly visible and present within the hollow without leaving) for the duration of a THPC on at least two separate occasions could be deemed as occupying an active nest. It is considered highly unlikely that a female would be present within a hollow for a prolonged period of time unless she were brooding eggs / nestlings.

- Nestlings are heard begging after an adult bird enters a hollow or is observed at the nest entrance

3.3.8 Timing of surveys

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. Due to external timeline requirements, these surveys were completed in late August and early September. While this is earlier than is ideal, activity may still be detected at this time.

Regent Parrot activity appears to be reduced during the middle (warmer) part of the day, therefore it is preferable to perform THPS from the early morning (sunrise) until no later than midday (or 11:00 am on hotter days). Temperatures during these surveys were mild throughout.

3.3.9 Field equipment

The following field equipment was used for Regent Parrot surveys:

- Good quality binoculars for making detailed observations, determining sex of birds and checking for activity within nest hollows
- Global Positioning System (GPS) for recording the coordinates of nest trees and bird observations
- Compass for recording flight direction of birds
- Camera – both compact digital with wide angle and telephoto capability (for photographs of nest trees), and an SLR with high quality telephoto lens (for photographs of Regent Parrots)

3.4 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 fauna and flora data collected during the surveys are submitted to the Atlas of Victorian Wildlife database and the Victorian Biodiversity Atlas (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.

3.5 Nomenclature

3.5.1 Flora

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 *Flora and Fauna Guarantee (FFG) Act 1988*, and the *Advisory List of Rare or Threatened Plants in Victoria* – 2014 (DEPI 2014).

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 cover8 is native.
- Any area with three or more native canopy trees9 where the drip line10 of each tree touches the drip line of at least one other tree, forming a continuous canopy.
- Any mapped wetland included in the Current wetlands map (available on DELWP online mapping tools).

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.

3.5.2 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.

[8] 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.

[9] 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.

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

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 within the study site (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.

3.5.3 Tree Protection Zones (TPZs)

In addition to the native vegetation patches, trees are present in the study site that whist being situated outside of the construction footprint 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[11] (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 (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).

3.5.4 Fauna species and communities

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

Fauna conservation significance was determined in accordance with the Victorian *Flora and Fauna Guarantee Act 1995* (FFG Act), DELWP's Advisory Lists (DSE 2009; DSE 2013) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

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 study area are only considered if they are listed under one or more of these Acts.

3.5.5 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 study area was created. This includes environmental weeds, noxious weeds listed under the *Catchment and Land Protection Act* 1994 and Weeds of National Significance. All such weed species are listed in Appendix A and Appendix C.

[11] 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)

4. Targeted threatened species surveys

Targeted surveys for rare or threatened species were undertaken in August / September 2019 at the proposed K10 Regulator, K10 Causeway Regulator and Bitterang Regulator construction areas. These areas contained intact native vegetation and it was considered possible that they supported suitable habitat for rare or threatened species.

Note: The requirement for the installation of three passing bays along River Track had not yet been identified at the time of these assessments, therefore no targeted surveys for rare or threatened species were undertaken at the passing bays in 2019.

4.1 Site descriptions

A description of the condition of vegetation at each of the construction areas the time of the 2019 targeted surveys is outlined below.

4.1.1 K10 Regulator

This site is located where the River Track meets the Chalka Creek in the northern section of Hattah-Kulkyne National Park. During the 2019 assessments the vegetation at this site was relatively intact, however the area had not been inundated for some time and so was tending to favour more terrestrial species rather than water dependent ephemeral herbs.

The overstorey was dominated by *Eucalyptus largiflorens* (Black Box) and *Eucalyptus camaldulensis* (River Red-gum). The midstorey was dominated by juvenile River Red-gum recruits with some *Chenopodium nitrariaceum* (Nitre Goosefoot) also present in the higher elevations. The understorey was dominated by native chenopods and some forbs including *Sclerolaena diacantha* (Grey Copperburr), *Einadia nutans* (Nodding Saltbush), *Enchylaena tomentosa* var. *tomentosa* (Ruby Saltbush) and some scattered *Myoporum parvifolium* (Creeping Myoporum).

The cover of weeds was low, with <5% cover throughout.

An incidental flora species list was taken whilst conducting the targeted flora searches of the K10 regulator construction footprint and a total of 33 flora were recorded (Appendix A).

4.1.2 K10 Causeway

This site is located approximately 1 km southeast of K10 regulator along the River Track. The vegetation at this site was relatively intact and was dominated by terrestrial species.

The overstorey was dominated by *Eucalyptus largiflorens* (Black Box) and some *Acacia stenophylla* (Eumong). The midstorey was dominated by *Chenopodium nitrariaceum* (Nitre Goosefoot) with the occasional scattered *Eremophila divaricata* subsp. *divaricata* (Spreading Emu-bush). The understorey was dominated by native chenopods and some forbs including *Sclerolaena diacantha* (Grey Copperburr), *Atriplex lindleyi* subsp. *lindleyi* (Flat-top Saltbush), *Enchylaena tomentosa* var. *tomentosa* (Ruby Saltbush) and some scattered *Roepera aurantiaca* subsp. *aurantiaca* (Shrubby Twin-leaf).

The cover of weeds was low, with <2% cover throughout.

An incidental flora species list was taken whilst conducting the targeted flora searches of the K10 causeway construction footprint and a total of 30 flora were recorded (Appendix A).

4.1.3 Bitterang Regulator

This site is located approximately 1 km north of Lake Bitterang. The vegetation at this site was relatively intact, and looks to have been inundated more recently than the other two sites, as it retained some of the ephemeral herbs along with more terrestrial species.

The overstorey was dominated by *Eucalyptus largiflorens* (Black Box) and *Eucalyptus camaldulensis* (River Red-gum). The midstorey was dominated by *Rhagodia spinescens* (Hedge Saltbush) in the northern half and juvenile River Red-gum recruits in the southern half. The understorey was dominated by native chenopods and forbs including *Einadia nutans* (Nodding Saltbush), *Enchylaena tomentosa* var. *tomentosa* (Ruby Saltbush), *Atriplex lindleyi* (Flat-top Saltbush) and scattered *Swainsona microphylla* (Small-leaf Swainson-pea).

The cover of weeds was moderate, approximately 15% cover throughout.

An incidental flora species list was taken whilst conducting the targeted flora searches of the Bitterang regulator and levee construction footprint and a total of 31 flora were recorded (Appendix A).

4.2 Targeted threatened flora assessment results

4.2.1 Desktop Assessment and Likelihood of Occurrence

VBA and PMST searches identified 22 FFG and/or EPBC listed flora that have either been recorded within 10 km of the proposed construction areas or considered possible to occur due to the modelled presence of suitable habitat.

Each of these 22 species were 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 construction areas, and also the number of recent records within 10 km of the study site.

Of the 22 species identified in the VBA and PMST searches, 16 were considered likely to occur or had the potential to occur in the study sites based on habitat requirements and number and timing of nearby records (Appendix E). These 16 species made up the target threatened species list for the surveys.

4.2.2 Threatened and protected flora recorded during 2019 surveys

No EPBC Act-listed flora were recorded during the surveys, however three species listed as threatened under the FFG Act were recorded (Table 3 and Table 4).

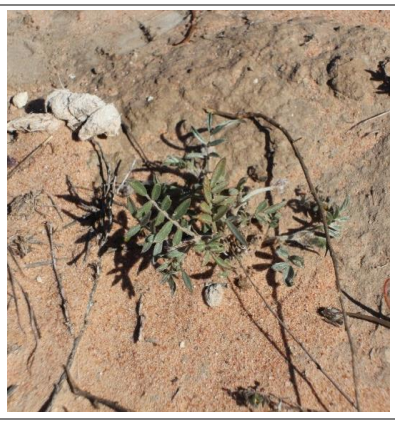
Eight species listed in Victoria under the DELWP advisory list of rare and threatened flora were also recorded incidentally during the 2019 assessments (Table 3 and Figure 3).

A summary of the listed threatened and protected flora species recorded during the 2019 targeted surveys is provided in Table 3. Fourteen flora listed as protected under the FFG Act were also identified (Table 3 and Table 9).

Table 3 Rare, threatened and protected flora identified at the construction areas during August 2019 surveys

Scientific Name	Common Name	FFG Act	DELWP advisory	K 10 Regulator	K10 Causeway	Bitterang Regulator and Levee
Acacia oswaldii	Umbrella Wattle	L	vu	y	y	
Acacia sp.	Wattle	P			y	
Acacia stenophylla	Eumong	P		y	y	y
Brachyscome ciliaris	Variable Daisy	P		y	y	y
Calotis cuneifolia	Blue Burr-daisy	P	r			y
Eremophila divaricata subsp. *divaricata*	Spreading Emu-bush		r	y	y	
Eremophila glabra	Common Emu-bush	P				y
Eremophila maculata subsp. *maculata*	Spotted Emu-bush	L	r		y	
Laphangium luteoalbum	Jersey Cudweed	P				y
Maireana triptera	Three-wing Bluebush		r			y
Olearia pimeleoides	Pimelea Daisy-bush	P				y
Pogonolepis muelleriana	Stiff Cup-flower	P		y		
Ptilotus nobilis	Yellow Tails	P	en	y		
Senecio pinnatifolius	Variable Groundsel	P		y		
Senecio runcinifolius	Tall Fireweed	P		y		
Swainsona microphylla	Small-leaf Swainson-pea		r	y		y
Swainsona phacoides	Dwarf Swainson-pea	L	en			y
Vittadinia dissecta var. *hirta*	Dissected New Holland Daisy	P				y
Vittadinia gracilis	Woolly New Holland Daisy	P				y
Vittadinia spp.	New Holland Daisy	P		y		y

Table 4 FFG Act-listed flora recorded during 2019 surveys at Hattah North

Species Name	Conservation Status	Location(s)	Photo
Acacia oswaldii (Umbrella wattle)	FFG Act – Listed as threatened DELWP Advisory list – vulnerable	K10 regulator x 1 K10 causeway x 1	
Eremophila maculata subsp. *maculata* (Spotted Emu-bush)	FFG Act – listed as Threatened DELWP Advisory list – rare	K10 causeway x 1	
Swainsona phacoides (Dwarf Swainson-pea)	FFG Act – listed as Threatened DELWP Advisory list - endangered	Bitterang regulator and levee x 8	

4.3 Targeted threatened fauna assessment results

A summary of all fauna species recorded during the surveys are provided in Appendix P, with results of the Regent Parrot Two Hour Point Surveys shown in Figure 3.

4.3.1 Desktop assessment and likelihood of occurrence

VBA and PMST searches identified 34 FFG Act and/or EPBC Act listed fauna that have either been recorded within 10 km of the proposed construction areas or considered possible to occur due to the modelled presence of suitable habitat.

Each of these 34 species were 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 construction areas, and also the number of recent records within 10 km of the proposed construction areas.

Of the 34 species identified in the VBA and PMST searches, 9 were considered to have the potential to occur in the construction areas based on habitat requirements and number and recency of nearby records (Appendix B). These 9 species made up the target threatened species list for the surveys.

4.3.2 K10 Regulator

Extensive surveys of the K10 Regulator site (e.g. Australian Ecosystems 2015, GHD 2018 and the current survey) recorded just one threatened fauna species, with Regent Parrot frequently observed passing through and around the study site. [redacted]

Previous survey undertaken by Australian Ecosystems 2015 recorded the FFG Act-listed Hooded Robin (*Melanodryas cucullata*) in the southern end of this site.

4.3.3 K10 Causeway

Surveys of the K10 causeway recorded no threatened fauna species within the proposed construction footprint during the current survey, however, the DELWP-advisory listed (endangered) Lace Monitor (*Varanus varius*) has been previously recorded at this location. Moderate-to-high quality fauna habitats exists in the vicinity of the study site, including large hollow-bearing trees, woody debris, shrubby vegetation, coarse woody debris, however, few habitat values exist within the proposed construction footprint itself, which includes the existing track and roadside verge.

The open woodland of this site and the surrounding area provides habitats for many of the common species of the area such as Australian Ringneck (*Barnardius zonarius*), Crested Pigeon (*Ocyphaps lophotes*), Weebill (*Smicrornis brevirostris*) and Willie Wagtail (*Rhipidura leucophrys*).

4.3.4 Bitterang Regulator and Containment Bank

Surveys of the Bitterang Regulator and Levee recorded no threatened fauna species within the proposed construction footprint. Moderate quality fauna habitats surround the site (e.g. large hollow-bearing trees), but few fauna values exist within the proposed construction footprint itself, which is largely comprised of open grassland/forbland occupying the existing levee.

The open woodland of this site and the surrounding area provides habitats for many of the common species of the area such as Noisy Miner (*Manorina melanocephala*), Crested Pigeon (*Ocyphaps lophotes*), and Willie Wagtail (*Rhipidura leucophrys*).

FIGURE 3: Threatened Flora and Fauna in construction footprints at Hattah North

VMFRP

Red Ochre Track
Mournpall Track
Eagles Nest Track
Bitterang Regulator
Bitterang Track

Legend

- Indicative Construction Area
- Investigation Area
- Rare and Threatened Flora recorded in 2017
- Rare and Threatened Flora recorded in 2015

Regent Parrot Survey

- RPNT

- THPS

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)
- Minor Road
- Cadastre

IS297701

N

Name: GDA 1994 MGA Zone 55

0 40 80

Meters

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

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

FIGURE 3: Threatened Flora and Fauna in construction footprints at Hattah North

VMFRP

Legend

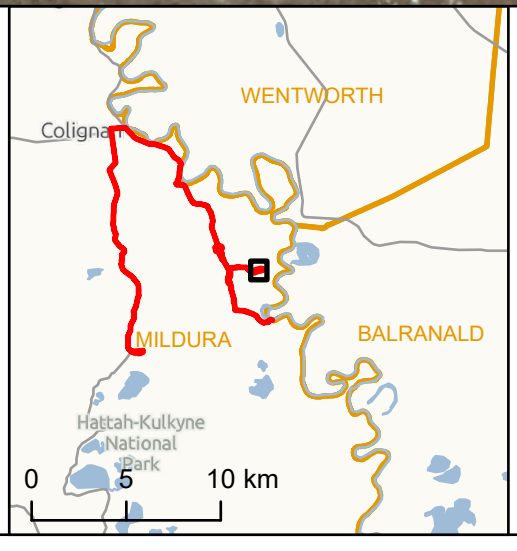
- Indicative Construction Area
- Investigation Area
- Rare and Threatened Flora recorded in 2017
- Rare and Threatened Flora recorded in 2015

Regent Parrot Survey

- RPNT
- THPS

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)
- Minor Road
- Channel / Drain
- Cadastre



IS297701

N

Name: GDA 1994 MGA Zone 55

0 40 80

Meters

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

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FIGURE 3: Threatened Flora and Fauna in construction footprints at Hattah North

VMFRP

Legend

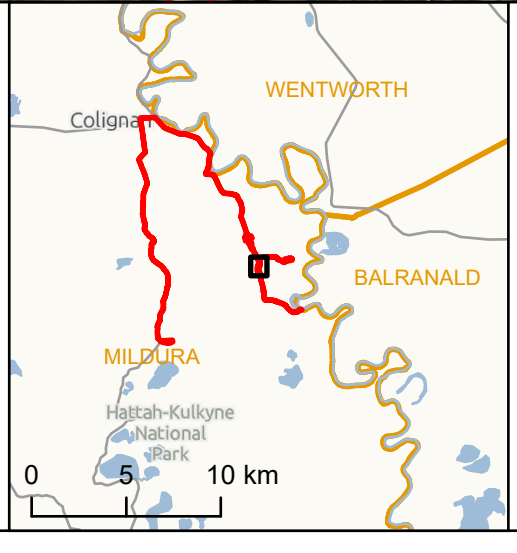
- Indicative Construction Area
- Investigation Area
- Rare and Threatened Flora recorded in 2017
- Rare and Threatened Flora recorded in 2015

Regent Parrot Survey

- RPNT
- THPS

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)
- Minor Road
- Cadastre



IS297701

N

Name: GDA 1994 MGA Zone 55

0 40 80

Meters

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

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

FIGURE 3: Threatened Flora and Fauna in construction footprints at Hattah North

VMFRP

Legend

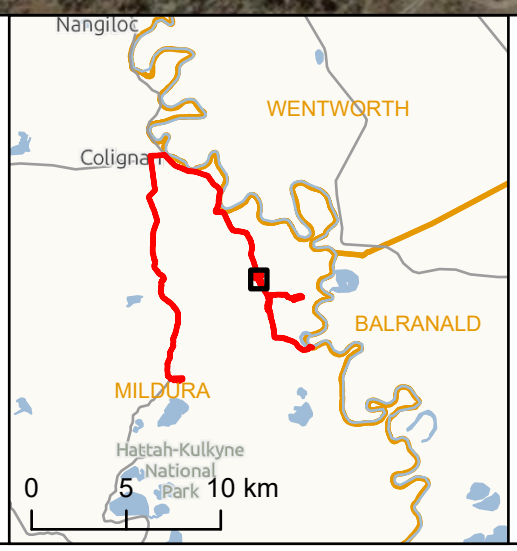
- Indicative Construction Area
- Investigation Area
- Rare and Threatened Flora recorded in 2017
- Rare and Threatened Flora recorded in 2015

Regent Parrot Survey

- RPNT
- THPS

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)
- Minor Road
- Cadastre



IS297701

N

Name: GDA 1994 MGA Zone 55

0 40 80

Meters

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

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

FIGURE 3: Threatened Flora and Fauna in construction footprints at Hattah North

VMFRP

Legend

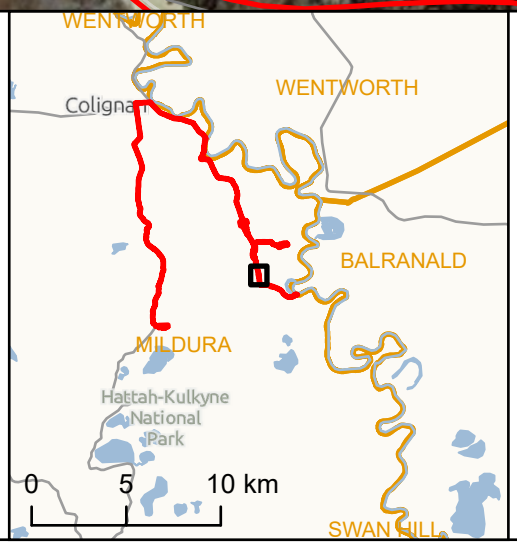
- Indicative Construction Area
- Investigation Area
- Rare and Threatened Flora recorded in 2017
- Rare and Threatened Flora recorded in 2015

Regent Parrot Survey

- RPNT
- THPS

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)
- Minor Road
- Watercourse Stream
- Cadastre



IS297701

N

Name: GDA 1994 MGA Zone 55

0 40 80

Meters

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

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FIGURE 3: Threatened Flora and Fauna in construction footprints at Hattah North

VMFRP

Legend

- Indicative Construction Area
- Investigation Area
- Rare and Threatened Flora recorded in 2017
- Rare and Threatened Flora recorded in 2015

Regent Parrot Survey

- RPNT
- THPS

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)
- Minor Road
- Watercourse Stream
- Cadastre

IS297701

N

Name: GDA 1994 MGA Zone 55

0 40 80

Meters

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

FIGURE 3: Threatened Flora and Fauna in construction footprints at Hattah North

VMFRP

River Track

Passing Bay South

Legend

- Indicative Construction Area
- Investigation Area
- Rare and Threatened Flora recorded in 2017
- Rare and Threatened Flora recorded in 2015

Regent Parrot Survey

- RPNT
- THPS

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)
- Minor Road
- Cadastre

IS297701

N

Name: GDA 1994 MGA Zone 55

0 40 80

Meters

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

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

5. Passing bay assessment

In late 2019 the requirement for three passing bays along River Track to be established to facilitate the proposed construction work within the Hattah North project area was identified. This section outlines the results of flora and fauna surveys undertaken in January 2020 to assess the potential impacts to ecological values associated with the proposed passing bays.

5.1 Vegetation and habitat condition

The three proposed passing bays are located along River Track. Efforts have been made to locate them in areas where there has been disturbance historically therefore minimising the impacts to remnant native vegetation (Table 5).

Patches of native vegetation identified during the current field assessment comprised the following three Ecological Vegetation Classes[12] (EVCs):

- Semi-arid Woodland (EVC 97): This EVC is typically a non-eucalypt woodland or open forest to 12 m tall, of low rainfall areas. Occurs in a range of somewhat elevated positions not subject to flooding or inundation.
- Low Chenopod Shrubland (EVC 102): This EVC is typically a chenopod shrubland to 1.5 m tall, occupying broad, flat alluvial terraces along the Murray River. The ground layer is characterised by succulents and a suite of annual herbs.
- Riverine Chenopod Woodland (EVC 103): This EVC is typically a eucalypt woodland to 15 m tall with a diverse shrubby and grassy understorey occurring on most elevated riverine terraces. It is confined to heavy clay soils on higher level terraces within or on the margins of riverine floodplains, naturally subject to only extremely infrequent incidental shallow flooding from major events, if at all flooded.

Table 5 Representative photo of each of the proposed passing bays

Passing Bay	Representative photo
Passing Bay South	

[12] h https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks

Passing Bay	Representative photo
Passing Bay Central	
Passing Bay North	

During the field assessment four Habitat Zones (HZs) were identified, a description of the condition of each of the HZs is outlined below in Table 6 and the results of the Habitat Hectares assessment is provided in Appendix D.

The location of patches of these vegetation types at each of the three passing bays is mapped in Figure 4. Due to the extent of native vegetation within the construction areas, only the native vegetation proposed to be impacted during the native vegetation within the construction footprint buffer has been included in the mapping.

Table 6 Habitat Zones identified during the field assessment

Vegetation type and condition	Flora description	Representative photos
Habitat Zone 1 EVC 97: Semi-arid Woodland (treeless) Located at Passing Bay South	Within patches of Habitat Zone 1 this EVC was modified and treeless, and persisting in areas that have been disturbed historically. The midstorey was sparse, containing scattered *Nitraria billardierei* (Nitre-bush). The understorey was dominated by a range of chenopods including *Atriplex stipitata* (Kidney Saltbush), *Enchylaena tomentosa* var. *tomentosa* (Ruby Saltbush), *Osteocarpum acropterum* var. *deminutum* (Babbagia), and *Rhagodia spinescens* (Hedge Saltbush). The cover of weeds was low, with <5% cover throughout.	
Habitat Zone 2 EVC 97: Semi-arid Woodland Located at Passing Bay South	Within patches of Habitat Zone 2 this EVC had maintained a moderate species richness, and a tree canopy dominated by *Allocasuarina luehmannii* (Buloke). The midstorey included *Dodonaea viscosa* (Sticky Hop-bush) and regenerating Buloke. The understorey was dominated by a range of chenopods and forbs including *Atriplex pumilio* (Mat Saltbush), *Brachyscome lineariloba* (Hard-head Daisy), *Enchylaena tomentosa* var. *tomentosa* (Ruby Saltbush), *Osteocarpum acropterum* var. *deminutum* (Babbagia), *Rhagodia spinescens* (Hedge Saltbush) and *Roepera apiculata* (Pointed Twin-leaf). The cover of weeds was low, with <5% cover throughout.	

Vegetation type and condition	Flora description	Representative photos
Habitat Zone 3 EVC 102: Low Chenopod Shrubland Located at Passing Bay Central	Within patches of Habitat Zone 3 this EVC was highly modified and entirely devoid of an overstorey or midstorey layer. This habitat zone persisted in areas that have been disturbed historically, but still contained >25% cover of perennial native vegetation. The understorey was low in diversity and contained graminoids and chenopods including *Atriplex lindleyi* (Flat-top Saltbush), *Osteocarpum acropterum* var. *deminutum* (Babbagia), *Sclerochlamys brachyptera* (Short-wing Saltbush) and *Tecticornia pergranulata* (Blackseed Glasswort). The cover of weeds was low, with <5% cover throughout.	
Habitat Zone 4 EVC 103: Riverine Chenopod Woodland Located at Passing Bay North	Within patches of Habitat Zone 4 this EVC was modified with a sparse overstorey dominated by *Eucalyptus largiflorens* (Black Box), but was devoid of a midstorey layer. The understorey was low in diversity and contained graminoids and chenopods including *Atriplex lindleyi* (Flat-top Saltbush), *Enchylaena tomentosa* var. *tomentosa* (Ruby Saltbush) and *Maireana pyramidata* (Sago Bush). The cover of weeds was low, with <5% cover throughout.	

Figure 4: Passing Bay Assessment at Hattah North

VMFRP

Passing Bay North

Passing Bay Central

Passing Bay South

River Track

Ghulka Creek

Kulkyne Track

Legend

- Indicative Construction Area
- Investigation Area
- Ecology point data recorded in 2019
- Canopy Tree
- HZ 1: EVC 97 Semi-arid Woodland
- HZ 2: EVC 97 Semi-arid Woodland
- HZ 3: EVC 102 Low Chenopod Shrubland
- HZ 4: EVC 103 Riverine Chenopod Woodland
- Minor Road
- Watercourse Stream
- Cadastre

WENTWORTH
Colignan
MILDURA
BALRANALD
0 5 10 km
Hattah-Kulkyne

IS297701

N

Name: GDA 1994 MGA Zone 55

0 50 100
Meters

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

5.2 Listed species and communities

5.2.1 Listed flora communities

The PMST predicted that an EPBC Act-listed threatened ecological community may occur within 10 km of the proposed Passing Bays, *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions* (Endangered). There are a number of FFG Act-listed flora communities that may be synonymous with this EPBC-listed community: Semi-arid Herbaceous Pine-Buloke Woodland Community, Semi-arid Herbaceous Pine Woodland Community, Semi-arid Northwest Plains Buloke Grassy Woodland Community, and Semi-arid Shrubby Pine-Buloke Woodland Community.

Vegetation at the southern passing bay, EVC 97 (Semi-arid Woodland), has the potential to meet the criteria of one or more of the FFG Act and/or EPBC Act-listed communities. The community descriptions and criteria thresholds for the FFG Act[13] or EPBC Act listed ecological communities (Sluiter et al. 1997, Cheal et al. 2011) have been reviewed against the condition of this EVC across the two habitat zones (HZ1, HZ2), and the vegetation mapped as habitat zone 2 meets the condition thresholds to be considered as the EPBC Act-listed community as well as the FFG Act-listed community (Semi-arid Shrubby Pine-Buloke Woodland Community).

The construction footprint for this passing bay has been refined to avoid native vegetation mapped as Habitat Zone 2 identified along the northern side of the track, and to utilise the area on the southern side of the track where the vegetation has been cleared historically and is highly modified. The vegetation on the southern side of the track does not meet the condition thresholds to be considered a listed community.

5.2.2 Flora

No flora listed as threatened under the EPBC Act were recorded during the assessment, nor are they considered likely to occur owing to a lack of suitable habitat.

However, three species considered rare or threatened in Victoria under the Advisory List of Rare or Threatened Plants in Victoria (DEPI, 2014) were identified within the study site (refer Table 7). One of these species (*Allocasuarina luehmannii*, Buloke) is also listed as threatened and protected under the FFG Act. *Allocasuarina luehmannii*, (Buloke) was found extensively throughout HZ2 as the dominant canopy species, all individuals considered to be large trees have been mapped individually.

Table 7 Listed flora species identified during the field assessment

Scientific Name	Common Name	DELWP Advisory	No. of individuals observed	Location
Allocasuarina luehmannii	Buloke	en	10-15	Passing Bay 1 (Habitat Zone 2)
Marsdenia australis	Doubah	vu	2-5	Passing Bay 1 (Habitat Zone 1)
Minuria cunninghamii	Bush Minuria	r	2-5	Passing Bay 1 (Habitat Zone 2)

[13] https://www.environment.vic.gov.au/conserving-threatened-species/flora-and-fauna-guarantee-act-1988 (last accessed by GHD March 2018).

Two additional species protected under the FFG Act were identified within the study site:

- *Minuria cunninghamii* (Bush Minuria)
- *Vittadinia sp.* (New Holland Daisy)

5.2.3 Noxious weeds

Two noxious weeds were identified during the field assessment, listed as Restricted within the Mallee CMA (see Table 11): *Asphodelus fistulosus* (Onion Weed) and *Marrubium vulgare* (Horehound).

6. Proposed inundation area assessment

6.1 Context

The project has been designed to facilitate environmental watering of up to 1,130 ha of the northern Hattah Lakes floodplain. The location and extent of the proposed inundation area, and the preferred frequency and duration of flooding for each of the vegetation communities targeted for restoration, has been determined through an extensive series of studies undertaken by Ecological Associates (2007, 2014, 2015). It is expected that the application of environmental water to water dependent Red Gum, Black Box, Lignum and wetland habitats will be extremely beneficial to these communities, provided it occurs within the bounds of the water regime requirements of each community (see Ecological Associates 2014).

The earlier desktop assessments undertaken by Ecological Associates identified that two non-water dependent communities have been mapped by DELWP (2005 modelled EVC mapping) as being present within the proposed inundation area, and therefore potentially receiving environmental water. As any environmental watering within non-water dependent ecosystems may not be beneficial, these areas were required to be ground-truthed and the EVC mapping confirmed and/or updated.

6.2 Desktop assessment

6.2.1 Threatened flora

VBA and PMST searches identified 109 FFG, DELWP advisory and/or EPBC listed flora species that have been recorded or have the potential to occur within the inundation area. Each of these species was then assessed for their likelihood of occurrence (Appendix F), taking into account factors such as the habitat requirements of each species and comparing those to the habitats encountered within the Hattah North inundation area, and also the number of recent records within 10 km of the study site.

6.2.2 Threatened fauna species

VBA and PMST searches identified 69 fauna species listed under the EPBC Act, FFG Act and/or DELWP Advisory Lists that have been recorded or have the potential to occur within the inundation area. Each of these species was then assessed for their likelihood of occurrence (Appendix F), taking into account factors such as the habitat requirements of each species and comparing those to the habitats encountered within the proposed inundation area, and also the number of recent records within 10 km of the proposed inundation area.

6.2.3 Vegetation communities

A summary of the vegetation communities making up the 1,130 hectares of vegetation proposed for inundation (along with the full extent of these communities in the broader Hattah North Area) is outlined in Table 8. Two non-water dependent communities are mapped as receiving environmental water, however, the vegetation mapping for the inundation areas has been ground-truthed and the on-ground inspection confirmed that these communities had been incorrectly mapped, with Semi-arid Woodland and Mallee vegetation only observed at higher elevations above the floodplains where environmental water will not penetrate during periods of inundation.

Table 8 Area of vegetation communities mapped by DELWP as occurring within the area proposed for inundation for Hattah North

Vegetation Community (broad class)	Hattah North Area (ha)	Inundation Area (ha)	EVCs
Red Gum Forest and Woodland	1,376	125	EVC 106 – Grassy Riverine Forest (Depleted) EVC 811 – Grassy Riverine Forest / Floodway Pond Herbland Complex (Depleted) EVC 813 – Intermittent Swampy Woodland (Depleted)
Black Box Woodland	4,113	883	EVC 103 – Riverine Chenopod Woodland (Depleted) EVC 295 – Riverine Grassy Woodland (Depleted) EVC 818 – Shrubby Riverine Woodland (Least Concern)
Episodic Wetlands	125	33	EVC 107 – Lake Bed Herbland (Depleted)
Mallee*	1,271	30	Chenopod Mallee Loamy Sands Mallee Woorinen Mallee Woorinen Sands Mallee
Plains Woodland and Forest*	1,908	31	Semi-arid Chenopod Woodland Semi-arid Woodland
Lignum Shrubland and Woodland**	235	3	EVC 808 – Lignum Shrubland (Least Concern) EVC 104 – Lignum Swamp (Vulnerable) EVC 823 – Lignum Swampy Woodland (Depleted)
Unmapped Vegetation***	25	25	Unmapped Vegetation
Totals (ha)	**9,053**	**1,130**	

* Not flood-dependent. Areas mapped as these communities within the inundation extent have been ground-truthed and the vegetation mapping has been updated, these communities are not present within the proposed inundation extent.

** Minor component of proposed inundation area for which ecological objectives are not relevant.

*** No EVC has been attributed to these areas on the DELWP modelled mapping.

6.2.4 Listed flora and fauna

VBA and PMST searches identified 109 FFG, DELWP advisory and/or EPBC listed flora that have been recorded or have the potential to occur within the inundation area with a 10 km buffer. Each of these species was then assessed for their likelihood of occurrence (Appendix F), taking into account factors such as the habitat requirements of each species and comparing those to the habitats encountered within the Hattah North inundation area, and also the number of recent records within 10 km of the study site.

VBA and PMST searches identified 69 FFG and/or EPBC listed fauna species that have been recorded or have the potential to occur within the inundation area with a 10 km buffer (Table 20).

6.3 Field assessment

The field assessment focussed on ground-truthing areas within the proposed inundation area that had been mapped (DELWP 2005) as containing non-water dependent ecosystems, namely Semi-arid Woodland and Mallee vegetation communities. Over 30 discrete locations within the inundation area were assessed, and the field assessment confirmed the following:

- The inundation mapping is fine scale and aligns well with topography / soil / vegetation types on the ground.
- The EVC mapping (DELWP 2005 modelled mapping) is coarser than the inundation area mapping.

- There was no Mallee vegetation or Semi-arid Woodland identified within the inundation areas surveyed. Each of the discrete locations where these vegetation communities were mapped by DELWP have now been reclassified, and photographs have been taken of each location.
- The vegetation present in these areas was usually EVC 103 (Riverine Chenopod Woodland) and occasionally EVC 102 (Low Chenopod Shrubland). Both of these EVCs are located on alluvial terraces and are prone to flooding and would not likely be adversely affected by the proposed watering regime.

A map was prepared highlighting the full extent of the inundation area, outlining the results of the EVC ground truthing exercise within areas that had been modelled as containing non-ground water dependent EVCs (see Figure 5). Native vegetation (EVC) mapping is only shown for the areas that were assessed during the field assessment.

6.3.1 Listed flora and communities

There was no vegetation identified within the inundation areas surveyed that met the criteria to be considered a listed community under the EPBC or FFG Act. Whilst the full extent of the inundation area was not assessed as a part of the EVC ground-truthing exercise, based on a desktop review of the available information and observations made during the fieldwork it is considered unlikely that any listed communities would be present within the proposed inundation area.

A determination was made on the likelihood of occurrence for rare or threatened flora within the proposed inundation area (Appendix F).

One flora species listed as threatened under the FFG Act was identified within the proposed indundation footprint, *Atriplex holocarpa* (Pop Saltbush), and one species listed as rare in Victoria, *Maireana triptera* (Three-wing Bluebush) (Appendix C). These species were recorded as an incidental observations during the field assessment and where significant populations were observed their location was mapped (Figure 5).

It is possible that other individuals of these species, and other rare or threatened flora may be present within the inundation areas, however, extensive survey of this area was not conducted as part of the present survey. Database records and previous surveys conducted by Australian Ecosystems 2014 at least partially offset the lower level of survey effort conducted.

FIGURE 5: EVC ground-truthing mapping within inundation extent

VMFRP

Boonoonar Road
Murray River
Kulkyne Way
Mallee Cliffs Road
Reed Road
Bangalow Creek
Murray River
Brown Road
Browns Road
Regent Drive
Sandy Lane
Wonga Avenue
Mournpall Track
Chalka Creek
Dry Lakes Track
Goosefoot Track
Dumosa Track
K10 Regulator
Boolca Track
Clay Pit
Lake Boolca
Raak Track
K10 Causeway Regulator
Passing Bay North
Murray River
River Track
Passing Bay Central
Passing Bay South
Murray River
Bitterang Regulator
Chalka Creek
Red Ochre Track
Mournpall Track
Eagles Nest Track
Bitterang Track
Moonah Track
Cantala Creek
Lake Cantala
Florence Annie Track
Lake Bitterang
Lake Cantala
Lake Woterap
Kulkyne Track

Legend

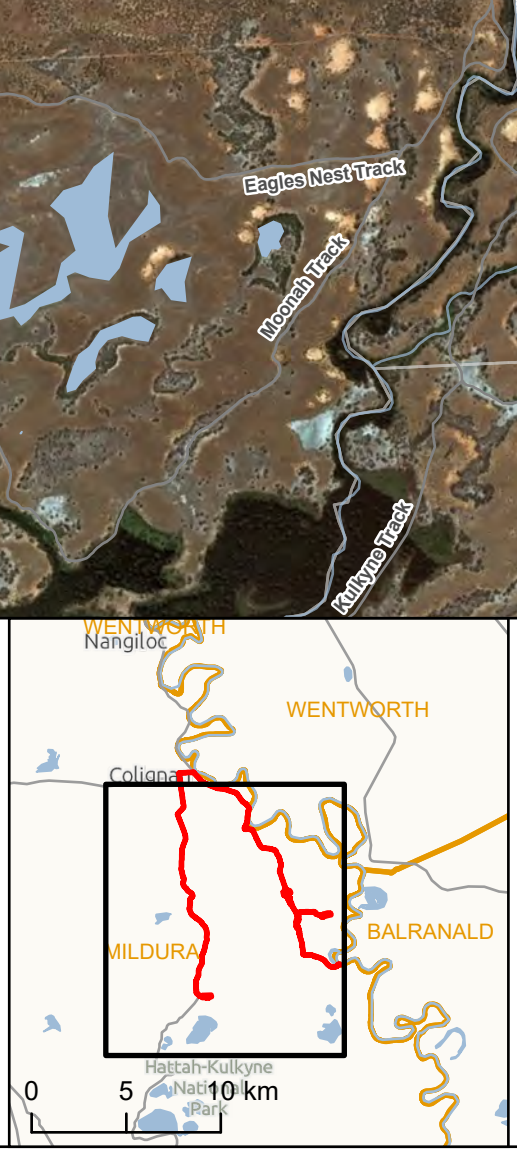
- Indicative Construction Area
- Investigation Area
- Maximum VMFRP Inundation Area

Field Data

- EVC 97: Semi-arid Woodland
- EVC 102: Low Chenopod Shrubland
- EVC 103: Riverine Chenopod Woodland

- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Cadastre

R8



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

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7. Impacts to threatened flora and fauna and communities

The following chapter outlines the impacts to threatened flora, fauna and communities resulting from the construction works proposed to be undertaken.

7.1 Impacts to threatened vegetation communities

No communities listed as threatened under the EPBC Act or FFG Act have been identified within the proposed construction footprint or within the inundation extent, and therefore impacts to threatened vegetation communities are considered unlikely.

7.2 Impacts to threatened flora

A summary of the likely impacts to flora listed under the EPBC and FFG Acts are outlined below.

7.2.1 EPBC Act-listed flora

The single EPBC-listed species considered to have the potential to occur at the study sites (based on the VBA and PMST searches combined with habitat requirements) was *Lepidium monoplocoides* (Winged Peppercress). This species was not recorded in the 2019 targeted surveys in any of the construction footprints, nor was it recorded in any prior threatened species surveys of the areas (Australian Ecosystems 2015, GHD 2018). Regardless of this, a significant impact assessment was undertaken for this species based on the EPBC Act Matters of National Significance (MNES) guidelines and indicates that the proposed works are unlikely to impact this species (Appendix A).

7.2.2 FFG Act-listed flora

Four species listed as threatened under the FFG Act were identified during the recent surveys in August 2019 and January 2020. Steps to avoid and minimise impacts to these species during construction of the project are outlined in Section 9.

- *Acacia oswaldii* (Umbrella Wattle): Several individuals were recorded within the K10 regulator footprint.
- *Allocasuarina luehmannii* (Buloke): This species was present immediately adjacent to the southern passing bay as part of an intact canopy in a patch of Semi-arid Woodland. This species is not proposed to be impacted based on the current footprint.
- *Eremophila maculata* subsp. *maculata* (Spotted Emu-bush): One individual was recorded relatively close to the edge of the proposed K10 causeway construction footprint.
- *Swainsona phacoides* (Dwarf Swainson-pea): Eight individuals were recorded near the edge of the Bitterang construction footprint.

7.2.3 FFG Act protected flora

A total of 17 different flora listed as protected under the FFG Act were recorded in the construction areas during the 2019 and 2020 surveys. A list of these species, including the approximate number of individuals identified within the construction footprints is outlined in Table 9.

Table 9 FFG protected flora recorded in 2019-20 surveys

Scientific name	Common Name	Total number (approximate) recorded over the construction areas
Acacia stenophylla	Eumong	50
Allocasuarina luehmannii	Buloke	10-15
Brachyscome ciliaris	Variable Daisy	100-200
Brachyscome lineariloba	Hard-head daisy	35
Minuria cunninghamii	Bush Minuria	5
Pogonolepis muelleriana	Stiff Cup-flower	100-200
Ptilotus nobilis	Yellow Tails	80
Senecio pinnatifolius	Variable Groundsel	60
Senecio runcinifolius	Tall Fireweed	200-500
Vittadinia spp.	New Holland Daisy	200-500
Acacia sp.	Wattle	<5
Calotis cuneifolia	Blue Burr-daisy	<5
Eremophila glabra	Common Emu-bush	2
Laphangium luteoalbum	Jersey Cudweed	50-100
Olearia pimeleoides	Pimelea Daisy-bush	50
Vittadinia dissecta var. *hirta*	Dissected New Holland Daisy	20-50
Vittadinia gracilis	Woolly New Holland Daisy	50-100

7.3 Impacts to threatened fauna

7.3.1 Impacts to EPBC Act listed fauna, communities and migratory species within the proposed construction areas

A single EPBC Act listed fauna species, the Regent Parrot (*Polytelus anthopeplus monarchoides*), was regularly observed within [redacted] the construction area [redacted]

This species is well known from Hattah-Kulkyne National Park, with nesting recorded in River Red-gum forest throughout the park (GHD 2009). The proposed construction area does not directly impact any trees considered suitable for Regent Parrot nesting. The construction area is therefore not likely to impact nesting habitat for this highly mobile and wide-ranging species.

A significant impact assessment was undertaken for this species based on the EPBC Act Matters of National Environmental Significance: Significant impact guidelines 1.1 (DOTE, 2013) and indicates that the proposed works are unlikely to significantly impact this species (Appendix M).

One other EPBC Act listed species, the Painted Honeyeater (*Grantiella picta*), has the potential to utilise habitats within the proposed construction area. This species was last recorded in 1985 within 10 km of the study sites and may occasionally forage in mistletoe within 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.

Fourteen migratory species have been identified as having the potential to occur within the construction footprint. Most of these species are either highly unlikely to occur (e.g. Black-eared Miner, Malleefowl, Clamorous Reed Warbler) due to habitat unsuitability or would very rarely use airspace over these footprints (e.g. Fork-tailed Swift, White-throated Needletail). 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.

7.3.2 Impacts to FFG Act listed fauna within the proposed construction areas

An additional six FFG Act listed fauna species have the potential to occur within the proposed construction areas, these are the Apostlebird (*Struthidea cinerea*), Black Falcon (*Falco subniger*), Diamond Dove (*Geopelia cuneata*), Hooded Robin (*Melanodryas cucullata*), Major Mitchell's Cockatoo (*Lophochroa leadbeateri*), and Carpet Python (*Morelia spilota metcalfei*). All species have been recorded within 10 km of one or more of the construction areas, and utilise habitats such as those found within the construction areas.

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. The Carpet Python is an extremely cryptic and difficult to detect species where it occurs and is likely to occur in very low densities across the landscape. Additional surveys could be conducted but it is unlikely that any Carpet Pythons would be located even if present. It may be a more prudent and precautionary approach to assume presence and manage potential python encounters during site development by carefully managing hollow-bearing tree removal with an on-site ecologist ready to relocate any pythons found within larger trees. Carpet Pythons prefer complex habitat of hollow-bearing trees and logs, plus thick litter or shrub cover (Action Statement No. 175 Inland Carpet Python *Morelia spilota metcalfei*). Habitat within the construction areas does not meet all of the habitat requirements for Carpet Python with higher quality habitat available for example 300 m upstream along the Chalka Creek (rabbit warrens also present here which are potential shelter and foraging habitat for the pythons) at K10 Regulator.

Most potential threatened species 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 areas represent an extremely small area of around 18.94 ha, centred on existing tracks and degraded areas, within a very large intact area of over 48,000 ha of high quality native vegetation within the National Park. All structures are proposed to be centred on and adjacent to existing vehicle tracks and areas of previous disturbance, (K10 Regulator along River and Raak Tracks, K10 levee along River Track, and Bitterang Levee along Eagles Nest Track and previous construction area of Bitterang Levee) 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 threatened fauna species and communities.

Fish passage is unlikely to be impacted due to the design of the regulators which allow for passage through managed release and natural flood scenarios under appropriate flow velocities (Seran BL&A, 2018).

7.3.3 Impacts to FFG Act listed fauna communities within the proposed construction areas

Additionally, two FFG Act listed fauna communities have the potential to occur within the broader study area:

- Victorian Temperate Woodland Bird Community (VTWBC)
- Victorian Mallee Bird Community (VMBC)

The VTWBC is defined by a group of 24 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 and is likely to be present. The VTWBC is potentially present within the construction footprint given that species such as Apostlebird and Hooded Robin are known from the study area. Impacts to this community are likely to be negligible as the northern Hattah Lakes floodplain 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, drier conditions in a semi-arid environment.

The VMBC is defined by a suit of 20 bird species that are almost completely restricted to habitat that is dominated by mallee, which distinctly characterises their distribution within Victoria. It is unlikely that this community is present within the construction or inundation areas as mallee habitats have not been observed within these locations.

7.3.4 Impacts to FFG Act and EPBC Act listed fauna, communities and migratory species within the proposed inundation extent

The project aims to inundate approximately 1,130 ha of periodically inundated Black Box woodland and smaller amounts of Red Gum, lignum shrubland and wetland habitats. Although these areas are currently dry and occupied by terrestrial ground-layer vegetation, historically these water dependent EVCs would have received water more frequently pre river regulation and specifically in the Lake Boolca area where an existing floodrunner has been blocked for agricultural purposes.

Several threatened fauna species are either known or have the potential to occur within the inundation extent including, Bandy Bandy (*Vermicella annulata*), Lace Monitor (*Varanus varius*), Carpet Python (*Morelia spilota metcalfei*), Red-backed Kingfisher (*Todiramphus pyrrhopygius*), Patch-nosed Brown Snake (*Pseudonaja aspidorhyncha*), Regent Parrot (*Polytelis anthopeplus*), Hooded Robin (*Melanodryas cucullata*), Square tailed Kite (*Lophoictinia isura*), Major Mitchell's Cockatoo (*Lophochroa leadbeateri*), Painted Honeyeater (*Grantiella picta*), Diamond Dove (*Geopelia cuneata*), Emu (*Dromaius novaehollandiae*), Ground Cuckoo-Shrike (*Coracina maxima*) and Brown Treecreeper (*Climacteris picumnus*). Each of these species either have a broad foraging/dispersal range and are unlikely to be adversely impacted by short and very occasional periods of inundation (e.g. Bandy Bandy, Ground Cuckoo-shrike) or would have the ability to continue utilising these habitats during inundation (e.g. Brown Treecreeper, Diamond Dove, Major Mitchell's Cockatoo). Certainly, the application of episodic environmental water would be expected to maintain and enhance the conditions of these woodland communities in the face of future climate change scenarios rather than a 'do nothing' approach to leaving these habitats in their current ecological state.

Previous condition monitoring at Hattah (e.g. Cook *et al.* 2011 and Wood *et al.* 2018) has shown that the introduction of environmental water has had positive benefits for threatened water birds including observations of the nationally endangered (EPBC) Australian Painted Snipe (*Rostratula australis*) recorded historically and confirmed again in the 2018 Lake Bitterang inundation event Wood *et al.* (2018). Other threatened waterbirds recorded during the 2018 inundation event included Freckled Duck (*Stictonetta naevosa*). Blue-billed Duck (*Oxyura australis*) and Glossy Ibis (*Plegadis falcinellus*), with several White-bellied Sea-eagle (*Haliaeetus leucogaster*) observed including a successful breeding pair.

Loyn and Dutson (2018) have been studying woodland bird habitat use, abundance and diversity in black box habitats during inundation events and have shown that frequently inundated sites may be more productive than sites which rarely flood, but are only useful to small birds, including rare species such as Black Honeyeater (*Sugomel niger*) when Noisy Miners are absent. It is expected that the proposed inundation is likely to be beneficial to the VTWBC, particularly in areas of habitat where Noisy Miners are absent.

Fourteen migratory species have been identified as having the potential to occur within the inundation extent. Most of these species are either highly unlikely to occur (e.g. Black-eared Miner, Malleefowl) or would very rarely use airspace over these footprints (e.g. Fork-tailed Swift, White-throated Needletail). Several species of migratory shorebird such as the Australian Painted Snipe and Latham's Snipe (*Gallinago hardwickii*) are known to respond to environmental water at Hattah and were reported in previous surveys (Cook *et al.* 2011 and Wood *et al.* 2018) and could be expected to utilise the proposed inundation extent for the Hattah North project. Other species of migratory waterbird including Eastern Great Egret (*Ardea modesta*) and Glossy Ibis (*Plegadis falcinellus*) are also known to respond to environmental water and were also reported by Cook *et al.* 2011 and Wood *et al.* 2018 with the potential for both to occur following watering in this location. Wood *et al.* 2018 reporting nesting White-bellied Sea-eagle and several other individual animals following the introduction of environmental water.

In terms of fish, previous condition monitoring at Hattah (e.g. Walters *et al.* 2010) following a pumping event has demonstrated that the wetlands (Lakes Mournpall, Little Hattah, Hattah and Lockie) were dominated by small-bodied fish species including Carp Gudgeons (*Hypseleotris spp.*), Australian Smelt (*Retropinna semoni*), Flathead Gudgeons (*Philypnodon grandiceps*). However, FFG and EPBC Act-listed Golden Perch (*Macquaria ambigua*), Silver Perch (*Bidyanus bidyanus*) and Murray Cod (*Maccullochella peelii peelii*) were also captured within the wetlands.

Table 10 Summary of EPBC Act listed migratory species known or with the potential to occur in the study area

Scientific Name	Common Name	Predicted (PMST)	GHD 2014	AE 2015	GHD 2018	R8 2020
Apus pacificus	Fork-tailed Swift	✓				
Ardea ibis	Cattle Egret	✓				
Ardea modesta	Eastern Great Egret	✓	✓			
Gallinago hardwickii	Latham's Snipe	✓				
Rostratula australis	Australian Painted Snipe	✓				
Manorina melanotis	Black-eared Miner	✓				
Leipoa ocellata	Malleefowl	✓				
Merops ornatus	Rainbow Bee-eater	✓	✓			
Hirundapus caudacutus	White-throated Needletail	✓				
Haliaeetus leucogaster	White-bellied Sea-eagle	✓	✓			
Acrocephalus stentoreus	Clamorous Reed Warbler	✓	✓			
Plegadis falcinellus	Glossy Ibis	✓			✓	
Calidris ferruginea	Curlew Sandpiper	✓				
Numenius madagascariensis	Eastern Curlew	✓				

7.4 FFG Act-listed threatening processes

Potentially threatening processes are listed in accordance with Section 10 of the *Flora and Fauna Guarantee* (FFG) *Act* 1988. There are a number of threatening processes that are relevant to the Hattah North project that have the potential to exacerbate by either the construction process or proposed inundation of 1,130 ha of floodplain and wetlands:

Construction Phase:

- Loss of hollow-bearing trees from Victorian native forests
- The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority

The construction footprint has been reduced and minimized during the various phases of the project (see Section 10) from earlier assessment footprints (Australian Ecosystems 2015, GHD 2018) to the current construction footprint to avoid hollow-bearing trees and particularly those that support Regent Parrot nests (none within construction footprint). A qualified ecologist will be on-site to manage the removal of any fauna habitat and capture and translocate fauna observed within the construction area. It is still possible that hollow-bearing trees will be removed as part of the project, however the broader objective to inundate 1,130 ha of primarily black box woodland is likely to contribute to the maintenance of hollow-bearing trees into the future.

A Construction Environmental Management Plan (CEMP) 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.*

Inundation Phase:

- Predation of native wildlife by the 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 feral cats 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 extent, however this may require Parks Victoria to expand current pest control programs within the park to target these areas during inundation events.

7.5 Wetlands of international importance

While reinstating a wetting and drying regime of appropriate frequency, duration and extent to the broader Hattah Lakes area adjacent to the Ramsar site is likely to impart significant ecological benefits for the Hattah Lakes, large infrastructure projects such as this can also have environmental risks, particularly localised, short-term impacts during the construction phase. It should be noted that both the construction footprint and inundation extent both occur outside the area designated as the Hattah Lakes Ramsar wetland of international importance. However, an Environmental Management Plan (EMP) is being developed that identifies potential environmental risks and puts in place mitigation strategies to avoid or minimise these risks (e.g. removal of small areas of fauna habitat). Any impacts will be localised and site rehabilitation will occur following completion. The EMP will set out specific measures that will be employed to minimise impacts during construction (e.g. presence of ecologists during site development to salvage and relocate fauna). This plan will be submitted with the planning permit application and will be implemented by all construction contractors.

A detailed semi-quantitative analysis of the potential salinity impacts of the proposed operational scenarios has also been completed. This assessment concluded that a major salinity impact on the Murray River, Hattah Lakes or surrounding floodplain is unlikely to occur and outlines a monitoring program to verify this.

Black-water 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 (although river regulation and drought conditions exacerbate this risk by increasing the time between site inundation and therefore mobilisation of nutrients following re-wetting). 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, reinstating appropriate wetting and drying regimes to over 1,130 ha of wetlands and floodplain. The current Hattah North project combined with existing infrastructure will maintain and enhance the health of more than 125 ha of wetlands, almost 1,376 ha of River Red-gum and more than 4,113 ha of Black Box communities. This will 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. The project will enable environmental water to be delivered to complement the broader Hattah Lakes TLM project, assisting in maintaining the ecological character of the Ramsar site. This will be of particular benefit during long dry periods and under current climate change scenarios.

8. Impacts to native vegetation

This section summarises the likely impacts to native vegetation associated with the proposed works at each of the construction areas. The impacts described in this section incorporate assessments undertaken at Hattah North from 2014–2020. The combined Vegetation Quality Assessment (Habitat Hectare) results are outlined in Appendix J for all of the native vegetation proposed to be impacted.

An assessment of the potential impacts to vegetation within the inundation areas as a result of flooding was outside the scope of this report. However, as targeted ground-truthing of EVCs within the proposed inundation areas has not identified any non flood-dependent EVCs, and it is assumed that the proposed environmental watering will be managed to deliver the preferred hydrological regime for native vegetation communities within the proposed inundation areas as identified by Ecological Associates (2007, 2014, 2015), native vegetation within the proposed inundation areas is expected to be benefited for the project rather than adversely impacted. Therefore the following description of native vegetation impacts is focussed on the proposed construction areas.

8.1 Objective of the Guidelines

The *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) were incorporated into the Victorian Planning Provisions and all planning schemes in Victoria in December 2017 (DELWP, 2017).

The purpose of the Guidelines is to guide how impacts on biodiversity should be considered when assessing an application for a permit to remove, destroy or lop native vegetation. The Guidelines set out the rules and tools for how the responsible authority (Mildura Rural City Council) and referral authority (DELWP) should consider biodiversity when assessing an application. Adherence to the practices and procedures outlined in the Guidelines will help protect native vegetation. They aim to ensure that the proposed removal of native vegetation is appropriately assessed, that opportunities to avoid and minimise removal are considered, and that appropriate offsets are secured (DELWP, 2017).

When native vegetation removal is permitted, an offset must be secured that achieves a no net loss outcome for biodiversity. To achieve this, the offset needs to make a contribution to Victoria's biodiversity that is equivalent to the contribution made by the native vegetation that was removed. Therefore, the type and amount of offset required depends on the native vegetation being removed and the contribution it makes to Victoria's biodiversity.

Offsets for the project will 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.

8.2 Proposed impacts to native vegetation

8.2.1 Ecological Vegetation Classes

Using the current footprint for each of the construction areas, a total of approximately 18.94 ha of native vegetation is proposed to be removed. The total proposed impacts to each individual EVC within the construction areas is outlined in the table below.

Table 11 Proposed impacts to each EVC for each of the proposed construction areas

Study Site	EVC	Conservation Significance	Area (ha)
Bitterang Regulator	103 - Riverine Chenopod Woodland	Depleted	2.963
Bitterang Regulator	806 - Alluvial Plains Semi-arid Grassland	Vulnerable	0.350
Clay Pit	103 - Riverine Chenopod Woodland	Depleted	0.026
Clay Pit	808 - Lignum Shrubland	Least Concern	3.501
K10 Causeway Regulator	103 - Riverine Chenopod Woodland	Depleted	2.575
K10 Causeway Regulator	813 - Intermittent Swampy Woodland	Depleted	1.070
K10 Causeway Regulator	820 - Sub-saline Depression Shrubland	Depleted	0.008
K10 Regulator	103 - Riverine Chenopod Woodland	Depleted	3.432
K10 Regulator	808 - Lignum Shrubland	Least Concern	0.334
K10 Regulator	810 - Floodway Pond Herbland	Depleted	0.893
K10 Regulator	813 - Intermittent Swampy Woodland	Depleted	3.648
K10 Regulator	295 - Riverine Grassy Forest	Vulnerable	0.112
Passing Bay Central	102 - Low Chenopod Shrubland	Depleted	0.005
Passing Bay North	103 - Riverine Chenopod Woodland	Depleted	0.005
Passing Bay South	097 - Semi-arid Woodland	Vulnerable	0.018
		TOTAL	**18.939**

8.2.2 Canopy trees

During the field assessments 469 trees were recorded within the construction areas (Appendix K) for the details of the trees that are proposed for removal. The DBH of each tree has been recorded at 1.3 m above ground level to determine the size class (as per the guidelines, DELWP 2017).

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).
Whilst the size class of a tree is determined by measuring the DBH at 1.3 m under the Guidelines, the TPZs of a tree are calculated by recording the DBH of a tree at 1.4 m (and for multi-stemmed trees such as Mallee eucalypts, the TPZ is determined by combining the DBH measurements of each individual stem).
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).

It is expected that 27 Large Trees will be impacted by the proposed works (Appendix R), with the majority of these being located at the K10 Regulator construction area.

8.3 Assessment pathway

Applications to remove native vegetation are categorised into one of three assessment pathways with corresponding application requirements and decision guidelines. The assessment pathway for an application to remove native vegetation reflects its potential impact on biodiversity and it is determined from the location and extent of the native vegetation to be removed (DELWP, 2017).

The three assessment pathways recognised by DELWP are:

- *Basic:* limited impacts on biodiversity.
- *Intermediate:* could impact on large trees, endangered EVCs, and sensitive wetlands and coastal areas.
- *Detailed:* could impact on large trees, endangered EVCs, sensitive wetlands and coastal areas, and could significantly impact on habitat for rare or threatened species.

The assessment pathway determines the information that is required to accompany an application to remove, lop or destroy native vegetation. There are three location categories that indicate the potential risk to biodiversity from removing a small amount of native vegetation: Location 1, 2 and 3 and play a role in determining the assessment pathway. The higher category is used if native vegetation proposed to be removed includes more than one location category. The process for determining the assessment pathway is summarised in Table 12.

The construction areas all occur within a broad area that has mapped as Location 3. Given the scale of the project and both the extent of native vegetation and the number of large trees identified within the Hattah North project area, it is considered likely that the project will follow the Detailed Assessment pathway.

Table 12 Risk matrix for determining the assessment pathway that an application to remove native vegetation will take

Extent of native vegetation	Location Category		
	Location 1	Location 2	Location 3
< 0.5 hectares (ha) and not including any Large Trees	Basic	Intermediate	Detailed
< 0.5 hectares (ha) and including one or more Large Trees	Intermediate	Intermediate	Detailed
0.5 hectares (ha) or more	Detailed	Detailed	Detailed

8.4 Summary of native vegetation impacts

Despite the efforts outlined in section 10 below to avoid and minimise impacts to native vegetation during the design and planning phase of the project, 18.94 hectares of native vegetation removal will be required for the project.

Twenty-seven Large Trees (i.e. canopy trees within patches with a DBH that meets the threshold to be considered Large for a particular EVC) will be impacted as a part of the project. No Scattered Trees will be impacted as a part of the project.

Table 13 summarises the proposed impacts to native vegetation, as outlined in the NVR report prepared on 10 February 2020, see Appendix R.

Table 13 Summary of impacts to native vegetation for the project

Summary of Impacts	
Assessment Pathway	Detailed Assessment Pathway
Extent of proposed vegetation removal	18.94 hectares
No. of Large Trees proposed to be removed	27
Location Category	Location 3 The native vegetation is in an area mapped as an endangered EVC, sensitive wetland or coastal area. Removal of less than 0.5 hectares of vegetation could have a significant impact on any habitat for rare or threatened species.

Appendix J outlines the results of the Habitat Hectare Assessments undertaken during the site assessments.

8.4.1 Offset requirements

The NVR report outlines the offset requirements for the project, including specific species offsets for 33 species of rare and threatened flora and fauna, and 27 Large Trees (Appendix R).

Offsets will 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.

9. Avoidance, minimisation and mitigation measures

Efforts have been made throughout the planning and design phases for the project 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 disturbance, and represent inferior areas of habitat to those which surround them. From a landscape perspective the proposed construction footprints represent an extremely small area within a very large intact area of high quality native vegetation.

9.1 Avoidance, minimisation and mitigation measures

9.1.1 General mitigation measures

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

- Avoid and minimise disturbance to Hattah-Kulkyne National Park and the Murray-Kulkyne Park where practicable.
- Manage habitat clearing and removal of hollow-bearing trees/limbs with respect to fauna.
- Flag no go zones for significant species (e.g. FFG threatened flora) that occur close to the construction area to avoid impacts.
- Retain as many Large Trees as practicable including potential micrositing within the constraints of the construction areas footprint.
- Flag areas of native vegetation adjacent to the proposed works that have not been approved for removal as no-go zones.
- Use existing disturbed areas or areas of non-native vegetation for lay-downs and stockpiling.
- Where practicable, avoid areas of high quality vegetation and vegetation that supports rare or threatened flora (e.g. Riverine Grassy Woodland at K10 Regulator).
- Fence off the patches of Semi-arid Woodland (EVC 97, Habitat Zone 2) identified at the southern Passing Bay (immediately north of the access track)) that meet the criteria to be considered a threatened ecological community under the EPBC and FFG Acts to manage inadvertent impacts to this community.
- Include the above points to develop and implement mitigation measures for incorporation into an EMP to minimize the potential for ecological impacts within and around the site before, during and after the construction process. These may also include:
- Adhere to the approved footprint (and further minimise where possible) and supervise construction activities to ensure that activities do not encroach on retained native vegetation.
- Standard vehicle hygiene measures 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).
- Management of run-off, spills and sediment to avoid impacts on Chalka Creek.
- Delineation of areas of remnant native vegetation to be retained from those areas to be removed as no-go zones to avoid encroachment into areas of retained vegetation.

9.1.2 Design Phase

During the detailed design phase the following activities have occurred as well as other measures that are recommended and still to be undertaken:

- Currently, there have already been two rounds of review of the construction footprint to reduce the area of native vegetation clearance required to construct the proposed water management infrastructure. The project footprint is now constrained to be the minimum required to undertake construction of the Hattah North project with necessary set-down areas and access allowed for.
- Specific recommendations to further avoid and minimise impacts to four FFG Act-listed flora species identified within the Hattah North project area are outlined below:
  - *Acacia oswaldii* (Umbrella Wattle): The individuals were recorded on the very southern edge of the K10 Regulator construction area, and another several metres outside the K10 Causeway Regulator construction area. It should be possible to avoid their removal during construction.
  - *Allocasuarina luehmannii* (Buloke): This species was present immediately adjacent to the southern passing bay as part of an intact canopy in a patch of Semi-arid Woodland. It is not expected that any of these trees will be impacted by the proposed works, provided the proposed passing bay is constructed on the southern side of the River Track as recommended. A buffer of 15 m should be allowed for from the base of each tree to avoid impacts.
  - *Eremophila maculata* subsp. *maculata* (Spotted Emu-bush): One individual was recorded relatively close to the edge of the proposed K10 Causeway Regulator construction area, within the construction area, it is recommended that this individual is avoided during construction.
  - *Swainsona phacoides* (Dwarf Swainson-pea): Eight individuals were recorded near the edge of the Bitterang Regulator construction area, efforts should be made to minimise impacts to this population.
- Consideration should still be given to whether any branches may need to be lopped on River Track for example to allow heavy machinery such as cranes to access the proposed construction footprint areas.

9.1.3 Construction phase

The following mitigation measures are recommended to minimise and avoid impacts upon the identified threatened flora values (FFG Act listed threatened species) during the construction phase of the project. These measures are general across the construction areas and are not site specific,

- Temporary fencing should be erected around 'sensitive' areas to indicate areas to avoid during construction,
- Establish work zones for each site to avoid 'sensitive' habitats (including areas containing threatened flora). This could be implemented through an initial briefing of construction works crews by a qualified ecologist and subsequent planning of safe work distances and establishment of each site.
- Develop and implement a Flora and Fauna Management Plan to manage impacts to all flora and fauna values and particularly threatened species and the habitat preclearance and clearance process.
- Manage the removal of hollow-bearing trees [redacted] where construction may impact nest trees of EPBC Act listed Regent Parrot and other hollow-dependent fauna:
  - Scenario 1 – Where clearing of hollow-bearing trees is proposed during the Regent Parrot breeding period (September through end of January, DoEE, 2017). Avoiding the breeding season is recommended, however where this is not practicable an assessment must be undertaken to determine if impacts from construction will impact trees that may support Regent Parrot nesting [redacted] The assessment must include surveys undertaken by a suitably qualified person of the hollow-bearing trees being removed during the breeding season (September and January). The survey should also include other native hollow-dependent fauna. A protocol needs to be developed/refined from the previous Threatened Species Management Plan for 'The Living Murray Hattah Lakes Environmental Flows Project' (2011) in the event that a Regent Parrot nest is identified just prior to/during construction.

  - Scenario 2 – Where clearing is proposed outside the Regent Parrot breeding season. Complete pre-clearance surveys for any remnant hollow-bearing trees to be removed. These trees could harbour one or more species of native hollow-dependent fauna. Pre-clearance surveys should be conducted prior to (within 24 hours) the hollow-bearing trees being removed.

- The FFG Act listed Carpet Python (*Morelia spilota*) may occur at K10 Regulator. The Carpet Python is an extremely cryptic and difficult to detect species where it occurs and is likely to occur in very low densities across the landscape. Additional surveys could be conducted but it is unlikely that any Carpet Pythons would be located even if present. It may be a more prudent and precautionary approach to assume presence and manage potential python encounters during site development by carefully managing hollow-bearing tree removal with an on-site ecologist ready to relocate any pythons found within larger trees. Carpet Pythons prefer complex habitat of hollow-bearing trees and logs, plus thick litter or shrub cover (Action Statement No. 175 Inland Carpet Python *Morelia spilota metcalfei*). Habitat within the construction footprints does not meet all of the habitat requirements for Carpet Python with higher quality habitat available for example 300 m upstream along the Chalka Creek (rabbit warrens also present here which are potential shelter and foraging habitat for the pythons).
- Develop and implement an Environmental Management Plan (EMP) for the construction phase. This EMP should provide appropriate measures to avoid or minimise indirect impacts such as erosion, sedimentation and the accidental spill of oils or other chemicals. It would also provide a protocol for minimising impacts in ecologically sensitive areas such as the Hattah Lakes. Ideally, the EMP would be audited during and following the construction process to ensure works have been conducted appropriately,
- Develop and implement a plan to manage weeds during and after the construction phase.
- Rehabilitate construction areas, including setting aside topsoil to reinstate when works are complete and compacting to original levels. If native vegetation must be removed, re-spreading of stored topsoil should occur, followed by monitoring to assess germination in the following year. Appropriate weed control measures at the site following the works should be incorporated into the rehabilitation program, as soon as possible. If the site is not naturally recolonised by locally indigenous species, 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, should be reinstated following the completion of works if possible.
- Minimise the need to create new tracks and use existing tracks as much as possible.
- If possible, avoid construction during the Regent Parrot breeding season of September to January inclusive. If construction is unavoidable, attempt to minimise particularly noisy or intensive activities such as pile driving during this period as was applied for the Hattah Lakes TLM project.

10. Policy and legislative requirements

There are a number of ecological values present within the study site as discussed within this report, with the potential to trigger the requirement to obtain permits if impacted (e.g. the removal of native vegetation may require a permit under the *Planning and Environment Act*). Table 14 below outlines the potential legislative implications for the project that may result from the removal of native vegetation and/or fauna habitat within the study site.

Table 14 Summary of probable legislative requirements

Federal	Relevance to project
Environment Protection and Biodiversity Conservation Act 1999	No listed flora or ecological communities were identified within the construction areas during the assessment, nor are they considered likely to occur. The EPBC Act listed Regent Parrot (*Polytelus anthopeplus monarchoides*), was regularly observed within [redacted] the construction footprint. This species is well known from Hattah-Kulkyne National Park, with nesting recorded in River Red-gum forest throughout the park (GHD 2009). The construction footprint area does not directly impact any trees considered suitable for Regent Parrot nesting. The construction impact area is not likely to impact nesting habitat for this highly mobile and wide-ranging species, however, as a precautionary approach, mitigation measures for this species are presented in the chapter above. A full assessment of the EPBC Act significant impact criteria to this species from the proposed works for this species are provided in Appendix M. One other EPBC Act listed species, the Painted Honeyeater (*Grantiella picta*), has the potential to utilise habitats within the proposed construction area. This species was last recorded in 1985 within 10 km of the proposed construction areas and may occasionally forage in mistletoe within 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. Fourteen migratory species have been identified as having the potential to occur within the construction footprint. Most of these species are either highly unlikely to occur (e.g. Black-eared Miner, Malleefowl, Clamorous Reed Warbler) or would very rarely use airspace over these footprints (e.g. Fork-tailed Swift, White-throated Needletail). 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. The Hattah Lakes Ramsar site is situated adjacent to the Hattah North project area. It is unlikely that the project will negatively impact on the character of the Ramsar site but will more likely complement the previously constructed and now operational TLM project which has the potential to deliver over 40 GL of environmental water to the lakes. The Hattah North project will build upon the TLM project and enable the release of water into Black Box, lignum and wetland habitats that are currently suffering the adverse impacts of river regulation, on-going drought and a drying climate. It is unlikely that the proposed Hattah North project will result in a significant impact to a MNES, however it is believed that a precautionary approach will be implemented for this project and an EPBC referral will be submitted.

State	
Environment Effects (EE) Act 1978	The project has been assessed in relation to the referral criteria relating to native vegetation, flora and fauna specified in the Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978, and is considered to trigger the following referral criteria: • Clearing of more than 10 ha of native vegetation not containing any Endangered EVCs • Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term (likely to be positive effects)
National Parks Act 1975	The proposed construction areas, and most of the proposed inundation area, occur in the Hattah-Kulkyne National Park and Murray-Kulkyne Park are subject to the objects of the Act, which make provision for the preservation and protection of the natural environment including wilderness areas and natural areas in those parks; for the protection and preservation of indigenous flora and fauna and of features of scenic or archaeological, ecological, geological, historic or other scientific interest in those parks; for the study of ecology, geology, botany, zoology and other sciences relating to the conservation of the natural environment in those parks, and for the responsible management of the land in those parks. The objects of the Act have been considered during the detailed design phase to minimise the construction footprint and avoid important threatened species habitat (e.g. Regent Parrot nesting trees). Furthermore, by aiming to restore a more natural inundation regime to about 1,130 ha of the northern Hattah Lakes floodplain, the project is consistent with the priority actions identified in the River Red Gums Management Plan (Parks Victoria) which aim to halt the decline of biodiversity values threatened by river regulation and changing flooding patterns.
Planning and Environment Act 1987 (P&E Act)	The proposed construction areas indicates that 18.94 hectares of native vegetation (including 27 Large Trees) will be impacted for the project. A permit under the *Planning and Environment Act* will be required for the removal of any native vegetation unless exemptions apply. Given the extent of native vegetation identified within the study site, as well as the presence of scattered native individuals (<25% cover) within areas considered to be non-native vegetation, it is considered likely that a permit under the P&E Act will be required for the project.
Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017) – the Guidelines.	The location mapping for the study area identifies that the construction areas are classified as Location Risk 3. Given the scale of the project and both the extent of native vegetation and the number of trees identified within the study site, it is considered likely that the project would need to follow the Detailed Assessment pathway. For this reason, habitat hectare assessments were undertaken in all areas of construction footprint. The results of this are presented in this current and previous (GHD 2018) reports and presented in Appendix J.

State	
Flora and Fauna Guarantee Act 1988	**Fauna species and communities** Eight FFG Act-listed fauna species have the potential to occur within the proposed construction area, these are the Regent Parrot (*Polytelis anthopeplus monarchoides*), Painted Honeyeater (*Grantiella picta*), Apostlebird (*Struthidea cinerea*), Black Falcon (*Falco subniger*), Diamond Dove (*Geopelia cuneata*), Hooded Robin (*Melanodryas cucullata*), Major Mitchell's Cockatoo (*Lophochroa leadbeateri*), and Carpet Python (*Morelia spilota metcalfei*). All species have been recorded within 10 km of one or more of the construction areas, and utilise habitats such as those found within these construction areas. 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 and Regent Parrot are possible. Most 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 native vegetation removal during construction represents an extremely small area of around 18.94 ha, centred on existing tracks and degraded areas, within a very large intact area of over 55,000 ha of high quality native vegetation within the National Park. All structures are proposed to be centred on and adjacent to existing vehicle tracks and areas of previous disturbance. With many trees already in poor health, these construction 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 threatened fauna species. Additionally, two FFG Act listed fauna communities have the potential to occur within the broader study area: ▪ Victorian Temperate Woodland Bird Community (VTWBC) ▪ Victorian Mallee Bird Community (VMBC) The VTWBC is potentially present within the construction area given that species such as Apostlebird and Hooded Robin are known from the proposed construction areas. Impacts to this community are likely to be negligible as the northern Hattah Lakes floodplain 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, drier conditions in a semi-arid environment. The VMBC is defined by a suite of 20 bird species that are almost completely restricted to habitat that is dominated by mallee, which distinctly characterises their distribution within Victoria. It is unlikely that this community is present within the proposed construction or inundation areas as mallee habitats have not been observed within these locations. **Flora species and communities** One vegetation community listed under the FFG Act was identified, Semi-arid Shrubby Pine-Buloke Woodland Community, at Passing Bay South (in patches of Semi-arid Woodland, mapped as Habitat Zone 2). The proposed construction area avoids impacting this community.

State	
	Three FFG Act listed threatened flora species were identified in proposed construction areas, *Acacia oswaldii* (Umbrella wattle), *Eremophila maculata subsp. maculata* (Spotted Emu-bush) and *Swainsona phacoides* (Dwarf Swainson-pea). These species have the potential to be impacted by the proposed works, and an FFG Permit would be required for their removal. Fourteen flora species listed as protected under the FFG Act were identified within the proposed construction areas (Table 9). An FFG permit for the removal of protected flora will need to be obtained prior to the commencement of works. 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 construction phase of the project and that any relevant FFG Act Management Plans for relevant species adhered to.
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	Four weeds listed under the CaLP Act were detected (including one species also listed as a WONS). Mitigation measures to prevent the spread of these species (and any other WONS or CaLP Act listed weed species) will need to be incorporated into a CEMP.

11. Recommendations

The Hattah North project has the opportunity to build on the previously constructed Hattah Lakes TLM project and has undergone a series of previous surveys to identify ecological values that have the potential to be adversely impacted upon during the construction phase. The proposed project aims to inundate approximately 1,130 ha of floodplain and wetland habitats that support water dependent vegetation threatened by river regulation, on-going drought and a drying climate.

11.1 Next steps

R8 recommends the following next steps:

- Refine the construction footprint within the bounds of the 18.94 ha 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.
- 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 detailed design 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 an offset exemption may apply to the works at Hattah North. 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 – this will include a plan for obtaining the required offsets.
- Develop specific impact mitigation measures related to the works. These should be incorporated into a Construction Environmental Management Plan.
- Submit an application for a permit to remove native vegetation under the *Planning and Environment Act 1987*.
- Once the Offset Plan has been approved by Local Council and DELWP and the process of obtaining the offsets has commenced, obtain a permit for the removal of native vegetation under the *Planning and Environment Act 1987*.
- A Construction Environmental Management Plan (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 study site.

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Appendix A. Flora recorded during surveys (August 2019)

Table 15 Summary of key ecological reports undertaken at project sites in the Hattah North Project study area

Report	Methods	Key Findings	Recommendations
Australian Ecosystems (2014) *Hattah North and Belsar Islands Yungera Flora Census 2013*. Report prepared for the Mallee Catchment Management Authority.	• Review of existing information • Field flora survey November 2013: ○ 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)	**Hattah North** • 10 EVCs sampled, most widespread were: ○ Riverine Chenopod Woodland ○ Semi-arid Woodland ○ various Mallee associated EVCs • Floodplain results inconsistent with previous mapping • Large areas of Mallee vegetation relatively intact • Many areas of Semi-arid Woodland highly degraded • 202 flora species recorded ○ 169 indigenous species ○ 33 exotic species ○ 20 rare or threated flora • 2 listed as under *FFG Act 1988*: ○ *Cullen pallidum* (Woolly Scurf-pea) ○ *Allocasuarina luehmannii* (Buloke) • Other frequently observed rare species included: ○ *Asperula wimmerana* (Wimmera Woodruff) ○ *Sphaeromorphaea australis* (Spreading Nut-heads) ○ *Senecio cunninghamii* var. *cunninghamii* (Branching Groundsel) • Weed coverage often high ○ 3 classified as restricted under *CaLP Act 1994* ○ a number of very high risk species under DSE Advisory list of Environmental Weeds ○ No weeds of National Significance recorded	No recommendations

Report	Methods	Key Findings	Recommendations
GHD (2014) SDL Offsets *Fauna Survey Hattah North and Belsar Yungera.* Report prepared by GHD for Mallee CMA. Mildura, Victoria.	• Review of existing information • Field surveys November 2013: ○ 8 sites • Ground dwelling vertebrates ○ Pitfall trapping using T-array and open buckets flush to the ground ○ Baited Elliot traps ○ Baited infrared motion-activated fauna camera traps • Bird surveys: ○ surveyed within 3 hours of sunrise and late afternoon ○ Standard 20 minute 2 hectare area search ○ Detection method included observation or call • Bat surveys ○ Anabat detectors for micro-bat calls ○ Each call was assigned a confidence rating ○ Harp-traps on two nights • Nocturnal spotlight surveys: ○ Targeting Carpet Python, Growling Gras Frog and nocturnal birds • Recording of incidental observations	**Hattah North** • 129 native fauna species recorded ○ 107 native bird species ○ 3 native amphibian species ○ 5 native terrestrial mammal species ○ 5 exotic terrestrial mammal species ○ 4 bat species (+ 3 further probable species) ○ 10 native reptile species • Significant and listed species included: ○ 50 records of EPBC Act listed Regent Parrot ○ 7 birds species listed as threatened under FFG Act ○ 9 species of bird and 1 reptile listed under the DEPI Advisory List of Threatened Vertebrate Fauna in Victoria 2013 • New records of bat species *Scotorepens greyii* (Little broad-nosed bat), not previously recorded in the study area with few records in north-west Victoria • Potential records of *Nyctophilius corbeni* (Corben's long-eared bat) listed as endangered on the DSE priority list and Vulnerable under EPBC Act.	No recommendations
Australian Ecosystems (2015) *Hattah North SDL Project Flora and Fauna Assessment: Detailed Design Stage*. Final Report. December 2015	• Investigates five project sites including the K10 Regulator, K10 Causeway Regulator, Bitterang Regulator and Kulkyne Station Claypit construction areas of interest • Review of existing information • Field survey October 2015 • Recording of incidental fauna species supplemented with: ○ 20 minute bird census within 1 hour of sunrise ○ 30-60 minutes of spotlighting after dusk • Habitat hectare assessment method version 1.3 • Large old tree assessment (dead or alive)	**Bitterang Regulator** • 2 EVCs: ○ Alluvial Plains Semi-arid Grassland ○ Riverine Chenopod Woodland • 100 flora species: ○ high diversity of threatened plant species, notably in Borrow Pit area ○77 indigenous species ○ 23 introduced species ○ 11 species listed as poorly known or rare or threatened under the Victorian Advisory List • 2 weeds listed as Restricted Weeds under CaLP Act • Habitat hectare results: ○ Riverine Chenopod Woodland – Total habitat hectares 4.1 and 1.03. with EVC conservation status described as Depleted ○ Alluvial Plains Semi-arid Grassland – Total habitat hectares 0.73 with EVC conservation status described as Vulnerable	**Overview"** • 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) • Salvage of fauna where hollow-bearing trees cannot be avoided during construction • Reduce impacts to Vulnerable, Rare or Threatened flora, particularly *Abutilon malvifolium* (Mallow-leaf Lantern-flower), salvaging and translocating this species if site cannot be avoided **Bitterang Regulator and Levee** • Reduce disturbance in areas of high diversity of threatened plant species, particularly the Borrow Pitt area.

Report	Methods	Key Findings	Recommendations
		• No large trees in the Riverine Chenopod Woodland • 19 fauna species: ○ 17 indigenous species ○ 2 introduced species • 2 threatened species: ○ *Polytelis anthopeplus* (Regent Parrot) ○ *Struthidea cinerea* (Apostlebird) • Thickets of *Eucalyptus largiflorens* (Black Box) are possibly being used for breeding by the Apostlebird **K10 Regulator** • 4 EVCs: ○ Floodway Pond Herbland ○ Intermittent Swampy Woodland ○ Lignum Shrubland ○ Riverine Chenopod Woodland • 93 flora species: ○ 81 indigenous species ○ 12 introduced species none listed under CaLP Act ○ 8 species listed as poorly known or rare or threatened under the Victorian Advisory List, ○includes endangered species, *Abutilon malvifolium* (Mallow-leaf Lantern-flower), with record the second recorded for Victoria •61 Large-old trees • Understorey vegetation of good quality (Habitat Hecatre score of 20) ○ some large old *Eucalyptus camaldulensis* (River Red-gum) with extensive hollows • 21 fauna species, 15 bird, 3 mammal, 2 reptile and 1 amphibian: ○ 18 indigenous species ○2 introduced species • 2 threatened species: ○ Hooded Robin (*Melanodryas cucullata*) ○ Regent Parrot (*Polytelis anthopeplus*) **K10 Causeway** • 2 EVCs: ○ Intermittent Swampy Woodland ○ Riverine Chenopod Woodland • 72 flora species: ○ 61 indigenous species ○ 11 introduced species none listed under CaLP Act	• Thickets of Black Box should be retained wherever possible **K10 Regulator** • Target surveys for *Abutilon malvifolium* along claypans associated with Chalka Creek during September and October • If site within the footprint cannot be avoided, *Abutilon malvifolium* should be salvaged and translocated • Retain large trees particularly *Eucalyptus camaldulensis* (River Red-gum) *along Chalka Creek.* **K10 Causeway** • Retain very large trees with habitat values wherever possible

Report	Methods	Key Findings	Recommendations
		○ 10 species listed as poorly known or rare or threatened under the Victorian Advisory List • Habitat Hectares Results: ○ Riverine Chenopod Woodland – Total habitat hectares 3.71 with EVC conservation status described as Depleted ○ Intermittent Swampy Woodland - Total habitat hectares 1.43 with EVC conservation status described as Depleted • 46 Large-old trees ○ some large old Black Box (*Eucalyptus largiflorens*) and River Red-gum (*Eucalyptus camaldulensis*) with extensive hollows •18 Fauna species – 12 bird, 3 mammal, 2 reptile and 1 amphibian: ○ 16 indigenous species ○ 2 introduced species • 2 threatened species ○ Lace Monitor (*Varanus varius*) ○ Regent Parrot (*Polytelis anthopeplus*)	
GHD (2018) *SDL Targeted Flora and Fauna Surveys, Hattah North Ecological Assessment*. Report prepared by GHD for Mallee CMA. Mildura, Victoria. April 2018	• Investigates the 3 project sites of interest with buffer zone extended since 2015 survey • Review of existing information • Field surveys October-November 2017 • Flora assessment ○ Habitat hectares ○ Large Old trees ○ in areas inundated with recent environmental flows, vegetation was assessed using arterial imagery supplemented by site observations from adjacent dry land • Fauna assessment: ○Recording identified fauna, and their observed behaviour (e.g. feeding, roosting, breeding), abundance and conservation status. ○ Pest fauna posing a threat to native vegetation and/or fauna. ○ Active searching of appropriate habitats (logs, tree hollows, tussocks, deep litter etc.) and food plants (i.e. fruit and/or nectar bearing) for	**Bitterang Regulator** • 45 flora species in the extended buffer zone ○ 33 native species ○ 12 introduced species ○ No threatened species listed under FFG Act or EBPC Act ○ 5 species protected under the FFG Act ○ 2 rare or threatened species listed under the Victorian Advisory list ○Threatened species Leek Flax-Lily (*Dianella* porracea) recorded immediately adjacent to the extended buffer • 12 weed species, 1 listed under CaLP Act • EVC Riverine Chenopod Woodland was identified in the extended buffer and confirmed in the construction footprint as identified in 2015 • 102 large-old trees • 42 fauna species, 40 bird, 1 fish and 1 reptile ○ 41 native species ○ 1 exotic species • 3 species listed as significant or threatened: ○ *Varanus varius* (Lace Monitor) ○ *Polytelis anthopeplus* (Regent Parrot) ○ *Struthidea cinerea* (Apostlebird)	A number of recommendations were made in regards to permits and environmental approvals. The following were recommended to be considered during the detailed design phase, permit application phase and during implementation of the project: • Avoid disturbance to Hattah-Kulkyne Lakes and the Murray River where practicable. • Manage habitat clearing and removal of hollow-bearing trees/limbs with respect to fauna. • Flag no go zones for significant species (e.g. Leek Flax-lily) that occur close to the construction area to avoid impacts. • Retain as many Large Old Trees as practicable in the extended buffer zones, in accordance with the recommendations of Australian Ecosystems (2015) for the original construction footprint area. • Use existing disturbed areas or areas of non-native vegetation for lay-downs and stockpiling. • Where practicable, avoid areas of high quality vegetation and vegetation that supports rare or threatened flora (e.g. Riverine Grassy Woodland at K10 Regulator). • Where practicable, avoid areas of disturbance-sensitive vegetation Flood Pondway Herbland

Report	Methods	Key Findings	Recommendations
	mammals, birds, reptiles and frogs and habitat assessments for threatened fauna. ○ Timed 20 min, 2 ha bird surveys at all sites as a standard method for detecting bird activity. ○ Habitat assessments for threatened fauna were conducted • Comparison with data collected in Australian Ecosystems (2015)	**K10 Causeway** • 52 flora species in the extended buffer zone ○ 41 native species ○ 11 introduced species ○ No threatened species listed under FFG Act or EBPC Act in 2017 ○ 6 species protected under the FFG Act ○ 4 rare or threatened species listed under the Victorian Advisory List in the extended buffer zone • 11 weed species, none listed under CaLP Act • EVCs identified in 2015 confirmed, with the addition of EVC Sub-Saline Depression Shrubland in the extended buffer zone with a habitat hectares score of 0.05 and conservation status described as depleted. • 23 large-old trees • 29 fauna species: recorded at K10 Causeway, 26 birds, 3 mammals, 1 reptile ○ 28 native species ○ 1 introduced species • 1 species listed as threatened, Regent Parrot (*Polytelis anthopeplus*) • 1 species Emu (*Dromaius novaehollandiae*) on the Victorian Advisory List **K10 Regulator** • 59 flora species in the extended buffer zone ○ 48 native species ○ 11 introduced species ○ No threatened species listed under FFG Act or EBPC Act in 2017 ○ 11 species protected under the FFG Act ○ 1 rare of threatened species listed under the Victorian Advisory List • 13 weed species, 2 listed as restricted under CaLP Act, and 1 of national significance • EVCs identified in 2015 confirmed, plus 1 additional EVC – Riverine Grassy Woodland • Habitat Hectares: ○ Riverine Chenopod Woodland score 0.72 with conservations status described as depleted, ○ Riverine Grass woodland score 0.56, with conservation status described as depleted • 274 large-old trees	• Since the time of year that the current survey was conducted was relatively late in the season, it would be prudent to conduct further searches for rare or threatened flora in early spring, with particular effort directed toward locating the FFG Act listed Mallow-leaf Lantern-flower, which is protected on public land. If re-located, plants should be protected from damage (including grazing) if practicable. Additional searches could be conducted as part of a pre-clearance survey prior to construction. • Manage the removal of hollow-bearing trees (if required): ○Scenario 1 - Where clearing of hollow-bearing trees is proposed during the Regent Parrot breeding period (September through end of January, DoEE, 2017). Avoiding the breeding season is recommended, however where this is not practicable an assessment must be undertaken to determine if Regent Parrots occupy the hollow bearing trees prior to clearing or modification of the tree (to occur at K10 regulator and causeway location only). The assessment must include surveys undertaken by a suitably qualified person of the hollow-bearing trees being removed during the breeding season (September and January). The survey should also include other native hollow-dependent fauna. A protocol needs to be developed/refined from the previous Threatened Species Management Plan for 'The Living Murray Hattah Lakes Environmental Flows Project' (2011) in the event that a Regent Parrot nest is identified just prior to/during construction. ○ Scenario 2 - Where clearing is proposed outside the Regent Parrot breeding season. Complete pre-clearance surveys for the remnant hollow-bearing trees to be removed. These trees could harbour one or more species of native hollow-dependent fauna. Preclearance surveys should be conducted prior to (within 24 hours) of the hollow-bearing trees being removed. • Include the above points to develop and implement mitigation measures for incorporation into an EMP to minimize the potential for ecological impacts within and around the site before, during and after the construction process. These may also include:

Report	Methods	Key Findings	Recommendations
		• 57 fauna species recorded at K10 Regulator, 53 birds, 2 mammal and 2 reptile ○ 56 native species ○ 1 introduced species • 2 significant or threatened species ○ Regent Parrot (*Polytelis anthopeplus*) ○ Emu (*Dromaius novaehollandiae*)	○ Minimise and adhere to the approved footprint, and supervise construction activities to ensure that activities do not encroach on retained native vegetation. ○ Standard vehicle hygiene measures to prevent the spread and introduction of weed species, particularly the weeds of national significance and noxious weeds listed under the CaLP Act. ○ Management of run-off, spills and sediment management to avoid impacts on Chalka Creek. ○ Delineation of areas of remnant native vegetation to be retained from those areas to be removed as no-go zones to avoid encroachment into areas of retained vegetation. • An arborist's report to quantify encroachment from earthworks to Tree Protection Zones during works. • Flagging Tree Protection Zones. • Undertake targeted Regent Parrot nest survey in the spring of 2018 to determine which trees are being utilized for nesting. • Refine and update the 'The Living Murray Hattah Lakes Environmental Flows Project, Threatened Species Management Plan' (2011).

Appendix B. Flora recorded during surveys (August 2019)

Table 16: Flora recorded in K10 regulator construction footprint in 2019 survey

Scientific Name	Common Name	Origin	EPBC Act	FFG Act	DELWP advisory	CaLP Act
Acacia oswaldii	Umbrella Wattle			L	vu	
Acacia stenophylla	Eumong			P		
Atriplex semibaccata	Berry Saltbush					
Brachyscome ciliaris	Variable Daisy			P		
Chenopodium nitrariaceum	Nitre Goosefoot					
Dodonaea viscosa subsp. *angustissima*	Slender Hop-bush					
Duma florulenta	Tangled Lignum					
Eremophila divaricata subsp. *divaricata*	Spreading Emu-bush				r	
Eucalyptus largiflorens	Black Box					
Eucalyptus camaldulensis	River Red-gum					
Fumaria spp.	Fumitory	*				
Goodenia glauca	Pale Goodenia					
Lepidium pseudohyssopifolium	Native Peppercress				k	
Maireana brevifolia	Short-leaf Bluebush					
Myoporum parvifolium	Creeping Myoporum					
Osteocarpum acropterum var. *deminutum*	Babbagia					
Plantago spp.	Plantain					
Pogonolepis muelleriana	Stiff Cup-flower			P		
Ptilotus nobilis	Yellow Tails			P	en	
Ranunculus pentandrus var. *platycarpus*	Inland Buttercup					
Rhagodia spinescens	Hedge Saltbush					
Roepera ammophila	Sand Twin-leaf					
Schenkia australis	Spiked Centaury					
Sclerochlamys brachyptera	Short-wing Saltbush					
Sclerolaena diacantha	Grey Copperburr					
Sclerolaena muricata var. *muricata*	Black Roly-poly				k	
Sclerolaena tricuspis	Streaked Copperburr					
Senecio pinnatifolius	Variable Groundsel			P		
Senecio runcinifolius	Tall Fireweed			P		
Spergularia spp.	Sand Spurrey					
Swainsona microphylla	Small-leaf Swainson-pea				r	
Urtica urens	Small Nettle	*				
Vittadinia spp.	New Holland Daisy			P		

Scientific Name	Common Name	Origin	EPBC Act	FFG Act	DELWP advisory	CaLP Act
KEY						
L	Listed as threatened under the FFG Act					
P	Protected under the FFG 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					

Table 17: Flora recorded in K10 causeway construction footprint in 2019 survey

Scientific Name	Common Name	Origin	EPBC Act	FFG Act	DELWP advisory	CaLP Act
Acacia oswaldii	Umbrella Wattle			L	vu	
Acacia sp.	Wattle			P		
Acacia stenophylla	Eumong			P		
Asperula sp.	Woodruff					
Atriplex lindleyi subsp. *lindleyi*	Flat-top Saltbush				k	
Atriplex nummularia	Old-man Saltbush					
Brachyscome ciliaris var. *ciliaris*	Variable Daisy			P		
Chenopodium nitrariaceum	Nitre Goosefoot					
Disphyma crassifolium subsp. *clavellatum*	Rounded Noon-flower					
Duma florulenta	Tangled Lignum					
Echium plantagineum	Paterson's Curse	*				R
Einadia nutans subsp. *nutans (s.s.)*	Nodding Saltbush					
Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush					
Eremophila divaricata subsp. *divaricata*	Spreading Emu-bush				r	
Eremophila maculata subsp. *maculata*	Spotted Emu-bush			L	r	
Erodium sp.	Heron's Bill					
Eucalyptus largiflorens	Black Box					
Fumaria sp.	Fumitory	*				
Goodenia glauca	Pale Goodenia					
Haloragis aspera	Rough Raspwort					
Osteocarpum acropterum var. *deminutum*	Babbagia					
Ptilotus spathulatus	Pussy Tails					
Rhagodia spinescens	Hedge Saltbush					
Roepera aurantiaca subsp. *aurantiaca*	Shrubby Twin-leaf					
Sclerochlamys brachyptera	Short-wing Saltbush					

Scientific Name	Common Name	Origin	EPBC Act	FFG Act	DELWP advisory	CaLP Act
Sclerolaena diacantha	Grey Copperburr					
Sclerolaena tricuspis	Streaked Copperburr					
Sida sp.	Sida					
Spergularia spp.	Sand Spurrey					
Tecticornia sp.	Glasswort					

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

Table 18: Flora species recorded in Bitterang regulator and levee construction footprint in 2019 survey.

Scientific Name	Common Name	Origin	EPBC Act	FFG Act	DELWP advisory	CaLP Act
Acacia stenophylla	Eumong			P		
Arctotheca calendula	Cape weed	*				
Atriplex lindleyi	Flat-top Saltbush					
Atriplex suberecta	Sprawling Saltbush					
Brachyscome ciliaris	Variable Daisy			P		
Calotis cuneifolia	Blue Burr-daisy			P	r	
Dissocarpus paradoxus	Hard-head Saltbush					
Dodonaea viscosa subsp. *angustissima*	Slender Hop-bush					
Echium plantagineum	Paterson's Curse	*				R
Einadia nutans	Nodding Saltbush					
Eragrostis spp.	Love Grass					
Eremophila glabra	Common Emu-bush			P		
Eucalyptus camaldulensis	River Red-gum					
Eucalyptus largiflorens	Black Box					
Haloragis aspera	Rough Raspwort					
Hypochaeris spp.	Cat's Ear	*				
Laphangium luteoalbum	Jersey Cudweed			P		
Maireana spp.	Bluebush					
Maireana triptera	Three-wing Bluebush				r	
Olearia pimeleoides	Pimelea Daisy-bush			P		
Onopordum acaulon	Stemless Thistle	*				R

Scientific Name	Common Name	Origin	EPBC Act	FFG Act	DELWP advisory	CaLP Act
Persicaria prostrata	Creeping Knotweed					
Rhagodia spinescens	Hedge Saltbush					
Sclerolaena diacantha	Grey Copperburr					
Stemodia florulenta	Blue Rod					
Swainsona microphylla	Small-leaf Swainson-pea				r	
Swainsona phacoides	Dwarf Swainson-pea			L	en	
Vittadinia dissecta var. *hirta*	Dissected New Holland Daisy			P		
Vittadinia gracilis	Woolly New Holland Daisy			P		
Vittadinia sp.	New Holland Daisy			P		
Wahlenbergia fluminalis	River Bluebell					

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 C. Flora recorded during surveys (January 2020)

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP advisory	CaLP Act	WONS
Native species						
Acacia ligulata	Small Cooba		P			
Acacia rigens	Nealie		P			
Actinobole uliginosum	Flannel Cudweed					
Ajuga australis	Austral Bugle					
Alectryon oleifolius subsp. *canescens*	Cattle Bush					
Allocasuarina luehmannii	Buloke		L, P	*en*		
Asteraceae spp.	Composite					
Atriplex holocarpa	Pop Saltbush		L, P	*vu*		
Atriplex lindleyi	Flat-top Saltbush					
Atriplex pumilio	Mat Saltbush					
Atriplex stipitata	Kidney Saltbush					
Austrostipa scabra	Rough Spear-grass					
Austrostipa sp.	Spear Grass					
Brachyscome lineariloba	Hard-head Daisy					
Callitris gracilis	Slender Cypress-pine					
Chenopodium curvispicatum	Cottony Saltbush					
Dodonaea viscosa	Sticky Hop-bush					
Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush					
Eragrostis dielsii	Mallee Love-grass					
Eucalyptus camaldulensis	River Red-gum					
Eucalyptus largiflorens	Black Box					
Lomandra leucocephala subsp. *robusta*	Woolly Mat-rush					
Maireana brevifolia	Short-leaf Bluebush					
Maireana pyramidata	Black Bluebush					
Maireana triptera	Three-wing Bluebush			*r*		
Marsdenia australis	Doubah			*vu*		
Melaleuca lanceolata	Moonah					
Minuria cunninghamii	Bush Minuria		P	*r*		
Nitraria billardierei	Nitre-bush					
Olearia muelleri	Mueller Daisy-bush					
Olearia pimeleoides	Pimelea Daisy-bush		P			
Osteocarpum acropterum var. *deminutum*	Babbagia					
Pittosporum angustifolium	Weeping Pittosporum					
Plantago turrifera	Crowned Plantain					
Podolepis capillaris	Wiry Podolepis					
Polycalymma stuartii	Poached-eggs Daisy					
Rhagodia spinescens	Hedge Saltbush					

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP advisory	CaLP Act	WONS
Roepera apiculata	Pointed Twin-leaf					
Rytidosperma spp.	Wallaby Grass					
Salsola tragus subsp. *tragus*	Prickly Saltwort					
Sclerochlamys brachyptera	Short-wing Saltbush					
Sclerolaena tricuspis	Streaked Copperburr					
Stemodia florulenta	Blue Rod					
Tecticornia pergranulata	Blackseed Glasswort					
Triodia scariosa	Porcupine Grass					
Vittadinia sp.	New Holland Daisy		P			
Wahlenbergia fluminalis	River Bluebell					
Waitzia acuminata var. *acuminata*	Orange Immortelle		P			
Introduced species						
Aira sp.	Hair Grass					
Asphodelus fistulosus	Onion Weed					
Brassicaceae sp.	Turnip					
Carrichtera annua	Ward's Weed					
Cucumis myriocarpus subsp. *myriocarpus*	Paddy Melon					
Hordeum sp.	Barley Grass					
Marrubium vulgare	Horehound				R	
Medicago sp.	Medic					
Medicago truncatula	Barrel Medic					
Mesembryanthemum nodiflorum	Small Ice-plant					
Opuntia sp.	Prickly Pear				C	WONS
Salvia verbenaca	Wild Sage					
Sisymbrium sp.	Mustard					
Vulpia sp.	Fescue					

Appendix D. Habitat Hectare scoring results of passing bays (January 2020)

Habitat Zone			HZ1	HZ2	HZ3	HZ4
Bioregion			RobP	RobP	RobP	RobP
EVC #			97	97	102	103
EVC Name			SAW (treeless)	SAW	LCS	RCW
		Max Score	Score	Score	Score	Score
Site Condition	Large Old Trees	10	0	9	N/A	10
	Canopy Cover	5	0	2	N/A	3
	Lack of Weeds	15	13	13	13	13
	Understorey	25	5	5	5	15
	Recruitment	10	3	5	10	6
	Organic Litter	5	5	3	3	3
	Logs	5	0	5	N/A	5
	Total Site Score	75	26	42	31	55
	EVC standardiser (e.g. 75/55)		1	1	1.36	1
	Adjusted Site Score		26	42	42	55
Landscape value	Patch Size	10	8	8	8	8
	Neighbourhood	10	8	8	8	8
	Distance to Core	5	4	4	4	4
Habitat Score		**100**	**46**	**62**	**62**	**75**
Habitat points = #/100		**1**	**0.46**	**0.62**	**0.62**	**0.75**

Appendix E. Likelihood of occurrence for rare or threatened flora (construction footprints)

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 study site and species' known range encompasses the study site. Species recorded historically in the 10-km search area, and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the study site, but suitable habitat does not occur within study site, or occurs within study site but with generally low quality and quantity. Species recorded historically in the 10-km study 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 study area.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	No. of Records	Most Recent Record	Source	Likelihood of Occurrence and Impacts
Abutilon malvifolium	Mallow-leaf Lantern Flower		L	en	1	2015	AE report	**Possible.** This species was present at the K10 regulator in 2015 surveys. **Impact unlikely.** Not recorded in subsequent 2017 and 2019 surveys at exact location of 2015 point or elsewhere in footprints.
Acacia oswaldii	Umbrella Wattle		L	vu	3	2001	VBA	**Present.** Present K10 causeway 2017. Present K10 regulator and K10 causeway 2019. **Impact possible.** Recorded on very southern edge of current K10 regulator footprint as well as outside the western side of the K10 causeway. Flagging of this species for no-go would mitigate any impacts.
Allocasuarina luehmannii	Buloke		L	en	14	2012	VBA	**Present.** Identified adjacent to the construction footprint for Passing Bay south. **Impact unlikely.** The proposed construction footprint avoids impacts to this species.
Atriplex holocarpa	Pop Saltbush		L	vu	2	2008	VBA	**Unlikely.** Favourable habitat in study sites, low number of records nearby. Not recorded in 2015, 2017 or 2019 targeted threatened flora surveys.
Caladenia tensa	Rigid Spider-orchid	EN		vu			PMST	**Unlikely.** Lack of suitable habitat in the construction footprint and lack of records nearby.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	No. of Records	Most Recent Record	Source	Likelihood of Occurrence and Impacts
Cullen cinereum	Hoary Scurf-pea		L	en	1	1980	VBA	**Possible.** Favourable habitat in study sites, but only one 1980 record nearby. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Cullen pallidum	Woolly Scurf-pea		L	en	7	2013	VBA	**Possible.** Sites have suboptimal habitat, but several records in search area, including recently. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Cullen patens	Spreading Scurf-pea		L	en	3	2006	VBA	**Possible.** Some habitat in study sites and records in search area. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Cullen tenax	Tough Scurf-pea		L	en	6	2018	VBA	**Possible.** Habitat and several records in area, including recently. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Cyperus rigidellus	Curly Flat-sedge		L	en	1	1971	VBA	**Unlikely.** Good habitat in study sites, but only 1 record in area from 1971. Not recorded in three rounds of targeted surveys.
Eremophila bignoniiflora	Bignonia Emu-bush		L	vu	2	2006	VBA	**Possible.** Suitable habitat in study sites, but low number of nearby records. **Impact unlikely.** Not recorded in 2015. 2017 or 2019 surveys.
Eremophila maculata subsp. *maculata*	Spotted Emu-bush		L	r	2	1997	VBA	**Present.** Present K10 causeway 2015 and 2019. **Impact Likely:** Recorded several metres inside the current construction footprint on the eastern side of K10 causeway. Species likely removed during construction.
Eriocaulon australasicum	Southern Pipewort	EN	L	en	1	1905	VBA	**Highly Unlikely.** Lack of suitable habitat requirements (aquatic) and lack of nearby records in last century.
Geijera parviflora	Wilga		L	en	1	2004	VBA	**Unlikely.** Suboptimal habitat in study sites, but one nearby record. Not recorded in three rounds of threatened flora surveys.
Glycine canescens	Silky Glycine		L	en	5	2013	VBA	**Possible.** Most habitat in study sites is unsuitable, but several records nearby, including recently. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	No. of Records	Most Recent Record	Source	Likelihood of Occurrence and Impacts
Isolepis congrua	Slender Club-sedge		L	vu	1	1986	VBA	**Possible.** Some habitat in study sites, but only one 1986 record nearby. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.
Lepidium monoplocoides	Winged Pepper-cress	EN	L	en			PMST	**Possible.** Suitable habitat in study sites, but no records nearby. Not recorded in three rounds of threatened flora surveys. **Impact unlikely.** Not recorded in 2015. 2017 or 2019 surveys.
Solanum karsense	Menindee nightshade	VU					PMST	**Unlikely.** Not recorded in Victoria previously.
Swainsona murrayana	Slender Darling-pea	VU	L	en			PMST	**Unlikely.** Suboptimal habitat in study sites and lack of records.
Swainsona phacoides	Dwarf Swainson-pea		L	en	5	2001	VBA	**Present.** Recorded in Bitterang regulator and levee construction footprint 2019. **Impact likely.** Recorded near the western edge of the current Bitterang regulator and levee construction footprint, in between the existing track and fence. Mitigation in the form of fencing around area where species is present is possible but may compromise the proposed works plans.
Swainsona pyrophila	Yellow Swainson-pea	VU		vu	1	1952	VBA, PMST	**Unlikely.** Lack of suitable habitat and lack of recent records.
Swainsona sericea	Silky Swainson-pea		L	vu	1	2010	VBA	**Possible.** Suboptimal habitat in study sites, but one record nearby. **Impact unlikely.** Not recorded in 2015, 2017 or 2019 surveys.

KEY

EN Listed as Endangered under the EPBC Act

VU Listed as Vulnerable under the EPBC Act

L Listed as threatened under the FFG 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

Appendix F. Likelihood of occurrence for rare or threatened flora (inundation areas)

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

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 study site and species' known range encompasses the study site. Species recorded historically in the 10-km search area, and generally within the last 30 years.

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

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Abutilon otocarpum	Desert Lantern			vu	5	2/04/2000	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Acacia colletioides	Wait-a-while			r	1	26/08/2018	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas sites and lack of records nearby.
Acacia oswaldii	Umbrella Wattle		L	vu	3	17/11/2001	VBA	**Possible.** A widespread species, is present at K10 causeway 2017, present K10 regulator and K10 causeway 2019. Could also occur in the inundation areas. **Impact Unlikely.** Species scattered throughout the area, inundation unlikely to have an impact on the population.
Acacia victoriae subsp. *victoriae*	Bramble Wattle			r	2	4/06/2003	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.
Allocasuarina luehmannii	Buloke		L	en	10	8/02/2012	VBA	**Unlikely:** Minimal suitable habitat in inundation area. Present only in areas adjacent to inundation areas.
Alternanthera nodiflora	Common Joyweed			k	8	1/04/2019	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Alternanthera sp. 1 (Plains)	Plains Joyweed			k	1	4/04/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.
Amaranthus macrocarpus var. *macrocarpus*	Dwarf Amaranth			vu	1	4/02/1984	VBA	**Unlikely:** Only one record, over 30 years ago.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Ammannia multiflora	Jerry-jerry			vu	2	13/01/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas. Inundation of these areas would promote occurrence of this species.
Amyema linophylla subsp. *orientalis*	Buloke Mistletoe			vu	4	6/07/2006	VBA	**Unlikely.** Lack of suitable habitat trees in the inundation areas.
Aristida holathera var. *holathera*	Tall Kerosene Grass			vu	7	29/05/2013	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Asperula gemella	Twin-leaf Bedstraw			r	3	29/05/2013	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Atriplex holocarpa	Pop Saltbush		L	vu	2	10/09/2008	VBA	**Present.** Some habitat in study sites, recorded in inundation area in January 2020. **Impacts Unlikely.** Species likely only present in low numbers. It is probable inundation with not impact any populations of this species.
Atriplex lindleyi subsp. *lindleyi*	Flat-top Saltbush			k	6	4/04/2017	VBA	**Possible:** Relatively common in area, recorded nearby in 2019. **Impact Unlikely.** Rather widespread and common species, would likely be inundated, but given its distribution, this would have minimal impact on the overall population in the area.
Atriplex papillata	Coral Saltbush			r	5	25/09/2002	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Atriplex pseudocampanulata	Mealy Saltbush			r	13	20/10/2015	VBA	**Possible.** Suitable habitat in the inundation areas, several records nearby. **Impact Unlikely.** Rather widespread and common species, would likely be inundated, but given its distribution, this would have minimal impact on the overall population in the area.
Atriplex spinibractea	Spiny-fruit Saltbush			en	3	24/09/1999	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Austrobryonia micrantha	Mallee Cucumber			r	14	12/12/2018	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas. Inundation of these areas would promote occurrence of this species.
Austrostipa pilata	Prickly Spear-grass			vu	1	5/10/1999	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.
Boerhavia coccinea	Scarlet Spiderling			r	3	19/01/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Caladenia tensa	Greencomb Spider-orchid, Rigid Spider-orchid	EN				species or species habitat may occur within area	PMST	**Unlikely.** Lack of suitable habitat in the construction footprint and lack of records nearby.
Calandrinia corrigioloides	Strap Purslane			r	5	1/09/1991	VBA	**Unlikely:** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Callistemon brachyandrus	Prickly Bottlebrush			r	1	29/05/2013	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Calostemma purpureum s.s.	Garland Lily			r	3	29/05/2013	VBA	**Possible.** Some suitable habitat in the inundation areas, some records nearby. **Impact Unlikely.** Would only occur in low numbers in the inundation area, with better habitat outside the inundation area. Impacts to local population minimal.
Calotis cuneifolia	Blue Burr-daisy			r	11	12/12/2018	VBA	**Possible.** Some suitable habitat in the inundation areas, some records nearby. **Impact Unlikely.** Adverse impacts minimal. This species is adapted to inundation and would possibly establish in higher (than current) numbers around the high water mark once waters start to recede.
Calotis cymbacantha	Burr-daisy			r	1	13/10/2018	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.
Centipeda nidiformis	Cotton Sneezeweed			r	1	12/12/2018	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.
Chenopodium desertorum subsp. *desertorum*	Frosted Goosefoot			r	11	1/04/2019	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Corynotheca licrota	Sand Lily			r	1	1/03/1995	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Cullen cinereum	Hoary Scurf-pea		L	en	1	14/11/1980	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Cullen pallidum	Woolly Scurf-pea		L	en	7	29/05/2013	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Cullen patens	Spreading Scurf-pea		L	en	2	22/05/2006	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Cullen tenax	Tough Scurf-pea		L	en	6	14/05/2018	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Cymbonotus lawsonianus	Bear's-ear			r	2	8/10/1987	VBA	**Unlikely:** Not recorded for over 30 years
Cynodon dactylon var. *pulchellus*	Native Couch			k	23	9/04/2019	VBA	**Possible.** Habitat and several records in area, including recently. **Impact Unlikely.** Widespread and common species in the area. Any impacts to this species in the inundation areas would have minimal effect on the overall local population.
Cyperus pygmaeus	Dwarf Flat-sedge			vu	4	1/02/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Cyperus rigidellus	Curly Flat-sedge		L	en	1	30/11/1971	VBA	**Unlikely** Minimal habitat in inundation areas and only 1 record in area from 1971.
Dianella porracea	Riverine Flax-lily			vu	8	1/04/2019	VBA	**Unlikely**: Lack of suitable habitat currently in proposed inundation areas. Inundation of these areas could promote occurrence of this species.
Digitaria ammophila	Silky Umbrella-grass			vu	2	1/04/2001	VBA	**Unlikely.** Some suitable habitat in inundation areas, but lack of recent records in area.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Duma horrida subsp. *horrida*	Spiny Lignum			r	1	29/05/2013	VBA	**Unlikely.** Some suitable habitat in inundation areas, but lack of records in area.
Elachanthus pusillus	Small Elachanth			r	1	15/10/1986	VBA	**Unlikely:** Only one record, over 30 years ago.
Eragrostis australasica	Cane Grass			vu	3	15/10/2000	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Eragrostis lacunaria	Purple Love-grass			vu	33	5/04/2019	VBA	**Possible.** Suitable habitat in inundation areas, several records nearby, including recently. **Impact Unlikely.** Adverse impacts minimal. This species is adapted to inundation and would possibly establish in higher (than current) numbers around the high water mark once waters start to recede.
Eragrostis setifolia	Bristly Love-grass			vu	5	20/10/2015	VBA	**Possible.** Suitable habitat in inundation areas, several records nearby, including recently. **Impact Unlikely.** Adverse impacts minimal. This species is adapted to inundation and would possibly establish in higher (than current) numbers once waters start to recede.
Eremophila bignoniiflora	Bignonia Emu-bush		L	vu	1	8/06/2006	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Eremophila divaricata subsp. *divaricata*	Spreading Emu-bush			r	21	7/11/2017	VBA	**Possible**: Suitable habitat throughout inundation areas, several records in area. **Impact Unlikely.** Widespread species in area, any impacts through inundation would have minimal overall impacts on the local population of this species.
Euryomyrtus ramosissima subsp. *prostrata*	Nodding Baeckea			r	2	7/11/1991	VBA	**Unlikely:** Not recorded for nearly 30 years.
Fimbristylis aestivalis	Summer Fringe-sedge			k	1	29/03/1970	VBA	**Unlikely:** Not recorded for 50 years.
Frankenia crispa	Hoary Sea-heath			r	4	25/10/1969	VBA	**Unlikely:** Not recorded for over 50 years.
Frankenia foliosa	Leafy Sea-heath			r	1	24/04/1969	VBA	**Unlikely:** Not recorded for over 50 years.
Frankenia serpyllifolia	Bristly Sea-heath			r	5	24/04/1991	VBA	**Unlikely**: Not recorded for nearly 30 years.
Geijera parviflora	Wilga		L	en	1	18/08/2004	VBA	**Unlikely.** Suboptimal habitat in inundation areas, but one nearby record.
Glycine canescens	Silky Glycine		L	en	5	29/05/2013	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Gnephosis tenuissima	Dwarf Cup-flower			r	4	12/11/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas
Haloragis odontocarpa f. octoforma	Toothed Raspwort			vu	1	30/11/1993	VBA	**Unlikely:** Not recorded for nearly 30 years.
Isolepis congrua	Slender Club-sedge		L	vu	1	15/10/1986	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Jasminum didymum subsp. *lineare*	Desert Jasmine			vu	6	23/11/2001	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Lepidium fasciculatum	Bundled Peppercress			k	1	1/10/1948	VBA	**Highly Unlikely**: Only one record, over 70 years ago.
Lepidium monoplocoides	Winged Pepper-cress	EN				species or species habitat likely occur within area	PMST	**Unlikely.** Minimal suitable habitat in the inundation areas and no records nearby.
Lepidium papillosum	Warty Peppercress			k	5	20/10/2015	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Lepidium pseudohyssopifolium	Native Peppercress			k	6	7/11/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Lipocarpha microcephala	Button Rush			vu	1	1/10/1986	VBA	**Unlikely:** Only one record, over 30 years ago.
Maireana sedifolia	Pearl Bluebush			r	2	24/04/1991	VBA	**Unlikely**: Not recorded for nearly 30 years.
Maireana triptera	Three-wing Bluebush			r	5	4/04/2017	VBA	**Present.** Recorded in the inundation areas in January 2020. **Impacts Unlikely.** Very common species in the local area. Impacts to this species through inundation will have minimal impacts on the local polulation overall.
Malacocera tricornis	Goat Head			r	10	20/10/2015	VBA	**Possible.** Some suitable habitat in the inundation areas and several nearby records. **Impacts Unlikely.** Very common species in the local area. Impacts to this species through inundation will have minimal impacts on the local polulation overall.
Millotia macrocarpa	Large-fruited Millotia			r	1	1/09/1991	VBA	**Unlikely**: Not recorded for nearly 30 years.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Minuria cunninghamii	Bush Minuria			r	1	10/09/1941	VBA	**Unlikely**: Not recorded for nearly 80 years.
Minuria integerrima	Smooth Minuria			r	8	20/10/2015	VBA	**Possible.** Some suitable habitat in the inundation areas and several nearby records. **Impact Unlikely.** Adverse impacts minimal. This species is adapted to inundation and would possibly establish in higher (than current) numbers once waters start to recede.
Olearia passerinoides subsp. *passerinoides*	Slender Daisy-bush			r	1	5/03/1970	VBA	**Highly Unlikely:** Not recorded for 50 years.
Olearia subspicata	Spiked Daisy-bush			vu	1	15/10/1960	VBA	**Highly Unlikely:** Not recorded for 60 years.
Ophioglossum polyphyllum	Upright Adder's-tongue			vu	1	23/12/2017	VBA	**Unlikely.** Lack of records nearby.
Phyllanthus lacunarius	Lagoon Spurge			vu	16	19/01/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Phyllanthus lacunellus	Sandhill Spurge			r	25	1/04/2019	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Picris squarrosa	Squat Picris			r	1	13/10/1987	VBA	**Unlikely:** Only one record, over 30 years ago.
Pimelea simplex subsp. *simplex*	Desert Rice-flower			r	1	17/08/2010	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of records nearby.
Pimelea williamsonii	Williamson's Rice-flower			vu	2	16/09/1990	VBA	**Unlikely:** Not recorded for 30 years.
Poa drummondiana	Knotted Poa			r	4	8/10/1990	VBA	**Unlikely:** Not recorded for 30 years.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Ptilotus nobilis var. *nobilis*	Yellow Tails			en	2	14/11/2017	VBA	**Possible:** Recorded in nearby areas in 2019. **Impact Unlikely.** Adverse impacts minimal. This species is adapted to inundation and would possibly establish in higher (than current) numbers once waters start to recede.
Rhyncharrhena linearis	Purple Pentatrope			vu	1	24/12/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation area and lack of records nearby.
Roepera compressa	Rabbit-ears Twin-leaf			vu	1	1/09/1991	VBA	**Unlikely**: Not recorded for nearly 30 years.
Roepera similis	White Twin-leaf			r	5	11/09/2018	VBA	**Unlikely.** Minimal habitat in the inundation areas (prefers Mallee scrub).
Rorippa eustylis	Dwarf Bitter-cress			r	2	29/08/1977	VBA	**Unlikely:** Not recorded for over 40 years.
Rumex crystallinus s.s.	Glistening Dock			vu	5	13/01/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Scaevola depauperata	Skeleton Fan-flower			en	2	1/03/1995	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Sclerolaena divaricata	Tangled Copperburr			k	3	20/10/2015	VBA	**Unlikely.** Lack of suitable habitat in the inundaton area and lack of records nearby.
Sclerolaena muricata var. *muricata*	Black Roly-poly			k	25	7/11/2017	VBA	**Possible:** Recorded nearby in 2019. **Impacts Unlikely.** Very common species in the local area. Impacts to this species through inundation will have minimal impacts on the local population overall.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Sclerolaena patenticuspis	Spear-fruit Copperburr			vu	11	1/04/2019	VBA	**Possible.** Some habitat in the inundation areas and some recent records nearby. **Impacts Unlikely.** Common species in the local area. Impacts to this species through inundation will have minimal impacts on the local population overall.
Sida ammophila	Sand Sida			vu	14	29/10/2011	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Sida fibulifera	Pin Sida			vu	21	9/04/2019	VBA	**Possible.** Some habitat in the inundation areas and some recent records nearby. **Impacts Unlikely.** Common species in the local area. Impacts to this species through inundation will have minimal impacts on the local population overall.
Sida intricata	Twiggy Sida			vu	8	31/08/2018	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Solanum karsense	Menindee Nightshade	VU				species or species habitat may occur within area	PMST	**Unlikely.** Not recorded in Victoria previously.
Stenanthemum notiale subsp. *notiale*	Trident Spyridium			en	1	21/07/1951	VBA	**Highly Unlikely**: Only one record, nearly 80 years ago.
Swainsona microphylla	Small-leaf Swainson-pea			r	17	19/04/2018	VBA	**Possible:** Recorded nearby in 2019. **Impacts Unlikely.** Common species in the local area. Impacts to this species through inundation will have minimal impacts on the local population overall.
Swainsona murrayana	Slender Darling-pea, Slender Swainson, Murray Swainson-pea	VU				species or species habitat likely occur within area	PMST	**Unlikely.** Suboptimal habitat in study sites and lack of records.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Swainsona phacoides	Dwarf Swainson-pea		L	en	8	19/11/2001	VBA	**Possible.** Recorded in Bitterang regulator and levee construction footprint 2019. **Impacts Unlikely.** Species likely only present in low numbers. It is probable inundation with not impact any populations of this species.
Swainsona pyrophila	Yellow Swainson-pea			vu	1	23/11/1952	VBA	**Highly Unlikely**: Only one record, nearly 80 years ago
Swainsona sericea	Silky Swainson-pea		L	vu	1	17/08/2010	VBA	**Unlikely.** Suboptimal habitat in inundation areas and only one record nearby.
Tecticornia flabelliformis	Bead Glasswort	VU				species or species habitat may occur within area	PMST	**Unlikely**: No suitable habitat or records in study area.
Tetragonia eremaea s.s.	Desert Spinach			k	4	10/09/2018	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Tetragonia moorei	Annual Spinach			k	9	20/10/2015	VBA	**Unlikely.** Lack of suitable habitat in the inundation area and lack of records nearby.
Teucrium albicaule	Scurfy Germander			k	3	6/12/2012	VBA	**Unlikely.** Minimal suitable habitat in inundation areas and low number of records nearby.
Triraphis mollis	Needle Grass			r	12	24/12/2017	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas.
Verbena officinalis var. *africana*	Inland Verbena			k	3	14/05/2018	VBA	**Possible.** Some suitable habitat in the inundation areas, and recent records nearby. **Impact Unlikely.** Adverse impacts minimal. This species is adapted to inundation and would possibly establish in higher (than current) numbers once waters start to recede.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Verbena officinalis var. *gaudichaudii*	Native Verbena			k	1	14/05/2018	VBA	**Possible.** Some suitable habitat in the inundation areas, and recent records nearby. **Impact Unlikely.** Adverse impacts minimal. This species is adapted to inundation and would possibly establish in higher (than current) numbers once waters start to recede.
Vittadinia condyloides	Club-hair New Holland Daisy			r	4	5/10/1999	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Vittadinia cuneata var. *hirsuta*	Fuzzy New Holland Daisy			r	1	29/05/2013	VBA	**Unlikely.** Lack of suitable habitat in the inundation areas and lack of recent records nearby.
Wahlenbergia tumidifructa	Mallee Annual-bluebell			r	2	7/10/1987	VBA	**Unlikely:** Not recorded for nearly over 30 years.

KEY

L	Listed as threatened under the FFG Act
P	Protected under the FFG 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
EN	listed as endangered under the EBPC Act
VU	listed as vulnerable under the EBPC Act

Appendix G. Likelihood of occurrence for threatened fauna (construction 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 study site and species' known range encompasses the study site. Species recorded historically in the 10-km search area, and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the study site, but suitable habitat does not occur within study site, or occurs within study site but with generally low quality and quantity. Species recorded historically in the 10-km study 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 study area.

Key: L – Listed EN / en – Endangered. VU / vu – Vulnerable. nt – Near Threatened. cr – Critically Endangered

Table 19: Likelihood of occurrence of FFG Act and EPBC Act listed threatened fauna species, as developed from VBA and PMST searches within a 10 km radius of the construction footprint.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Struthidea cinerea	Apostlebird		L		143	8/11/2018	VBA	**Possible.** Suitable habitat at all sites. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Botaurus poiciloptilus	Australasian Bittern	EN	L	en	1	6/03/1994	VBA PMST	**Unlikely.** Suitable habitat not present within study site.
Gelochelidon macrotarsa	Australian Gull-billed Tern		L	en	2	26/02/2014	VBA	**Unlikely.** Suitable habitat not present within study site.
Ninox connivens	Barking Owl		L	en	1	1/01/1930	VBA	**Unlikely.** Not recorded in area for 80 years.
Falco subniger	Black Falcon		L	vu	2	26/03/2001	VBA	**Possible.** Species may utilise habitats for foraging. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Oxyura australis	Blue-billed Duck		L	en	12	21/03/2017	VBA	**Unlikely.** Suitable habitat not present within study site.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Burhinus grallarius	Bush Stone-curlew		L	en	8	15/01/2006	VBA	**Unlikely.** Suitable habitat present within all study sites but predation by foxes likely to preclude this species.
Hydroprogne caspia	Caspian Tern		L	nt	29	20/06/2014	VBA	**Unlikely.** Suitable habitat not present within study site.
Oreoica gutturalis	Crested Bellbird		L	nt	126	26/08/2018	VBA	**Unlikely.** Suitable habitat not present within study site
Geopelia cuneata	Diamond Dove		L	nt	5	16/11/2005	VBA	**Possible.** Species may utilise habitats for foraging. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Ardea alba modesta	Eastern Great Egret		L	vu	54	1/06/2018	VBA	**Unlikely.** Suitable habitat not present within study site.
Stictonetta naevosa	Freckled Duck		L	en	25	30/07/2008	VBA	**Unlikely.** Suitable habitat not present within study site.
Falco hypoleucos	Grey Falcon		L	en	1	1/01/1930	VBA	**Unlikely.** Not recorded in area for 80 years.
Coracina maxima	Ground Cuckoo-shrike		L	en	2	3/03/2007	VBA	**Unlikely.** Suitable habitat not present within study site.
Melanodryas cucullata	Hooded Robin		L	nt	33	13/06/2010	VBA	**Possible.** Suitable habitat at all sites, species may use habitats to forage. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Egretta garzetta	Little Egret		L	en	12	9/12/2017	VBA	**Unlikely.** Suitable habitat not present within study site.
Lophochroa leadbeateri	Major Mitchell's Cockatoo		L	vu	51	17/10/2018	VBA	**Possible.** Suitable habitat at all sites. **Impact Unlikely.** Impact areas do not include trees suitable for nesting, species wide ranging and suitable surrounding habitat widespread.
Stipiturus mallee	Mallee Emu-wren	EN	L	en	23	1/10/2018	VBA PMST	**Highly unlikely.** Suitable habitat not present within study site.
Leipoa ocellata	Mallee fowl	VU	L	en	14	11/11/2011	VBA PMST	**Highly unlikely.** Suitable habitat not present within study site.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Grantiella picta	Painted Honeyeater	VU	L	vu	1	10/11/1985	VBA PMST	**Possible.** Species may occasionally utilise habitats for foraging. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Ardea intermedia plumifera	Plumed Egret		L	en	11	7/07/2018	VBA	**Unlikely.** Suitable habitat not present within study site.
Pachycephala rufogularis	Red-lored Whistler	VU	L	en	1	1/01/1930	VBA PMST	**Highly unlikely.** Suitable habitat not present within study site.
Calyptorhynchus banksii graptogyne	Red-tailed Black-Cockatoo (south-eastern)	EN	L	en	1	01/01/1857	VBA PMST	**Highly unlikely.** Last record 150 years ago.
Polytelis anthopeplus monarchoides	Regent Parrot	V	L	vu	229	18/10/2018	VBA PMST AE 2015, GHD 2018, GHD 2019	**Present.** Recorded throughout study sites regularly, [redacted] **Impact Unlikely.** Impact to nest trees unlikely with current footprint. Species wide ranging and suitable surrounding nesting habitat widespread.
Neophema splendida	Scarlet-chested Parrot		L	vu	1	12/01/1987	VBA	**Unlikely.** Suitable habitat not present within study site.
Acanthiza iredalei hedleyi	Slender-billed Thornbill (Lowan Mallee)		L	nt	1	3/11/2006	VBA	**Unlikely.** Suitable habitat not present within study site.
Ptilonorhynchus maculatus	Spotted Bowerbird		L	cr	5	1/01/1951	VBA	**Unlikely.** Suitable habitat not present within study site.
Lophoictinia isura	Square-tailed Kite		L	vu	1	13/09/2000	VBA	**Unlikely.** Suitable habitat not present within study site.
Neophema pulchella	Turquoise Parrot		L	nt	1	01/01/1857	VBA	**Unlikely.** Suitable habitat not present within study site.
Haliaeetus leucogaster	White-bellied Sea-Eagle		L	vu	40	12/11/2013	VBA	**Unlikely.** Suitable habitat not present within study site.
Climacteris affinis	White-browed Treecreeper		L	vu	4	20/12/2009	VBA	**Unlikely.** Suitable habitat not present within study site.

Species Name	Common Name	EPBC Act	FFG Act	DELWP advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Nyctophilus corbeni	South-eastern Long-eared Bat	VU	L	en	2	13/11/2007	VBA PMST	**Unlikely.** Suitable habitat not present within study site.
Vermicella annulata	Bandy Bandy		L	vu	1	2/11/2013	VBA	**Unlikely.** Suitable habitat not present within study site.
Morelia spilota metcalfei	Carpet Python	EPBC Act	L	en	13	3/11/1988	VBA	**Possible.** Suitable habitat at all sites. **Impact Unlikely.** Localised impacts possible, consideration of finalised footprint required. Suitable habitat surrounding and widespread.
Varanus varius	Lace Monitor			en	20	2015	VBA	**Possible.** Suitable habitat at all sites. **Impact Unlikely.** Localised impacts possible, consideration of finalised footprint required. Suitable habitat surrounding and widespread.

Appendix H. Likelihood of occurrence for 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 study site and species' known range encompasses the study site. Species recorded historically in the 10-km search area, and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the study site, but suitable habitat does not occur within study site, or occurs within study site but with generally low quality and quantity. Species recorded historically in the 10-km study 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 study area.

Key: L – Listed EN / en – Endangered. VU / vu – Vulnerable. nt – Near Threatened. cr – Critically Endangered.

Table 20 Likelihood of occurrence of FFG Act and EPBC Act listed threatened fauna species, as developed from VBA and PMST searches within a 10 km radius of the inundation areas.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Acanthiza iredalei hedleyi	Slender-billed Thornbill (Lowan Mallee)		L	nt	1	3/11/2006	VBA	**Unlikely**. Suitable habitat not present within inundation extent.
Amytornis striatus	Striated Grasswren			nt	1	30/11/2004	VBA	**Highly Unlikely**. Suitable habitat not present within inundation extent.
Antipodia atralba	Diamond Sand-skipper Butterfly		L	en	1	5/05/1965	VBA	**Unlikely**. Last record over 80 years ago
Ardea alba	Great Egret		L	vu	22	21/03/2017	VBA	**Unlikely.** Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Ardea intermedia plumifera	Plumed Egret		L	en	18	26/11/2018	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Aythya australis	Hardhead			vu	25	13/11/2018	VBA	**Unlikely.** Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Bidyanaus bidyanus	Silver Perch	CR				species or species habitat known to occur within area	PMST	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Biziura lobata	Musk Duck			vu	19	21/03/2017	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Botaurus poiciloptilus	Australasian Bittern	EN				Species or species habitat known to occur within area	PMST	**Unlikely**. Suitable habitat not present within inundation extent.
Burhinus grallarius	Bush Stone-curlew		L	en	8	15/01/2006	VBA	**Unlikely**. Suitable habitat present within the inundation extent but predation by foxes likely to preclude this species
Calamanthus campestris	Rufous Fieldwren			nt	1	18/04/1991	VBA	**Unlikely**. Suitable habitat not present within inundation extent. Last record nearly 30 years ago.
Calamanthus pyrrhopygius	Chestnut-rumped Heathwren		L	vu	2	13/04/2008	VBA	**Unlikely**. Suitable habitat not present within inundation extent.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Calidris ferruginea	Curlew Sandpiper	CR				species or species habitat may occur within area	PMST	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Chlamydera maculata	Spotted Bowerbird		L	cr	3	1/01/1951	VBA	**Unlikely**. Suitable habitat not present within inundation extent. Last record nearly 70 years ago.
Chlidonias hybrida	Whiskered Tern			nt	7	21/10/2018	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Chrysococcyx osculans	Black-eared Cuckoo			nt	1	14/10/2017	VBA	**Unlikely**. Suitable habitat not present within inundation extent.
Cinclosoma castanotum	Chestnut Quail-thrush			nt	3	13/07/2019	VBA	**Unlikely**. Suitable habitat not present within inundation extent.
Climacteris affinis	White-browed Treecreeper		L	vu	4	20/12/2009	VBA	**Unlikely**. Suitable habitat not present within inundation extent.
Climacteris picumnus	Brown Treecreeper			nt	74	4/12/2018	VBA	**Present**. Suitable habitat occurs within the inundation extent and is likely to be used whether environmental water is present or not. **Impact Unlikely.** Inundation of Black Box habitat will not preclude Brown Treecreeper from continuing to utilise woodland habitats.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Coracina maxima	Ground Cuckoo-shrike		L	vu	2	3/03/2007	VBA	**Possible**. Suitable habitat present but likely to be a very occasional visitor only. **Impact Unlikely.** Given the broad foraging and dispersal range of this species, it is unlikely that a short and very occasional period of inundation will adversely impact on this species.
Craterocephalus fluviatilis	Murray Hardyhead	EN				Species or species habitat likely to occur within area	PMST	**Unlikely**. Murray Hardyhead are restricted to a few discrete wetlands only where they were re-introduced. Colonisation during an inundation event is extremely unlikely.
Dromaius novaehollandiae	Emu			nt	78	25/05/2019	VBA	**Present**. Recorded from the inundation extent. **Impact Unlikely.** Given the broad foraging and dispersal range of this species, it is unlikely that a short and very occasional period of inundation will adversely impact on this species.
Egretta garzetta	Little Egret		L	en	4	29/09/2018	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Emydura macquarii	Murray River Turtle		vu	vu	1	19/12/2012	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Galaxias rostratus	Flathead Galaxias	CR				Species or species habitat likely to occur within area	PMST	**Unlikely**. 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	26/02/2014	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Geopelia cuneata	Diamond Dove		L	nt	2	17/09/2000	VBA	**Possible.** Habitat present within the inundation areas. **Impact Unlikely**. Given the broad foraging and dispersal range of this species, it is unlikely that a short and very occasional period of inundation will adversely impact on this species.
Grantiella picta	Painted Honeyeater	VU	L	vu	1	10/11/1985	VBA	**Possible**. Species may occasionally utilise habitats for foraging. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Haliaeetus leucogaster	White-bellied Sea-Eagle		L	vu	22	1/05/2017	VBA	**Unlikely**. Suitable habitat not present within inundation extent, but species likely to benefit from environmental water when present.
Hydroprogne caspia	Caspian Tern		L	nt	20	20/06/2014	VBA	**Unlikely**. Suitable habitat not present within inundation extent, but species likely to benefit from environmental water when present.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Leipoa ocellata	Malleefowl	VU	L	en	4	25/05/2017	VBA	**Occurrence Highly unlikely**. Suitable habitat not present within inundation extent.
Litoria raniformis	Growling Grass Frog	VU				species or species habitat likely occur within area	PMST	**Unlikely**. Suitable habitat not present within inundation extent, but species likely to benefit from environmental water when present.
Lophochroa leadbeateri	Major Mitchell's Cockatoo		L	vu	26	25/05/2019	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Lophoictinia isura	Square-tailed Kite		L	vu	1	13/09/2000	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Maccullochella macquariensis	Trout Cod	EN	cr	L	1	1/01/1970	VBA	**Highly Unlikely**. Suitable habitat not present within inundation extent.
Maccullochella peelii	Murray Cod	VU	vu	L	2	1/01/1970	VBA	**Unlikely**. Suitable habitat not present within inundation extent, but species likely to benefit from environmental water when present.
Macquaria ambigua	Golden Perch		nt	X	1	21/08/2017	VBA	**Unlikely**. Suitable habitat not present within inundation extent, but species likely to benefit from environmental water when present.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Macquaria australasica	Macquarie Perch	EN				species or species habitat may occur within area	PMST	**Highly Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Manorina melanotis	Black-eared Miner	EN				Species or species habitat known to occur within area	PMST	**Highly Unlikely**. Suitable habitat not present within inundation extent.
Melanodryas cucullata	Hooded Robin		L	nt	16	30/12/2008	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Morelia spilota metcalfei	Carpet Python		L	en	12	3/11/1988	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Myotis macropus	Southern Myotis			nt	1	8/11/1994	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Neophema elegans	Elegant Parrot			vu	1	13/10/2005	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Nematalosa erebi	Bony Herring				4	15/02/1995	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	CR				species or species habitat may occur within area	PMST	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Nycticorax caledonicus	Nankeen Night-Heron			nt	11	21/03/2017	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Nyctophilus corbeni	Corben's Long-eared Bat, South-eastern Long-eared Bat	VU				species or species habitat likely occur within area	PMST	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Oreoica gutturalis	Crested Bellbird		L	nt	30	26/07/2019	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Oxyura australis	Blue-billed Duck		L	en	6	29/09/2018	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Pedionomus torquatus	Plains-wanderer	CR				Species or species habitat known to occur within area	PMST	**Unlikely**. Suitable habitat not present within inundation extent.
Pezoporus occcidentalis	Night Parrot	E				Extinct within area	PMST	**Highly Unlikely**. Species presumed extinct in Victoria.
Phalacrocorax varius	Pied Cormorant			nt	46	13/11/2018	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Phascolarctos cinereus	Koala	VU				species or species habitat may occur within area	PMST	**Highly Unlikely.** Suitable habitat not present within inundation extent.
Platalea regia	Royal Spoonbill			nt	9	29/09/2018	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Plegadis falcinellus	Glossy Ibis			nt	1	13/11/2017	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Polytelis anthopeplus	Regent Parrot	VU	L	vu	208	25/05/2019	VBA	**Present.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Pseudonaja aspidorhyncha	Patch-nosed Brown Snake			nt	1	18/01/1986	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Given the broad foraging and dispersal habitat available in the Hattah region for this species it is unlikely that a short and very occasional period of inundation will adversely impact on the Patch-nosed Brown Snake.
Ptilotula plumula	Grey-fronted Honeyeater			vu	2	20/12/2009	VBA	**Unlikely.** Suitable habitat not present within inundation extent.
Rostratula australis	Australian Painted Snipe	EN				species or species habitat likely occur within area	PMST	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Spatula rhynchotis	Australasian Shoveler			vu	8	24/02/2019	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Stictonetta naevosa	Freckled Duck		L	en	11	18/03/1991	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Stipiturus mallee	Mallee Emu-wren	EN	L	en	7	23/09/2008	VBA	**Highly unlikely**. Suitable habitat not present within inundation extent.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Struthidea cinerea	Apostlebird		L		74	8/11/2018	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Todiramphus pyrrhopygius	Red-backed Kingfisher			nt	1	13/09/1979	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.
Tringa stagnatilis	Marsh Sandpiper			vu	1	24/02/1990	VBA	**Unlikely**. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Turnix velox	Little Button-quail			nt	2	25/03/2008	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact** Unlikely. Given the broad foraging and dispersal habitat available in the Hattah region for this species it is unlikely that a short and very occasional period of inundation will adversely impact on the Little button-quail.
Varanus varius	Lace Monitor			en	20	18/10/2015	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Inundation of Black Box habitat will not preclude this species from continuing to utilise woodland habitats.

Scientific Name	Common Name	EPBC	FFG	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact
Vermicella annulata	Bandy Bandy		L	vu	1	10/01/2000	VBA	**Possible.** Suitable habitat occurs within the inundation extent. **Impact Unlikely**. Given the broad foraging and dispersal habitat available in the Hattah region for this species it is unlikely that a short and very occasional period of inundation will adversely impact on the Bandy Bandy.

KEY

L	Listed as threatened under the FFG Act
P	Protected under the FFG 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
EN	listed as endangered under the EPBC Act
CR	listed as critically endangered un the EPBC act
VU	listed as vulnerable under the EPBC Act

Appendix I. Ecological Values mapped in the construction footprints at Hattah North

Appendix H – Figure 1: Ecological values mapped in the construction footprints at Hattah North. Map 1 of 7 - K10 Regulator

VMFRP

Legend

- Indicative Construction Area
- Investigation Area

Ecology point data recorded in 2017

- Threatened Flora Species
- Canopy Tree

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)

Regent Parrot Survey

- RPNT
- THPS

Rare and Threatened Flora recorded in 2015

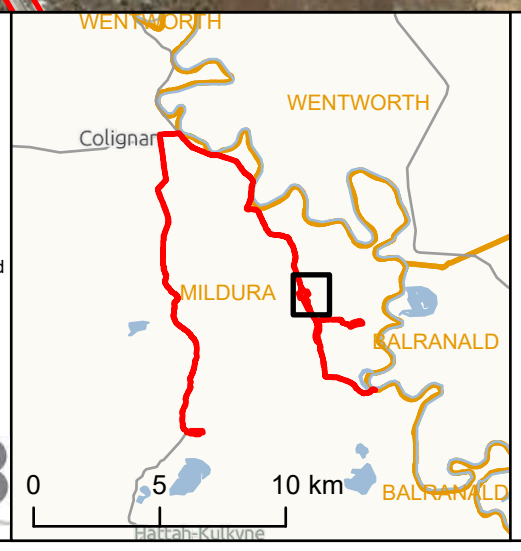
- Rare and Threatened Flora recorded in 2015

Rare and Threatened Flora recorded in 2017

- Rare and Threatened Flora recorded in 2017

Habitat Zones (recorded 2015 - 2020)

- HZ13: EVC 103 Riverine Chenopod Woodland
- HZ14: EVC 813 Intermittent Swampy Woodland
- HZ15: EVC 810 Floodway Pond Herbland
- HZ16: EVC 808 Lignum Shrubland
- HZ17: EVC 295 Riverine Grassy Woodland
- EVC 813 Intermittent Swampy Woodland



IS297701

N

Name: GDA 1994 MGA Zone 55

0 125 250

Meters

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

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

Appendix H – Figure 1: Ecological values mapped in the construction footprints at Hattah North. Map 2 of 7 - K10 Causeway Regulator

VMFRP

River Track

K10 Causeway Regulator

Legend

- Indicative Construction Area
- Investigation Area

Ecology point data recorded in 2017

- Threatened Flora Species
- Canopy Tree

2019 Flora Survey

- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)

Rare and Threatened Flora recorded in 2015

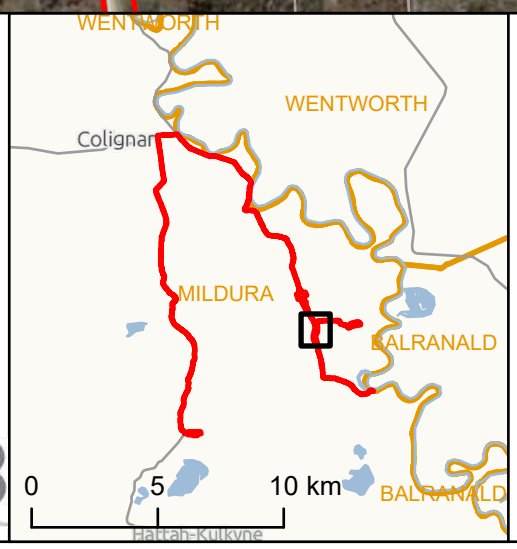
- Rare and Threatened Flora recorded in 2015

Rare and Threatened Flora recorded in 2017

- Rare and Threatened Flora recorded in 2017

Habitat Zones (recorded 2015 - 2020)

- HZ10: EVC 103 Riverine Chenopod Woodland
- HZ11: EVC 813 Intermittent Swampy Woodland
- HZ12: EVC 820 Sub-saline Depression Shrubland



IS297701

N

Name: GDA 1994 MGA Zone 55

0 100 200

Meters

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

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

Appendix H – Figure 1: Ecological values mapped in the construction footprints at Hattah North. Map 3 of 7 - Clay Pit

VMFRP

Clay Pit

Legend

- Indicative Construction Area
- Investigation Area

Ecology point data recorded in 2017

- Threatened Flora Species
- Canopy Tree

Rare and Threatened Flora recorded in 2015

- Rare and Threatened Flora recorded in 2015

Rare and Threatened Flora recorded in 2017

- Rare and Threatened Flora recorded in 2017

Habitat Zones (recorded 2015 - 2020)

- HZ4: EVC 103 Riverine Chenopod Woodland
- HZ5: EVC 808 Lignum Shrubland
- HZ6: EVC 808 Lignum Shrubland
- HZ7: EVC 820 Sub-saline Depression Shrubland
- HZ8: EVC 810 Floodway Pond Herbland
- HZ9: EVC 813 Intermittent Swampy Woodland

IS297701

N

Name: GDA 1994 MGA Zone 55

0 100 200

Meters

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

Appendix H – Figure 1: Ecological values mapped in the construction footprints at Hattah North. Map 4 of 7 - Bitterang Regulator

VMFRP

Mournpall Track
Red Ochre Track
Bitterang Regulator
Eagles Nest Track
Bitterang Track

Legend

- Indicative Construction Area
- Investigation Area

Ecology point data recorded in 2017

- Canopy Tree

2019 Flora Survey

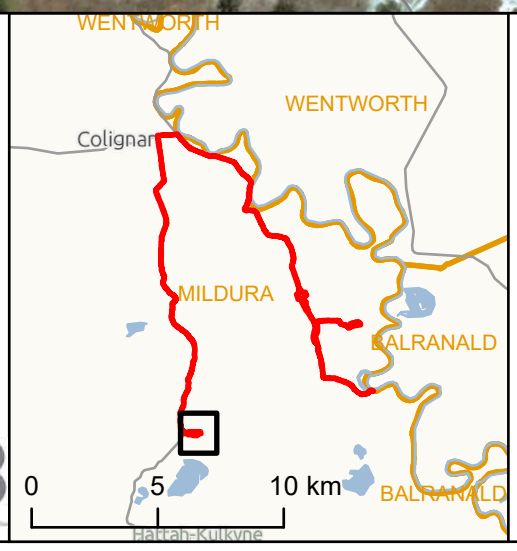
- FFG threatened flora species (2019)
- DELWP advisory rare or threatened flora species (2019)

Rare and Threatened Flora recorded in 2015

- Rare and Threatened Flora recorded in 2015

Habitat Zones (recorded 2015 - 2020)

- HZ1: EVC 103 Riverine Chenopod Woodland
- HZ2: EVC 103 Riverine Chenopod Woodland
- HZ3: EVC 808 Lignum Shrubland
- EVC 103 Riverine Chenopod Woodland
- EVC 824 Woorinen Mallee



IS297701

N

Name: GDA 1994 MGA Zone 55

0 125 250

Meters

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

Appendix H – Figure 1: Ecological values mapped in the construction footprints at Hattah North. Map 5 of 7 - Passing Bay North

VMFRP

Legend

- Indicative Construction Area
- Investigation Area

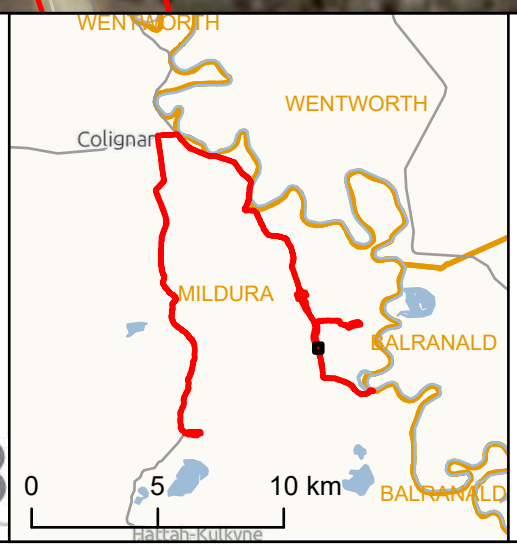
Ecology Field Data

Ecology point data recorded in 2019

- Canopy Tree

Habitat Zones (recorded 2015 - 2020)

- HZ21: EVC 103 Riverine Chenopod Woodland



IS297701

N

Name: GDA 1994 MGA Zone 55

0 25 50

Meters

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

Appendix H – Figure 1: Ecological values mapped in the construction footprints at Hattah North. Map 6 of 7 - Passing Bay Central

VMFRP

Legend

- Indicative Construction Area
- Investigation Area

Ecology Field Data

Ecology point data recorded in 2019

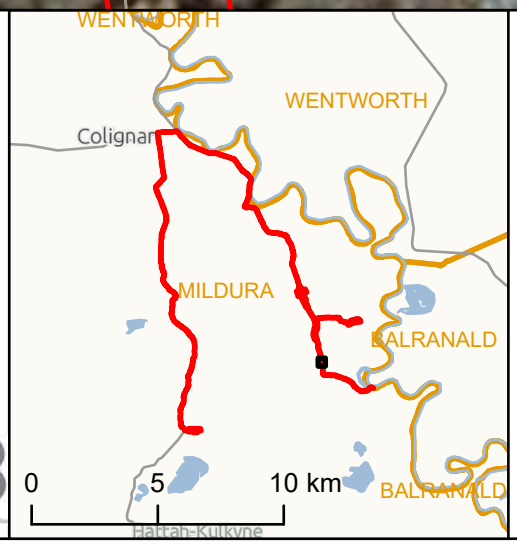
- Canopy Tree

Rare and Threatened Flora recorded in 2015

- Rare and Threatened Flora recorded in 2015

Habitat Zones (recorded 2015 - 2020)

- HZ20: EVC 102 Low Chenopod Shrubland
- HZ21: EVC 103 Riverine Chenopod Woodland



IS297701

N

Name: GDA 1994 MGA Zone 55

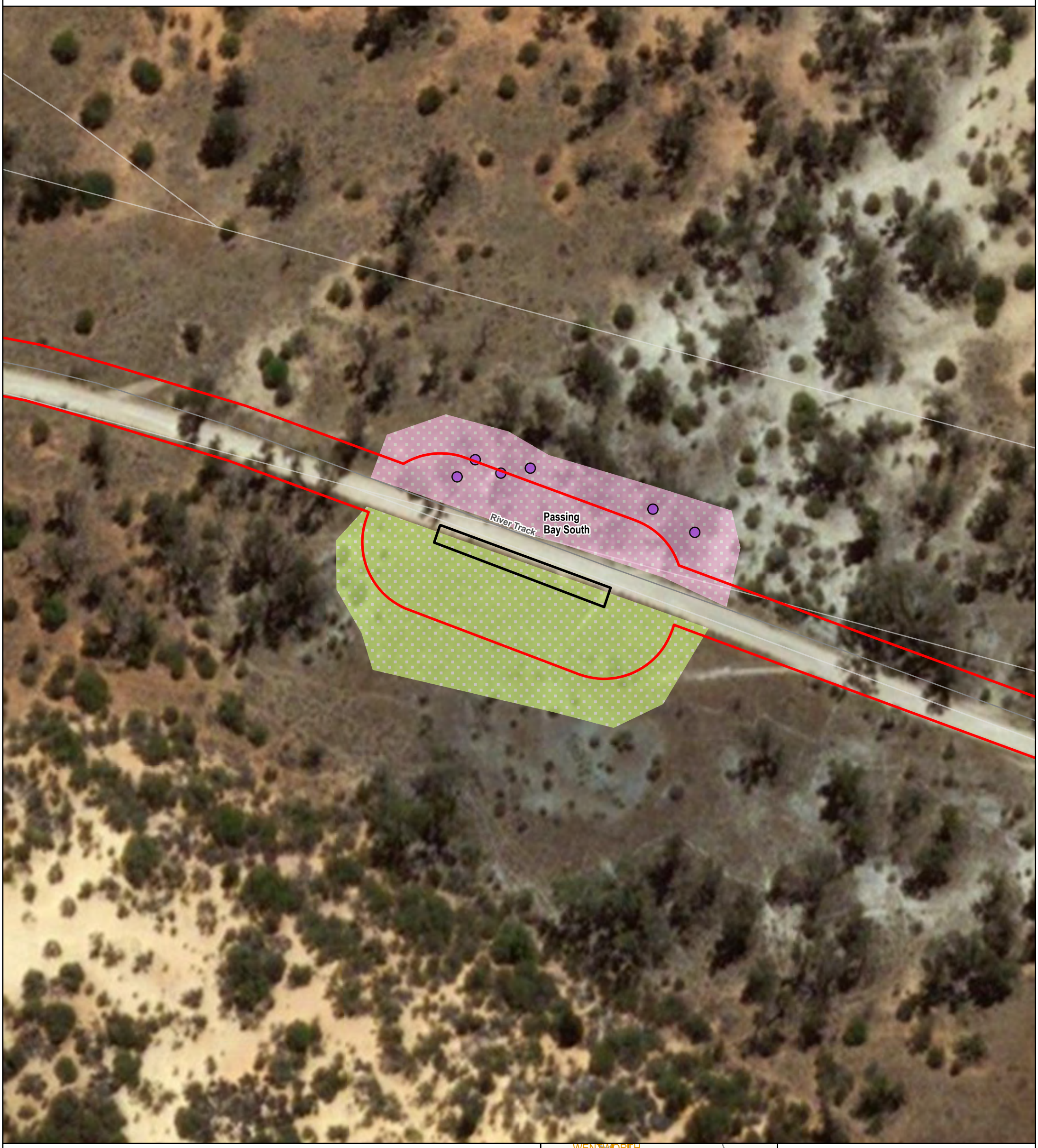
0 25 50

Meters

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

Appendix H – Figure 1: Ecological values mapped in the construction footprints at Hattah North. Map 7 of 7 - Passing Bay South

VMFRP



Legend

- Indicative Construction Area
- Investigation Area

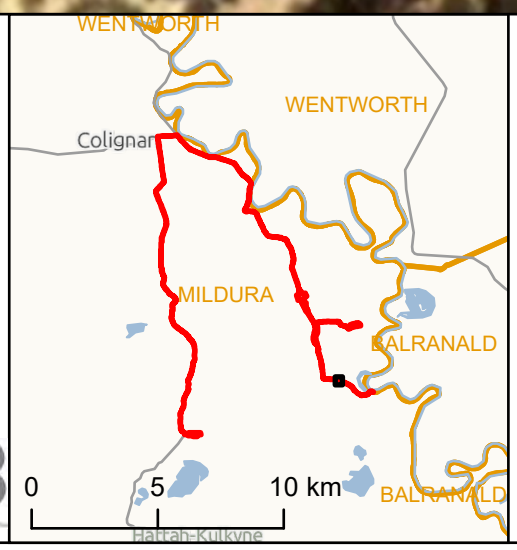
Ecology Field Data

Ecology point data recorded in 2019

- Canopy Tree

Habitat Zones (recorded 2015 - 2020)

- HZ18: EVC 97 Semi-arid Woodland
- HZ19: EVC 97 Semi-arid Woodland



IS297701

N

Name: GDA 1994 MGA Zone 55

0 25 50

Meters

Path: J:\IE\Projects\03_Southern\IS297700\Spatial\ArcPro\AGP\Ecology\Hattah\Hattah_EcologyReport.aprx

Appendix J. Habitat Hectare (VQA) Assessment Results for native vegetation proposed to be impacted

Habitat Zone			HZ1	HZ2	HZ3	HZ4	HZ5	HZ6	HZ7	HZ8	HZ9	HZ10	HZ11	HZ12	HZ13	HZ14	HZ15	HZ16	HZ17	HZ18	HZ19	HZ20	HZ21
Bioregion			RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP	RobP
EVC #			**103**	**103**	**806**	**103**	**808**	**808**	**820**	**810**	**813**	**103**	**813**	**820**	**103**	**813**	**810**	**808**	**295**	**97**	**97**	**103**	**103**
			Riverine Chenopod Woodland	**Riverine Chenopod Woodland**	**Alluvial Plains Semi-arid Grassland**	**Riverine Chenopod Woodland**	**Lignum Shrubland**	**Lignum Shrubland**	**Sub-saline Depression Shrubland**	**Floodway Pond Herbland**	**Intermittent Swampy Woodland**	**Riverine Chenopod Woodland**	**Intermittent Swampy Woodland**	**Sub-saline Depression Shrubland**	**Riverine Chenopod Woodland**	**Intermittent Swampy Woodland**	**Floodway Pond Herbland**	**Lignum Shrubland**	**Riverine Grassy Woodland**	**Semi-arid Woodland**	**Riverine Chenopod Woodland**	**Riverine Chenopod Woodland**	**Riverine Chenopod Woodland**
EVC Name			**RCW**	**RCW**	**APS-AG**	**RCW**	**LS**	**LS**	**SDS**	**FPH**	**ISW**	**RCW**	**ISW**	**SDS**	**RCW**	**ISW**	**FPH**	**LS**	**RGW**	**SAW (treeless)**	**SAW**	**RCW**	**RCW**
Biorgional Conservation Significance			**Depleted**	**Depleted**	**Vulnerable**	**Depleted**	**Least Concern**	**Least Concern**	**Depleted**	**Depleted**	**Depleted**	**Depleted**	**Depleted**	**Depleted**	**Depleted**	**Depleted**	**Depleted**	**Least Concern**	**Depleted**	**Vulnerable**	**Vulnerable**	**Depleted**	**Depleted**
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	Large Old Trees	10	0	0	N/A	9	NA	NA	NA	NA	0	10	10	NA	7		NA	NA	0	0	10	10	10
	Canopy Cover	5	3	0	N/A	4	NA	NA	NA	NA	0	5	5	NA	4	0	NA	NA	4	0	3	3	3
	Lack of Weeds	15	7	7	7	6	7	2	11	7	7	11	9	0	11	6	9	9	9	13	13	13	13
	Understorey	25	15	15	15	20	15	5	25	15	5	20	15	5	15	20	15	15	10	5	15	15	15
	Recruitment	10	10	10	10	3	10	10	10	3	3	10	10	10	5	10	3	5	3	3	6	6	6
	Organic Litter	5	3	0	3	5	5	0	5	3	3	5	5	5	5	3	5	5	5	5	3	3	3
	Logs	5	3	1	N/A	3	NA	NA	NA	NA	0	3	2	NA	0	5	NA	NA	0	0	5	5	5
	Total Site Score	**75**	**41**	**32**	**35**	**50**	**37**	**17**	**51**	**28**	**18**	**64**	**56**	**20**	**47**	**44**	**32**	**34**	**31**	**26**	**55**	**55**	**55**
	EVC standardiser (e.g. 75/55)		1	1	1.36	1	1.36	1.36	1.36	1.36	1	1	1	1.36	1	1	1.36	1.36	1	1	1	1	1
	Adjusted Site Score		**41**	**32**	**48**	**50**	**50**	**23**	**69**	**38**	**18**	**64**	**56**	**27.2**	**47**	**44**	**44**	**46**	**31**	**26**	**55**	**55**	**55**
Landscape	Patch Size	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	8	8	8
	Neighbourhood	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	8	8	8	8
	Distance to Core	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4
Habitat Score		**100**	**66**	**57**	**73**	**75**	**75**	**48**	**94**	**63**	**43**	**89**	**81**	**52**	**72**	**69**	**69**	**71**	**56**	**46**	**62**	**75**	**75**
Habitat points = #/100		**1**	**0.66**	**0.57**	**0.73**	**0.75**	**0.75**	**0.48**	**0.94**	**0.63**	**0.43**	**0.89**	**0.81**	**0.52**	**0.72**	**0.69**	**0.69**	**0.71**	**0.56**	**0.46**	**0.62**	**0.75**	**0.75**

Appendix K. Large Trees Recorded within the Hattah North Project Site

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
K10 Causeway Regulator	1	Black Box	60	Retain
K10 Causeway Regulator	2	River Red-gum	58	Retain
K10 Causeway Regulator	3	River Red-gum	81	Retain
K10 Causeway Regulator	4	River Red-gum	90	Retain
K10 Causeway Regulator	6	Black Box	104	Retain
K10 Causeway Regulator	7	Black Box	116	Retain
K10 Causeway Regulator	8	Black Box	113	Remove
K10 Causeway Regulator	9	Black Box	54	Remove
K10 Causeway Regulator	10	River Red-gum	75	Retain
K10 Causeway Regulator	11	Black Box	42	Retain
K10 Causeway Regulator	13	Black Box	57	Retain
K10 Causeway Regulator	14	Black Box	70	Retain
K10 Causeway Regulator	15	Black Box	66	Retain
K10 Causeway Regulator	16	River Red-gum	84	Retain
K10 Causeway Regulator	17	River Red-gum	54	Retain
K10 Causeway Regulator	18	River Red-gum	84	Retain
K10 Causeway Regulator	20	River Red-gum	69	Retain
K10 Causeway Regulator	22	River Red-gum	49	Retain
K10 Causeway Regulator	23	River Red-gum	66	Retain
K10 Causeway Regulator	24	River Red-gum	87	Retain
K10 Causeway Regulator	25	River Red-gum	49	Retain
K10 Causeway Regulator	26	Black Box	90	Retain
Claypit	27	River Red-gum	126	Retain
ClayPit	28	Black Box	57	Retain
ClayPit	29	Black Box	75	Retain
ClayPit	30	Black Box	93	Retain
ClayPit	31	Black Box	56	Retain
ClayPit	32	Black Box	44	Retain
ClayPit	33	Black Box	49	Retain
ClayPit	34	Black Box	151	Retain
ClayPit	35	Black Box	56	Retain
ClayPit	36	Black Box	100	Retain
ClayPit	37	Black Box	91	Retain
ClayPit	38	Black Box	58	Retain
ClayPit	39	Black Box	60	Retain
ClayPit	40	Black Box	84	Retain
ClayPit	41	Black Box	51	Retain
ClayPit	42	Black Box	89	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
ClayPit	43	Black Box	93	Retain
ClayPit	44	Black Box	57	Retain
ClayPit	45	Black Box	46	Retain
ClayPit	46	Black Box	44	Retain
ClayPit	47	Black Box	47	Retain
ClayPit	48	Black Box	62	Retain
ClayPit	49	Black Box	86	Retain
ClayPit	50	Black Box	49	Retain
ClayPit	51	River Red-gum	96	Retain
ClayPit	52	Black Box	59	Retain
ClayPit	53	River Red-gum	82	Retain
ClayPit	54	Black Box	68	Retain
ClayPit	55	Black Box	40	Retain
ClayPit	56	Black Box	51	Retain
ClayPit	57	Black Box	70	Retain
ClayPit	58	Black Box	52	Retain
ClayPit	60	Black Box	69	Retain
ClayPit	61	Black Box	100	Retain
ClayPit	62	Black Box	99	Retain
ClayPit	63	River Red-gum	92	Retain
ClayPit	64	Black Box	63	Retain
ClayPit	65	Black Box	67	Retain
ClayPit	66	Black Box	44	Retain
ClayPit	67	Black Box	63	Retain
K10 Regulator	107	River Red-gum	72	Retain
K10 Regulator	108	River Red-gum	112	Retain
K10 Regulator	109	River Red-gum	96	Remove
K10 Regulator	110	River Red-gum	70	Remove
K10 Regulator	111	River Red-gum	88	Remove
K10 Regulator	112	River Red-gum	109	Retain
K10 Regulator	113	River Red-gum	204	Remove
K10 Regulator	114	River Red-gum	71	Retain
K10 Regulator	115	River Red-gum	160	Remove
K10 Regulator	116	Black Box	82	Retain
K10 Regulator	117	River Red-gum	55	Retain
K10 Regulator	118	Black Box	64	Retain
K10 Regulator	119	Black Box	124	Retain
K10 Regulator	120	Black Box	74	Retain
K10 Regulator	121	Black Box	87	Remove
K10 Regulator	122	Black Box	50	Retain
K10 Regulator	123	Black Box	92	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
K10 Regulator	124	Black Box	60	Retain
K10 Regulator	125	Black Box	87	Remove
K10 Regulator	126	Black Box	67	Remove
K10 Regulator	127	Black Box	86	Remove
K10 Regulator	128	River Red-gum	80	Remove
K10 Regulator	129	Black Box	85	Remove
K10 Regulator	130	Black Box	95	Remove
K10 Regulator	131	Black Box	83	Remove
K10 Regulator	132	River Red-gum	130	Remove
K10 Regulator	133	River Red-gum	130	Remove
K10 Regulator	134	River Red-gum	94	Remove
K10 Regulator	135	River Red-gum	151	Retain
K10 Regulator	136	River Red-gum	139	Retain
K10 Regulator	137	River Red-gum	179	Retain
K10 Regulator	138	River Red-gum	111	Retain
K10 Regulator	139	River Red-gum	112	Retain
K10 Regulator	140	River Red-gum	113	Retain
K10 Regulator	141	River Red-gum	109	Retain
K10 Regulator	142	Black Box	60	Retain
K10 Regulator	143	River Red-gum	127	Retain
K10 Regulator	144	Black Box	71	Retain
K10 Regulator	145	Black Box	94	Retain
K10 Regulator	146	River Red-gum	121	Retain
K10 Regulator	147	River Red-gum	86	Retain
K10 Regulator	148	River Red-gum	97	Retain
K10 Regulator	149	River Red-gum	145	Retain
K10 Regulator	150	River Red-gum	105	Retain
K10 Regulator	151	River Red-gum	114	Retain
K10 Regulator	152	River Red-gum	165	Retain
K10 Regulator	153	River Red-gum	157	Retain
K10 Regulator	154	River Red-gum	105	Retain
K10 Regulator	155	River Red-gum	72	Retain
K10 Regulator	156	River Red-gum	98	Retain
K10 Regulator	157	River Red-gum	158	Retain
K10 Regulator	158	River Red-gum	70	Retain
K10 Regulator	159	River Red-gum	87	Retain
K10 Regulator	160	River Red-gum	164	Retain
K10 Regulator	161	River Red-gum	77	Retain
K10 Regulator	162	River Red-gum	75	Retain
K10 Regulator	163	River Red-gum	106	Retain
K10 Regulator	164	River Red-gum	148	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
K10 Regulator	165	River Red-gum	137	Retain
K10 Regulator	166	River Red-gum	268	Retain
K10 Regulator	167	River Red-gum	76	Retain
K10 Regulator	168	River Red-gum	154	Retain
K10 Regulator	169	River Red-gum	154	Retain
K10 Regulator	170	River Red-gum	108	Retain
K10 Regulator	171	River Red-gum	139	Retain
K10 Regulator	172	River Red-gum	131	Retain
K10 Regulator	173	River Red-gum	121	Retain
K10 Regulator	174	River Red-gum	99	Retain
K10 Regulator	175	Black Box	83	Retain
K10 Regulator	176	Black Box	99	Retain
K10 Regulator	177	River Red-gum	90	Retain
K10 Regulator	178	River Red-gum	130	Retain
K10 Regulator	179	River Red-gum	180	Retain
K10 Regulator	180	River Red-gum	134	Retain
K10 Regulator	181	River Red-gum	189	Retain
K10 Regulator	184	River Red-gum	196	Retain
K10 Regulator	185	River Red-gum	258	Retain
K10 Regulator	186	River Red-gum	159	Retain
K10 Regulator	187	River Red-gum	243	Retain
K10 Regulator	188	River Red-gum	174	Retain
K10 Regulator	189	River Red-gum	213	Retain
K10 Regulator	190	River Red-gum	166	Retain
K10 Regulator	192	River Red-gum	209	Retain
K10 Regulator	193	River Red-gum	253	Retain
K10 Regulator	194	River Red-gum	253	Retain
K10 Regulator	195	Black Box	147	Retain
K10 Regulator	196	River Red-gum	143	Retain
K10 Regulator	197	River Red-gum	310	Retain
K10 Regulator	198	River Red-gum	123	Retain
K10 Regulator	199	River Red-gum	118	Retain
K10 Regulator	200	River Red-gum	140	Retain
K10 Regulator	201	River Red-gum	252	Retain
K10 Regulator	202	River Red-gum	113	Retain
K10 Regulator	203	River Red-gum	127	Retain
K10 Regulator	204	River Red-gum	122	Retain
K10 Regulator	205	River Red-gum	241	Retain
K10 Regulator	206	River Red-gum	135	Retain
K10 Regulator	207	River Red-gum	120	Retain
ClayPit	208	River Red-gum	75	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
ClayPit	209	Black Box	83	Retain
ClayPit	210	River Red-gum	79	Retain
ClayPit	211	River Red-gum	81	Retain
ClayPit	212	River Red-gum	99	Retain
ClayPit	213	Black Box	64	Retain
ClayPit	214	Black Box	64	Retain
ClayPit	215	Black Box	56	Retain
ClayPit	216	Black Box	67	Retain
ClayPit	217	River Red-gum	98	Retain
ClayPit	218	Black Box	55	Retain
ClayPit	219	Black Box	63	Retain
ClayPit	220	Black Box	43	Retain
ClayPit	221	Black Box	42	Retain
ClayPit	222	Black Box	41	Retain
ClayPit	223	Black Box	66	Retain
ClayPit	224	Black Box	69	Retain
ClayPit	225	Black Box	40	Retain
ClayPit	226	Black Box	42	Retain
ClayPit	227	Black Box	42	Retain
ClayPit	228	Black Box	45	Retain
ClayPit	229	Black Box	55	Retain
ClayPit	230	River Red-gum	182	Retain
ClayPit	231	Black Box	53	Retain
ClayPit	232	River Red-gum	125	Retain
ClayPit	233	River Red-gum (dead)	135	Retain
K10 Regulator	234	Black Box (dead)	47	Retain
K10 Regulator	235	Black Box	71	Retain
K10 Regulator	236	Black Box	59	Retain
K10 Regulator	237	Black Box	45	Remove
K10 Regulator	238	Black Box	48	Remove
K10 Regulator	239	Black Box	53	Retain
K10 Regulator	240	Black Box	53	Retain
K10 Regulator	241	Black Box (dead)	46	Retain
K10 Regulator	242	Black Box	54	Remove
K10 Regulator	243	River Red-gum (dead)	49	Remove
K10 Regulator	244	Black Box	48	Retain
K10 Regulator	245	Black Box	44	Retain
K10 Regulator	246	Black Box	54	Retain
K10 Regulator	247	Black Box	55	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
K10 Regulator	248	River Red-gum (dead)	46	Retain
Bitterang Regulator	249	Black Box	45	Retain
Bitterang Regulator	250	Black Box	55	Retain
Bitterang Regulator	251	Black Box	N/A	Retain
Bitterang Regulator	252	Black Box	46	Retain
Bitterang Regulator	253	Black Box	65	Retain
K10 Regulator	286	River Red-gum	167	Retain
K10 Regulator	287	River Red-gum	109	Retain
K10 Regulator	288	River Red-gum	134	Retain
K10 Regulator	289	River Red-gum	93	Retain
K10 Regulator	290	River Red-gum	117	Retain
K10 Regulator	291	River Red-gum	131	Retain
K10 Regulator	292	River Red-gum	98	Retain
K10 Regulator	293	River Red-gum	247	Retain
K10 Regulator	294	River Red-gum	178	Retain
K10 Regulator	295	River Red-gum	119	Retain
K10 Regulator	296	River Red-gum	204	Retain
K10 Regulator	297	River Red-gum	99	Retain
K10 Regulator	298	River Red-gum	196	Retain
K10 Regulator	299	River Red-gum	135	Retain
K10 Regulator	300	River Red-gum	240	Retain
K10 Regulator	301	River Red-gum	96	Retain
K10 Regulator	302	River Red-gum	121	Retain
K10 Regulator	303	River Red-gum	194	Retain
K10 Regulator	304	River Red-gum	173	Retain
K10 Regulator	305	River Red-gum	231	Retain
K10 Regulator	306	River Red-gum	162	Retain
K10 Regulator	307	River Red-gum	178	Retain
K10 Regulator	308	River Red-gum	176	Retain
K10 Regulator	309	River Red-gum	93	Retain
K10 Regulator	310	River Red-gum	112	Retain
K10 Regulator	311	River Red-gum	117	Retain
K10 Regulator	312	River Red-gum	109	Retain
K10 Regulator	313	River Red-gum	82	Retain
K10 Regulator	314	River Red-gum	148	Retain
K10 Regulator	315	River Red-gum	123	Retain
K10 Regulator	316	River Red-gum	107	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
K10 Regulator	317	River Red-gum	120	Retain
K10 Regulator	318	River Red-gum	109	Retain
K10 Regulator	319	River Red-gum	95	Retain
K10 Regulator	320	River Red-gum	68	Retain
K10 Regulator	321	River Red-gum	85	Retain
K10 Regulator	322	River Red-gum	92	Retain
K10 Regulator	323	River Red-gum	94	Retain
K10 Regulator	324	River Red-gum	84	Retain
K10 Regulator	325	River Red-gum	73	Retain
K10 Regulator	326	River Red-gum	61	Retain
K10 Regulator	327	River Red-gum	74	Retain
K10 Regulator	328	River Red-gum	72	Retain
K10 Regulator	329	River Red-gum	88	Retain
K10 Regulator	330	River Red-gum	76	Retain
K10 Regulator	331	River Red-gum	81	Retain
K10 Regulator	332	River Red-gum	71	Retain
K10 Regulator	333	River Red-gum	75	Retain
K10 Regulator	334	River Red-gum	72	Retain
K10 Regulator	335	River Red-gum	70	Retain
K10 Regulator	336	River Red-gum	73	Retain
K10 Regulator	337	River Red-gum	71	Retain
K10 Regulator	338	River Red-gum	73	Retain
K10 Regulator	339	River Red-gum	137	Retain
K10 Regulator	340	River Red-gum	101	Retain
K10 Regulator	341	River Red-gum	109	Retain
K10 Regulator	342	River Red-gum	85	Retain
K10 Regulator	343	River Red-gum	86	Retain
K10 Regulator	344	River Red-gum	148	Retain
K10 Regulator	345	River Red-gum	76	Retain
K10 Regulator	346	River Red-gum	88	Retain
K10 Regulator	347	River Red-gum	75	Retain
K10 Regulator	348	River Red-gum	132	Retain
K10 Regulator	349	River Red-gum	159	Retain
K10 Regulator	350	River Red-gum	77	Retain
K10 Regulator	351	River Red-gum	108	Retain
K10 Regulator	352	River Red-gum	82	Retain
K10 Regulator	353	River Red-gum	112	Retain
K10 Regulator	354	River Red-gum	92	Retain
K10 Regulator	355	River Red-gum	99	Retain
K10 Regulator	356	River Red-gum	96	Retain
K10 Regulator	357	River Red-gum	76	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
K10 Regulator	358	River Red-gum	72	Retain
K10 Regulator	359	River Red-gum	74	Retain
K10 Regulator	360	River Red-gum	132	Retain
K10 Regulator	361	River Red-gum	152	Retain
K10 Regulator	362	River Red-gum	162	Retain
K10 Regulator	363	River Red-gum	215	Retain
K10 Regulator	364	River Red-gum	134	Retain
K10 Regulator	365	River Red-gum	116	Retain
K10 Regulator	366	River Red-gum	97	Retain
K10 Regulator	367	River Red-gum	86	Retain
K10 Regulator	368	River Red-gum	138	Retain
K10 Regulator	369	River Red-gum	152	Retain
K10 Regulator	370	River Red-gum	154	Retain
K10 Regulator	371	River Red-gum	74	Retain
K10 Regulator	372	River Red-gum	78	Retain
K10 Regulator	373	River Red-gum	168	Retain
K10 Regulator	374	River Red-gum	129	Retain
K10 Regulator	375	River Red-gum	156	Retain
K10 Regulator	376	River Red-gum	234	Retain
K10 Regulator	377	River Red-gum	107	Retain
K10 Regulator	378	River Red-gum	78	Retain
K10 Regulator	379	River Red-gum	73	Retain
K10 Regulator	380	Black Box	75	Retain
K10 Regulator	381	River Red-gum	71	Retain
K10 Regulator	382	River Red-gum	76	Retain
K10 Regulator	383	Black Box	86	Retain
K10 Regulator	384	River Red-gum	124	Retain
K10 Regulator	385	River Red-gum	107	Retain
K10 Regulator	386	River Red-gum	83	Retain
K10 Regulator	387	River Red-gum	72	Retain
K10 Regulator	388	River Red-gum	71	Retain
K10 Regulator	389	River Red-gum	85	Retain
K10 Regulator	390	River Red-gum	71	Retain
K10 Regulator	391	River Red-gum	107	Retain
K10 Regulator	392	Black Box	197	Retain
K10 Regulator	393	Black Box	108	Retain
K10 Regulator	394	River Red-gum	74	Retain
K10 Regulator	395	River Red-gum	97	Retain
K10 Regulator	396	River Red-gum	80	Retain
Bitterang Regulator	397	Black Box	93	Retain
Bitterang Regulator	398	Black Box	102	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
Bitterang Regulator	399	Black Box	52	Retain
Bitterang Regulator	400	Black Box	81	Retain
Bitterang Regulator	401	Black Box	67	Retain
Bitterang Regulator	402	Black Box	77	Retain
Bitterang Regulator	403	Black Box	53	Retain
Bitterang Regulator	404	Black Box	51	Retain
Bitterang Regulator	405	Black Box	89	Retain
Bitterang Regulator	406	Black Box	62	Retain
Bitterang Regulator	407	Black Box	85	Retain
Bitterang Regulator	408	Black Box	104	Retain
Bitterang Regulator	409	Black Box	88	Retain
Bitterang Regulator	410	Black Box	72	Retain
Bitterang Regulator	411	Black Box	51	Retain
Bitterang Regulator	412	Black Box	54	Retain
Bitterang Regulator	413	Black Box	62	Retain
Bitterang Regulator	414	Black Box	71	Retain
Bitterang Regulator	415	Black Box	79	Retain
Bitterang Regulator	416	Black Box	80	Retain
Bitterang Regulator	417	Black Box	58	Retain
Bitterang Regulator	418	Black Box	72	Retain
Bitterang Regulator	419	Black Box	69	Retain
Bitterang Regulator	420	Black Box	68	Retain
Bitterang Regulator	421	Black Box	76	Retain
Bitterang Regulator	422	Black Box	81	Retain
Bitterang Regulator	423	Black Box	69	Retain
Bitterang Regulator	424	Black Box	61	Retain
Bitterang Regulator	425	Black Box	94	Retain
Bitterang Regulator	426	Black Box	53	Retain
Bitterang Regulator	427	Black Box	105	Retain
Bitterang Regulator	428	Black Box	86	Retain
Bitterang Regulator	429	Black Box	89	Retain
Bitterang Regulator	430	Black Box	73	Retain
Bitterang Regulator	431	Black Box	98	Retain
Bitterang Regulator	432	Black Box	91	Retain
Bitterang Regulator	433	Black Box	87	Retain
Bitterang Regulator	434	Black Box	126	Retain
Bitterang Regulator	435	Black Box	65	Retain
Bitterang Regulator	436	Black Box	59	Retain
Bitterang Regulator	437	Black Box	69	Retain
Bitterang Regulator	438	Black Box	57	Retain
Bitterang Regulator	439	Black Box	54	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
Bitterang Regulator	440	Black Box	54	Retain
Bitterang Regulator	441	Black Box	84	Retain
Bitterang Regulator	442	Black Box	74	Retain
Bitterang Regulator	443	Black Box	61	Retain
Bitterang Regulator	444	Black Box	70	Retain
Bitterang Regulator	445	Black Box	75	Retain
Bitterang Regulator	446	Black Box	50	Retain
Bitterang Regulator	447	Black Box	51	Retain
Bitterang Regulator	448	Black Box	59	Retain
Bitterang Regulator	450	Black Box	86	Retain
Bitterang Regulator	451	Black Box	102	Retain
Bitterang Regulator	452	Black Box	88	Retain
Bitterang Regulator	453	Black Box	77	Retain
Bitterang Regulator	454	Black Box	54	Retain
Bitterang Regulator	455	Black Box	53	Retain
Bitterang Regulator	456	Black Box	76	Retain
Bitterang Regulator	457	Black Box	79	Retain
Bitterang Regulator	458	Black Box	55	Remove
Bitterang Regulator	459	Black Box	57	Retain
K10 Regulator	462	Black Box	N/A	Retain
K10 Regulator	463	Black Box	N/A	Retain
K10 Regulator	464	Black Box	35	Retain
K10 Regulator	465	Black Box	N/A	Retain
K10 Regulator	466	River Red-gum	N/A	Retain
K10 Regulator	467	River Red-gum	N/A	Retain
K10 Regulator	468	River Red-gum	N/A	Retain
K10 Regulator	469	River Red-gum	N/A	Retain
K10 Regulator	470	River Red-gum	180	Retain
K10 Regulator	471	River Red-gum	110	Retain
K10 Regulator	472	River Red-gum	155	Retain
K10 Regulator	473	River Red-gum	275	Retain
K10 Regulator	474	River Red-gum	140	Retain
K10 Regulator	475	River Red-gum	205	Retain
K10 Regulator	477	River Red-gum	275	Retain
K10 Regulator	478	River Red-gum	256	Retain
K10 Regulator	479	River Red-gum	N/A	Retain
K10 Regulator	480	River Red-gum	N/A	Retain
K10 Regulator	481	River Red-gum	N/A	Retain
K10 Regulator	482	River Red-gum	N/A	Retain
K10 Regulator	483	River Red-gum	90	Retain
K10 Regulator	484	River Red-gum	N/A	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
K10 Regulator	485	River Red-gum	N/A	Retain
K10 Regulator	486	River Red-gum	N/A	Retain
K10 Regulator	487	River Red-gum	N/A	Retain
K10 Regulator	488	River Red-gum	80	Retain
K10 Regulator	489	River Red-gum	235	Retain
K10 Regulator	490	River Red-gum	N/A	Retain
K10 Regulator	491	River Red-gum	N/A	Retain
K10 Regulator	492	Black Box	43	Retain
K10 Regulator	493	River Red-gum	N/A	Retain
K10 Regulator	494	River Red-gum	N/A	Retain
K10 Regulator	495	River Red-gum	130	Retain
K10 Regulator	496	Black Box	47	Retain
K10 Regulator	497	River Red-gum	N/A	Retain
K10 Regulator	498	River Red-gum	84	Retain
K10 Regulator	499	River Red-gum	112	Retain
K10 Regulator	500	River Red-gum	105	Retain
K10 Regulator	501	River Red-gum	98	Retain
K10 Regulator	502	River Red-gum	134	Retain
K10 Regulator	503	River Red-gum	115	Retain
K10 Regulator	504	River Red-gum	247	Retain
K10 Regulator	505	River Red-gum	N/A	Retain
K10 Regulator	506	River Red-gum	285	Retain
K10 Regulator	507	River Red-gum	N/A	Retain
K10 Regulator	508	River Red-gum	N/A	Retain
K10 Regulator	509	River Red-gum	160	Retain
K10 Regulator	510	River Red-gum	164	Retain
Bitterang Regulator	511	Black Box	N/A	Retain
Bitterang Regulator	512	Black Box	N/A	Retain
Bitterang Regulator	513	Black Box	N/A	Retain
Bitterang Regulator	514	Black Box	N/A	Retain
Bitterang Regulator	515	Black Box	N/A	Retain
Bitterang Regulator	516	Black Box	N/A	Retain
Bitterang Regulator	517	Black Box	N/A	Retain
Bitterang Regulator	518	Black Box	N/A	Retain
Bitterang Regulator	519	Black Box	N/A	Retain
Bitterang Regulator	520	Black Box	N/A	Retain
Bitterang Regulator	521	Black Box	N/A	Retain
Bitterang Regulator	522	Black Box	N/A	Retain
Bitterang Regulator	523	Black Box	N/A	Retain
Bitterang Regulator	524	Black Box	N/A	Retain
Bitterang Regulator	525	Black Box	N/A	Retain

Location	Tree ID	Tree species	DBH (cm)	Retain or Remove
Bitterang Regulator	526	Black Box	N/A	Retain
Bitterang Regulator	527	Black Box	N/A	Retain
Bitterang Regulator	528	Black Box	N/A	Retain
Bitterang Regulator	529	Black Box	N/A	Retain
Bitterang Regulator	530	Black Box	N/A	Retain
Bitterang Regulator	531	Black Box	N/A	Retain
Bitterang Regulator	532	Black Box	N/A	Retain
Bitterang Regulator	533	Black Box	N/A	Remove
Bitterang Regulator	534	Black Box	N/A	Remove
Bitterang Regulator	535	Black Box	N/A	Retain
Bitterang Regulator	536	Black Box	N/A	Retain
Bitterang Regulator	537	Black Box	N/A	Retain
Bitterang Regulator	538	Black Box	N/A	Retain
Bitterang Regulator	539	Black Box	N/A	Retain
Bitterang Regulator	540	Black Box	65	Retain
Bitterang Regulator	541	Black Box	70	Retain
Bitterang Regulator	542	Black Box	N/A	Retain
Bitterang Regulator	543	Black Box	N/A	Remove
Bitterang Regulator	544	River Red-gum	73	Retain
Bitterang Regulator	545	Black Box	78	Retain
Passing Bay South	608	Buloke	55	Retain
Passing Bay South	609	Buloke	56	Retain
Passing Bay South	610	Buloke	49	Retain
Passing Bay South	611	Buloke	66	Retain
Passing Bay South	612	Buloke	53	Retain
Passing Bay South	613	Buloke	50	Retain
Passing Bay Central	614	River Red-gum	100	Retain

Appendix L. Significance assessment for EPBC-listed flora

Below are the significant impact criteria for species listed under the EPBC Act as either critically endangered or endangered. The criteria are addressed below for the EPBC Endangered (EN) listed *Lepidium monoplocoides* (Winged Peppercress) and any potential impact to this 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
- ***Lead to a long-term decrease in the size of a population***

  Winged Peppercress was not recorded in any of the three targeted threatened flora surveys in 2015, 2017 or 2019. This would suggest that a 'population' of this species does not occur in the vicinity of the proposed works.

- ***Reduce the area of occupancy of the species***

  As touched on above, this species has not been recorded in targeted surveys. There are also no VBA records for the species within a 10 km radius. Therefore, the works are not considered to have an impact on the area of occupancy for this species.

- ***Fragment an existing population into two or more populations***

  No population of the species occurs in impact areas or their immediate surrounds.

- ***Adversely affect habitat critical to the survival of a species***

  Potential habitat (heavy soils near lakes and watercourses (Walsh & Entwisle 1996)) for Winged Peppercress does occur in some of the construction footprint areas. However, the species was not recorded in targeted surveys and no VBA records of the species occur within 10 km. This suggests the proposed construction areas do not contain habitat critical to the survival of the species.

- ***Disrupt the breeding cycle of a population***

  No population of the species occurs in impact areas or their immediate surrounds.

- ***Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline***

  The species has not been recorded nearby, so cannot decline further.

- ***Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat***

  Weed infiltration is possible from the proposed works, and systems must be followed to minimise the impacts of this possibility. However, given Winged Peppercress has not been recorded nearby the construction sites, we would not consider it to be core habitat for the species.

- ***Introduce disease that may cause the species to decline, or***

  The species has not been recorded nearby, so cannot decline further.

- ***Interfere with the recovery of the species.***

  The species will not be directly impacted by the works and therefore will not require recovery in the immediate area.

Appendix M. Significance assessment for EPBC-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 any potential impacts to this 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
- ***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 park boundary (Messenger's/Oatey's Regulator). The proposed construction footprint areas themselves are not used for breeding or foraging by this species [redacted] and represent a very small, moderate quality area of habitat for this mobile species, and is very unlikely to lead to a long-term decrease in the size of an important population of this species. [redacted]

- ***reduce the area of occupancy of an important population***

  The proposed construction footprint areas represent less than 0.04% of the potential habitat for this species (18.94 hectares within 48,000+ hectares of high quality native vegetation within the surrounding National Park), and 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 footprint areas 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 TLM projects did not negatively impact Regent Parrot nesting extent and success.

- ***adversely affect habitat critical to the survival of a species***

  The proposed construction footprint areas 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***

  Regent Parrot breeding behaviour is highly likely to be occurring [redacted] However, the proposed works are not likely to impact this small breeding population, or the other known breeding populations throughout the National Park. [redacted] Impact areas represent less than 0.04% of suitable habitat, and will not directly impact nesting trees or important foraging habitat which is essential to birds when breeding.

- ***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 areas represent very small, isolated and discreet areas of habitat (less than 0.04%) within an extensive area of suitable habitat, and will not directly impact nesting trees or suitable foraging habitat, 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 area of the construction. Appropriate systems must be 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, or***

  The proposed construction works do not pose a risk of introducing disease that could cause the species to decline.

- ***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 directly impacted by the proposed works.

Appendix N. Significance assessment for Migratory Species

Below are the significant impact criteria for EPBC Act listed migratory species used to determine whether there is a chance 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***

  Fourteen migratory species have been identified as having the potential to occur within the construction footprint. Most of these species are either highly unlikely to occur (e.g. Black-eared Miner, Malleefowl, Clamorous Reed Warbler) due to habitat unsuitability or would very rarely use airspace over these footprints (e.g. Fork-tailed Swift, White-throated Needletail). 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. Due to the construction area supporting low quality habitat for migratory species it is unlikely that the proposed works will destroy or isolate important habitat for a migratory species.

  Several species of migratory shorebird such as the Australian Painted Snipe and Latham's Snipe (*Gallinago hardwickii*) are known to respond to environmental water at Hattah and were reported in previous surveys (Cook *et al.* 2011 and Wood *et al.* 2018) and could be expected to utilise the proposed inundation extent for the Hattah North project. Other species of migratory waterbird including Eastern Great Egret (*Ardea modesta*) and Glossy Ibis (*Plegadis falcinellus*) are also known to respond to environmental water and were also reported by Cook *et al.* 2011 and Wood *et al.* 2018 with the potential for both to occur following watering in this location. Wood *et al.* 2018 reporting nesting White-bellied Sea-eagle and several other individual animals following the introduction of environmental water. It likely that proposed inundation of Hattah North habitats will provide periodic habitat for migratory species, particularly species that favour wetland habitats.

- ***result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or***

  Within the proposed construction footprint it is unlikely that the proposed Hattah North 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 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 incease in productivity. Some of the species such as feral cats 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 significantproportion of the population of a migratory species.***

  Given that the proposed construction footprint does 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 O. Significance assessment for Wetlands of International Importance

Below are the significant impact criteria for EPBC Act listed Wetlands of International Importance used to determine whether there is a chance of a significant impact.

Approval is required for an action occurring within or outside a declared Ramsar wetland if the action has, will have, or is likely to have a significant impact on the ecological character of the Ramsar wetland.

A 'declared Ramsar wetland' is an area that has been designated under Article 2 of the Ramsar Convention or declared by the minister to be a declared Ramsar wetland under section 16 of the EPBC Act.

The 'ecological character' is the combination of the ecosystem components, processes and benefits/ services that characterise the wetland at a given point in time. The phrase 'at a given point in time' refers to the time of designation for the Ramsar List.

An action is likely to have a significant impact on the ecological character of a declared Ramsar wetland if there is a real chance or possibility that it will result in:

- ***Areas of the wetland being destroyed or substantially modified***

  The proposed construction footprint is located in a primarily dry landscape currently experiencing drought conditions. It is unlikely that the planned works will destroy or modify existing wetland habitats. However, overall, the project is likely to significantly benefit the environment, reinstating appropriate wetting and drying regimes to over 1,130 ha of wetlands and floodplain that meet ecological water requirements and ecological objectives as set out in Ecological Associates (2014).

- ***a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland***

  The generally dry floodplains of the Hattah North project area will be targeted by this project to deliver environmental water to inundate up to 1,130 ha of floodplain and wetland habitats. Under the current regime of river regulation, drought and climate change, these floodplain/wetland environments are being targeted for a substantial change in hydrological conditions, with a more 'natural' wetting and drying pattern implemented to address the water requirements of vegetation communities and fauna groups (Ecological Associates 2014). The change in frequency, duration and extent of flooding will benefit the habitats present in these areas that currently display poor and declining condition (Wood *et al.* 2018).

- ***the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the wetland being seriously affected***

  Overall, the project is likely to significantly benefit the environment, reinstating appropriate wetting and drying regimes to over 1,130 ha of wetlands and floodplain. The current Hattah North project combined with existing infrastructure will maintain and enhance the health of more than 125 ha of wetlands, almost 1,376 ha of River Red-gum and more than 4,113 ha of Black Box communities. This will 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. The project will enable environmental water to be delivered to complement the broader Hattah Lakes TLM project, assisting in maintaining the ecological character of the Ramsar site. This will be of particular benefit during long dry periods and under current climate change scenarios

- ***a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or***

  There are several potential risks associated with the application of environmental water. Black-water events may 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 (although river regulation and drought conditions exacerbate this risk by increasing the time between site inundation and therefore mobilisation of nutrients following re-wetting). 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.

- ***an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.***

  Within the proposed construction footprint it is unlikely that the proposed Hattah North project will result in the introduction of invasive species that might be harmful to migratory species. A Construction Environmental Management Plan (CEMP) 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 feral cats could potentially prey on migratory waterbirds. An accompanying pest animal management and control program would need to be implemented within the inundation extent, however this may require Parks Victoria to expand current pest control programs within the park.

Appendix P. Fauna species recorded during surveys

Summary of the fauna species recorded during surveys on August 22, 26, 29, and September 2 2019.

Key:

V – Vulnerable under EPBC Act

L – Listed under FFG Act

vu – Victorian Advisory List

Common Name (Scientific Name)	Number	Conservation Status
August 22 2019		
Australian Magpie (*Gymnorhina tibicen*)	4	
Australian Raven (*Corvus coronoides*)	2	
Australian Ringneck (Mallee) (*Barnardius zonarius barnardi*)	4	
Black-faced Cuckooshrike (*Coracina novaehollandiae*)	2	
Brown Treecreeper (*Climacteris picumnus*)	5	
Chestnut-rumped Thornbill (*Acanthiza uropygialis*)	2	
Crested Pigeon (*Ocyphaps lophotes*)	4	
Crimson Rosella (Yellow) (*Platycercus elegans flaveolus*)	6	
Galah (*Eolophus roseicapilla*)	6	
Greater Bluebonnet (*Northiella haematogaster*)	1	
Grey Butcherbird (*Cracticus torquatus*)	2	
Grey Currawong (*Strepera versicolor*)	1	
Grey Shrikethrush (*Colluricincla harmonica*)	3	
Horsfield's Bronze-Cuckoo (*Chrysococcyx basalis*)	1	
Laughing Kookaburra (*Dacelo novaeguineae*)	2	
Little Corella (*Cacatua sanguinea*)	12	
Magpie-lark (*Grallina cyanoleuca*)	6	
Noisy Miner (*Manorina melanocephala*)	20	
Pallid Cuckoo (*Cacomantis pallidus*)	2	
Peaceful Dove (*Geopelia placida*)	2	
Pied Butcherbird (*Cracticus nigrogularis*)	1	
Purple-backed Fairywren (*Malurus assimilis*)	6	
Red-rumped Parrot (*Psephotus haematonotus*)	15	
Regent Parrot (*Polytelis anthopeplus monarchoides*)	22	V / L / vu
Restless Flycatcher (*Myiagra inquieta*)	4	
Rufous Whistler (*Pachycephala rufiventris*)	1	
Southern Whiteface (*Aphelocephala leucopsis*)	2	
Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*)	1	
Striated Pardalote (*Pardalotus striatus*)	6	
Striped Honeyeater (*Plectorhyncha lanceolata*)	8	

Common Name (Scientific Name)	Number	Conservation Status
Sulphur-crested Cockatoo (*Cacatua galerita*)	8	
Tree Martin (*Petrochelidon nigricans*)	30	
Varied Sittella (Black-capped) (*Daphoenositta chrysoptera pileata*)	6	
Weebill (*Smicrornis brevirostris*)	8	
White-browed Babbler (*Pomatostomus superciliosus*)	6	
White-plumed Honeyeater (*Ptilotula penicillata*)	12	
Willie Wagtail (*Rhipidura leucophrys*)	4	
Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*)	4	
August 26 2019		
Australian Magpie (*Gymnorhina tibicen*)	2	
Australian Raven (*Corvus coronoides*)	2	
Australian Ringneck (Mallee) (*Barnardius zonarius barnardi*)	2	
Brown Treecreeper (*Climacteris picumnus*)	2	
Chestnut-rumped Thornbill (*Acanthiza uropygialis*)	2	
Crimson Rosella (Yellow) (*Platycercus elegans flaveolus*)	4	
Galah (*Eolophus roseicapilla*)	15	
Grey Fantail (*Rhipidura albiscapa*)	1	
Grey Shrikethrush (*Colluricincla harmonica*)	1	
Horsfield's Bronze-Cuckoo (*Chrysococcyx basalis*)	1	
Laughing Kookaburra (*Dacelo novaeguineae*)	2	
Magpie-lark (*Grallina cyanoleuca*)	2	
Nankeen Kestrel (*Falco cenchroides*)	1	
Peaceful Dove (*Geopelia placida*)	2	
Pied Butcherbird (*Cracticus nigrogularis*)	2	
Purple-backed Fairywren (*Malurus assimilis*)	2	
Red-rumped Parrot (*Psephotus haematonotus*)	6	
Regent Parrot (*Polytelis anthopeplus monarchoides*)	18	V / L / vu
Restless Flycatcher (*Myiagra inquieta*)	2	
Rufous Whistler (*Pachycephala rufiventris*)	1	
Southern Whiteface (*Aphelocephala leucopsis*)	2	
Striated Pardalote (*Pardalotus striatus*)	6	
Striped Honeyeater (*Plectorhyncha lanceolata*)	2	
Sulphur-crested Cockatoo (*Cacatua galerita*)	6	
Tree Martin (*Petrochelidon nigricans*)	25	
Wedge-tailed Eagle (*Aquila audax*)	1	
Weebill (*Smicrornis brevirostris*)	4	
Western Gerygone (*Gerygone fusca*)	1	
White-browed Babbler (*Pomatostomus superciliosus*)	4	
White-plumed Honeyeater (*Ptilotula penicillata*)	8	
Willie Wagtail (*Rhipidura leucophrys*)	1	

Common Name (Scientific Name)	Number	Conservation Status
August 29 2019		
Australian Magpie (*Gymnorhina tibicen*)	4	
Australian Pelican (*Pelecanus conspicillatus*)	1	
Australian Raven (*Corvus coronoides*)	2	
Australian Ringneck (Mallee) (*Barnardius zonarius barnardi*)	2	
Brown Treecreeper (*Climacteris picumnus*)	2	
Chestnut-rumped Thornbill (*Acanthiza uropygialis*)	2	
Crested Pigeon (*Ocyphaps lophotes*)	4	
Crimson Rosella (Yellow) (*Platycercus elegans flaveolus*)	4	
Galah (*Eolophus roseicapilla*)	4	
Grey Shrike-thrush (*Colluricincla harmonica*)	2	
Horsfield's Bronze-Cuckoo (*Chrysococcyx basalis*)	1	
Inland Thornbill (*Acanthiza apicalis*)	4	
Little Corella (*Cacatua sanguinea*)	5	
Magpie-lark (*Grallina cyanoleuca*)	4	
Mistletoebird (*Dicaeum hirundinaceum*)	1	
Pallid Cuckoo (*Cacomantis pallidus*)	1	
Peaceful Dove (*Geopelia placida*)	2	
Pied Butcherbird (*Cracticus nigrogularis*)	1	
Purple-backed Fairywren (*Malurus assimilis*)	4	
Red-rumped Parrot (*Psephotus haematonotus*)	8	
Regent Parrot (*Polytelis anthopeplus monarchoides*)	25	V / L / vu
Restless Flycatcher (*Myiagra inquieta*)	2	
Southern Whiteface (*Aphelocephala leucopsis*)	4	
Spotted Pardalote (*Pardalotus punctatus*)	4	
Striated Pardalote (*Pardalotus striatus*)	4	
Striped Honeyeater (*Plectorhyncha lanceolata*)	2	
Sulphur-crested Cockatoo (*Cacatua galerita*)	4	
Tree Martin (*Petrochelidon nigricans*)	10	
Wedge-tailed Eagle (*Aquila audax*)	1	
Weebill (*Smicrornis brevirostris*)	6	
Whistling Kite (*Haliastur sphenurus*)	1	
White-browed Babbler (*Pomatostomus superciliosus*)	1	
White-plumed Honeyeater (*Ptilotula penicillata*)	6	
Willie Wagtail (*Rhipidura leucophrys*)	2	
September 2 2019		
Australian Magpie (*Gymnorhina tibicen*)	4	
Australian Raven (*Corvus coronoides*)	2	
Australian Ringneck (Mallee) (*Barnardius zonarius barnardi*)	2	
Black-chinned Honeyeater (*Melithreptus gularis*)	1	

Common Name (Scientific Name)	Number	Conservation Status
Black-faced Cuckooshrike (*Coracina novaehollandiae*)	2	
Brown Treecreeper (*Climacteris picumnus*)	2	
Chestnut-rumped Thornbill (*Acanthiza uropygialis*)	12	
Crested Pigeon (*Ocyphaps lophotes*)	4	
Crimson Rosella (Yellow) (*Platycercus elegans flaveolus*)	4	
Galah (*Eolophus roseicapilla*)	8	
Grey Butcherbird (*Cracticus torquatus*)	1	
Grey Shrikethrush (*Colluricincla harmonica*)	2	
Horsfield's Bronze-Cuckoo (*Chrysococcyx basalis*)	1	
Laughing Kookaburra (*Dacelo novaeguineae*)	2	
Little Corella (*Cacatua sanguinea*)	10	
Little Friarbird (*Philemon citreogularis*)	1	
Magpie-lark (*Grallina cyanoleuca*)	2	
Noisy Miner (*Manorina melanocephala*)	6	
Peaceful Dove (*Geopelia placida*)	4	
Pied Butcherbird (*Cracticus nigrogularis*)	2	
Purple-backed Fairywren (*Malurus assimilis*)	6	
Red-rumped Parrot (*Psephotus haematonotus*)	8	
Regent Parrot (*Polytelis anthopeplus monarchoides*)	16	V / L / vu
Restless Flycatcher (*Myiagra inquieta*)	1	
Southern Whiteface (*Aphelocephala leucopsis*)	2	
Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*)	1	
Striated Pardalote (*Pardalotus striatus*)	4	
Striped Honeyeater (*Plectorhyncha lanceolata*)	4	
Sulphur-crested Cockatoo (*Cacatua galerita*)	6	
Tree Martin (*Petrochelidon nigricans*)	30	
Wedge-tailed Eagle (*Aquila audax*)	1	
Weebill (*Smicrornis brevirostris*)	4	
Whistling Kite (*Haliastur sphenurus*)	1	
White-browed Babbler (*Pomatostomus superciliosus*)	12	
White-plumed Honeyeater (*Ptilotula penicillata*)	12	
Willie Wagtail (*Rhipidura leucophrys*)	2	

Appendix Q. Results of Regent Parrot Two Hour Point Surveys

Summary of the results of targeted Regent Parrot nest surveys [redacted] on August 22, 26, 29, and September 2 2019.

[redacted]

[redacted]

Appendix R. Native Vegetation Removal Report (NVRR)

Native vegetation removal report

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

Date of issue: **10/02/2020**
Time of issue: **2:22 pm**

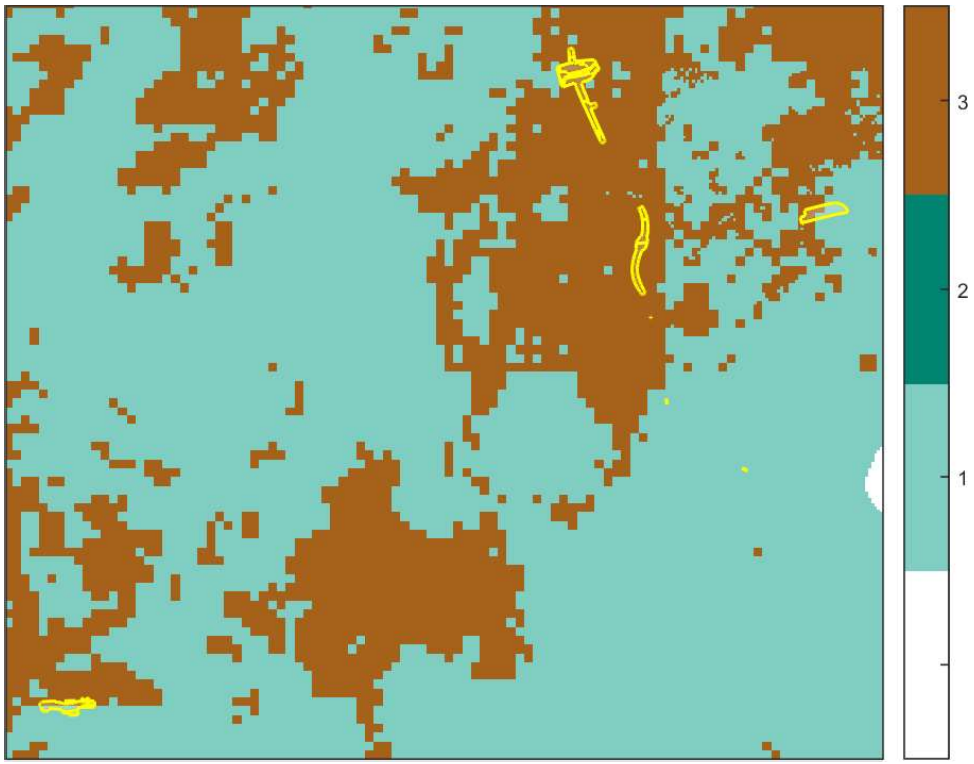
Report ID: GHD_2020_004

Project ID	NVR_3112510225_revB

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	18.939 ha
Extent of past removal	0.000 ha
Extent of proposed removal	18.939 ha
No. Large trees proposed to be removed	27
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.

1. Location map



Offset requirements if a permit is granted

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

Species offset amount[1]	21.725 species units of habitat for Growling Grass Frog, *Litoria raniformis* 26.300 species units of habitat for Carpet Python, *Morelia spilota metcalfei* 12.461 species units of habitat for Twiggy Emu-bush, *Eremophila polyclada* 15.344 species units of habitat for Hairy Darling-pea, *Swainsona greyana* 12.431 species units of habitat for Soda Bush, *Neobassia proceriflora* 12.465 species units of habitat for Native Madder, *Synaptantha tillaeacea var. tillaeacea* 10.956 species units of habitat for Spotted Bowerbird, *Ptilonorhynchus maculatus* 22.098 species units of habitat for Dwarf Burrowing Skink, *Lerista timida* 24.544 species units of habitat for Desert Lantern, *Abutilon otocarpum* 20.446 species units of habitat for Jerry-jerry, *Ammannia multiflora* 24.565 species units of habitat for Spreading Saltbush, *Atriplex limbata* 20.823 species units of habitat for Silver Saltbush, *Atriplex rhagodioides* 20.832 species units of habitat for Darling Lily, *Crinum flaccidum* 20.100 species units of habitat for Silky Umbrella-grass, *Digitaria ammophila* 24.563 species units of habitat for Twin-flower Saltbush, *Dissocarpus biflorus var. biflorus* 20.042 species units of habitat for Bignonia Emu-bush, *Eremophila bignoniiflora* 24.556 species units of habitat for Spreading Emu-bush, *Eremophila divaricata subsp. divaricata* 24.563 species units of habitat for Spotted Emu-bush, *Eremophila maculata subsp. maculata* 12.465 species units of habitat for Plains Spurge, *Euphorbia planiticola* 20.160 species units of habitat for Veined Peppercress, *Lepidium phlebopetalum* 20.847 species units of habitat for Goat Head, *Malacocera tricornis* 20.437 species units of habitat for Woolly Minuria, *Minuria denticulata* 20.832 species units of habitat for Mallee Cucumber, *Austrobryonia micrantha* 15.119 species units of habitat for Desert Glasswort, *Tecticornia triandra* 20.832 species units of habitat for Lagoon Spurge, *Phyllanthus lacunarius* 10.291 species units of habitat for Poverty Bush, *Sclerolaena intricata* 4.958 species units of habitat for Lagoon Nightshade, *Solanum lacunarium* 20.830 species units of habitat for Yakka Grass, *Sporobolus caroli* 15.120 species units of habitat for Small Pop Saltbush, *Atriplex spongiosa* 20.835 species units of habitat for Sandhill Spurge, *Phyllanthus lacunellus* 24.539 species units of habitat for Spiny-fruit Saltbush, *Atriplex spinibractea* 15.746 species units of habitat for Kneed Swainson-pea, *Swainsona reticulata* 7.763 species units of habitat for Cotton Sneezeweed, *Centipeda nidiformis*
Large trees	27 trees

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

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

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

Next steps

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

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

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

Refer to the *Guidelines for the removal, destruction or lopping of native* vegetation (the Guidelines) for a full list of application requirements This report provides information that meets the following application requirements:

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

Additional application requirements must be met including:

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

Authorised by the Victorian Government, 8 Nicholson Street, East Melbourne.

For more information contact the DELWP Customer Service Centre 136 186

www.delwp.vic.gov.au

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

Species habitat units = extent x condition x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
1-B	Patch	mum_0097	Vulnerable	0	no	0.460	0.018	0.018	0.910	0.835	0.016	62969 Carpet Python *Morelia spilota metcalfei*
										0.642	0.014	500003 Desert Lantern *Abutilon otocarpum*
										0.642	0.014	500322 Spreading Saltbush *Atriplex limbata*
										0.359	0.014	502117 Goat Head *Malacocera tricornis*
										0.283	0.014	502200 Woolly Minuria *Minuria denticulata*
2-B	Patch	msb_0102	Depleted	0	no	0.620	0.005	0.005	0.850	0.910	0.006	62969 Carpet Python *Morelia spilota metcalfei*
										0.010	0.006	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.007	0.005	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.770	0.006	500003 Desert Lantern *Abutilon otocarpum*
										0.770	0.006	500202 Jerry-jerry *Ammannia multiflora*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.770	0.006	500322 Spreading Saltbush *Atriplex limbata*
										0.770	0.006	500331 Silver Saltbush *Atriplex rhagodioides*
										0.770	0.006	500874 Darling Lily *Crinum flaccidum*
										0.761	0.006	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.770	0.006	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.770	0.006	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.770	0.006	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.770	0.006	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.010	0.006	501333 Plains Spurge *Euphorbia planiticola*
										0.770	0.006	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.770	0.006	502117 Goat Head *Malacocera tricornis*
										0.770	0.006	502200 Woolly Minuria *Minuria denticulata*
										0.010	0.006	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.010	0.006	502397 Desert Glasswort *Tecticornia triandra*
										0.770	0.006	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.770	0.006	503227 Yakka Grass *Sporobolus caroli*
										0.770	0.006	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.770	0.006	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.770	0.006	504608 Spiny-fruit Saltbush *Atriplex spinibractea*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
3-B	Patch	msb_0103	Depleted	0	no	0.750	0.005	0.005	0.920	0.860	0.007	13207 Growling Grass Frog *Litoria raniformis*
										0.940	0.007	62969 Carpet Python *Morelia spilota metcalfei*
										0.780	0.006	503316 Hairy Darling-pea *Swainsona greyana*
										0.780	0.006	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.560	0.006	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.850	0.007	12492 Dwarf Burrowing Skink *Lerista timida*
										0.780	0.006	500003 Desert Lantern *Abutilon otocarpum*
										0.780	0.006	500202 Jerry-jerry *Ammannia multiflora*
										0.780	0.006	500322 Spreading Saltbush *Atriplex limbata*
										0.780	0.006	500331 Silver Saltbush *Atriplex rhagodioides*
										0.780	0.006	500874 Darling Lily *Crinum flaccidum*
										0.780	0.006	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.780	0.006	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.780	0.006	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.780	0.006	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.780	0.006	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.780	0.006	501333 Plains Spurge *Euphorbia planiticola*
										0.780	0.006	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.780	0.006	502117 Goat Head *Malacocera tricornis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.780	0.006	502200 Woolly Minuria *Minuria denticulata*
										0.780	0.006	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.780	0.006	502397 Desert Glasswort *Tecticornia triandra*
										0.780	0.006	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.780	0.006	503227 Yakka Grass *Sporobolus caroli*
										0.780	0.006	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.780	0.006	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.780	0.006	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.780	0.006	505616 Cotton Sneezeweed *Centipeda nidiformis*
4-B	Patch	msb_0103	Depleted	2	no	0.890	2.158	2.158	0.898	0.875	3.600	13207 Growling Grass Frog *Litoria raniformis*
										0.936	3.718	62969 Carpet Python *Morelia spilota metcalfei*
										0.780	3.419	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.780	3.419	503316 Hairy Darling-pea *Swainsona greyana*
										0.780	3.419	503881 Soda Bush *Neobassia proceriflora*
										0.780	3.419	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.563	3.005	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.575	3.487	12492 Dwarf Burrowing Skink *Lerista timida*
										0.780	3.419	500003 Desert Lantern *Abutilon otocarpum*
										0.780	3.419	500202 Jerry-jerry *Ammannia multiflora*
										0.780	3.419	500322 Spreading Saltbush *Atriplex limbata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.780	3.419	500331 Silver Saltbush *Atriplex rhagodioides*
										0.780	3.419	500874 Darling Lily *Crinum flaccidum*
										0.780	3.419	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.780	3.419	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.780	3.419	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.780	3.419	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.780	3.419	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.780	3.419	501333 Plains Spurge *Euphorbia planiticola*
										0.780	3.419	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.780	3.419	502117 Goat Head *Malacocera tricornis*
										0.780	3.419	502200 Woolly Minuria *Minuria denticulata*
										0.780	3.419	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.780	3.419	502397 Desert Glasswort *Tecticornia triandra*
										0.780	3.419	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.671	3.416	503074 Poverty Bush *Sclerolaena intricata*
										0.627	3.416	503180 Lagoon Nightshade *Solanum lacunarium*
										0.780	3.419	503227 Yakka Grass *Sporobolus caroli*
										0.780	3.419	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.780	3.419	503924 Sandhill Spurge *Phyllanthus lacunellus*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.780	3.419	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.759	3.419	504945 Kneed Swainson-pea *Swainsona reticulata*
										0.780	3.419	505616 Cotton Sneezeweed *Centipeda nidiformis*
5-B	Patch	msb_0103	Depleted	0	no	0.890	0.417	0.417	0.850	0.880	0.697	13207 Growling Grass Frog *Litoria raniformis*
										0.940	0.719	62969 Carpet Python *Morelia spilota metcalfei*
										0.798	0.667	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.798	0.667	503316 Hairy Darling-pea *Swainsona greyana*
										0.798	0.667	503881 Soda Bush *Neobassia proceriflora*
										0.798	0.667	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.574	0.584	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.798	0.667	500003 Desert Lantern *Abutilon otocarpum*
										0.798	0.667	500202 Jerry-jerry *Ammannia multiflora*
										0.798	0.667	500322 Spreading Saltbush *Atriplex limbata*
										0.798	0.667	500331 Silver Saltbush *Atriplex rhagodioides*
										0.798	0.667	500874 Darling Lily *Crinum flaccidum*
										0.798	0.667	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.798	0.667	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.798	0.667	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.798	0.667	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.798	0.667	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.798	0.667	501333 Plains Spurge *Euphorbia planiticola*
										0.798	0.667	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.798	0.667	502117 Goat Head *Malacocera tricornis*
										0.798	0.667	502200 Woolly Minuria *Minuria denticulata*
										0.798	0.667	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.798	0.667	502397 Desert Glasswort *Tecticornia triandra*
										0.798	0.667	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.798	0.667	503074 Poverty Bush *Sclerolaena intricata*
										0.798	0.667	503227 Yakka Grass *Sporobolus caroli*
										0.798	0.667	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.798	0.667	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.798	0.667	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.464	0.664	504945 Kneed Swainson-pea *Swainsona reticulata*
										0.798	0.667	505616 Cotton Sneezeweed *Centipeda nidiformis*
6-B	Patch	robp0813	Depleted	0	no	0.810	1.070	1.070	0.875	0.874	1.624	13207 Growling Grass Frog *Litoria raniformis*
										0.934	1.676	62969 Carpet Python *Morelia spilota metcalfei*
										0.780	1.543	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.780	1.543	503316 Hairy Darling-pea *Swainsona greyana*
										0.780	1.543	503881 Soda Bush *Neobassia proceriflora*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.780	1.543	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.563	1.360	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.547	1.629	12492 Dwarf Burrowing Skink *Lerista timida*
										0.780	1.543	500003 Desert Lantern *Abutilon otocarpum*
										0.780	1.543	500202 Jerry-jerry *Ammannia multiflora*
										0.780	1.543	500322 Spreading Saltbush *Atriplex limbata*
										0.780	1.543	500331 Silver Saltbush *Atriplex rhagodioides*
										0.780	1.543	500874 Darling Lily *Crinum flaccidum*
										0.780	1.543	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.780	1.543	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.780	1.543	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.780	1.543	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.780	1.543	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.780	1.543	501333 Plains Spurge *Euphorbia planiticola*
										0.780	1.543	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.780	1.543	502117 Goat Head *Malacocera tricornis*
										0.780	1.543	502200 Woolly Minuria *Minuria denticulata*
										0.780	1.543	502234 Mallee Cucumber *Austrobryonia micrantha*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.780	1.543	502397 Desert Glasswort *Tecticornia triandra*
										0.780	1.543	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.780	1.543	503074 Poverty Bush *Sclerolaena intricata*
										0.728	1.542	503180 Lagoon Nightshade *Solanum lacunarium*
										0.780	1.543	503227 Yakka Grass *Sporobolus caroli*
										0.780	1.543	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.780	1.543	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.780	1.543	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.780	1.543	504945 Kneed Swainson-pea *Swainsona reticulata*
										0.780	1.543	505616 Cotton Sneezeweed *Centipeda nidiformis*
7-B	Patch	robp0820	Depleted	0	no	0.520	0.008	0.008	0.850	0.880	0.008	13207 Growling Grass Frog *Litoria raniformis*
										0.940	0.008	62969 Carpet Python *Morelia spilota metcalfei*
										0.810	0.007	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.810	0.007	503316 Hairy Darling-pea *Swainsona greyana*
										0.810	0.007	503881 Soda Bush *Neobassia proceriflora*
										0.810	0.007	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.580	0.006	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.084	0.008	12492 Dwarf Burrowing Skink *Lerista timida*
										0.810	0.007	500003 Desert Lantern *Abutilon otocarpum*
										0.810	0.007	500202 Jerry-jerry *Ammannia multiflora*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.810	0.007	500322 Spreading Saltbush *Atriplex limbata*
										0.810	0.007	500331 Silver Saltbush *Atriplex rhagodioides*
										0.810	0.007	500874 Darling Lily *Crinum flaccidum*
										0.810	0.007	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.810	0.007	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.810	0.007	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.810	0.007	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.810	0.007	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.810	0.007	501333 Plains Spurge *Euphorbia planiticola*
										0.810	0.007	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.810	0.007	502117 Goat Head *Malacocera tricornis*
										0.810	0.007	502200 Woolly Minuria *Minuria denticulata*
										0.810	0.007	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.810	0.007	502397 Desert Glasswort *Tecticornia triandra*
										0.810	0.007	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.810	0.007	503074 Poverty Bush *Sclerolaena intricata*
										0.810	0.007	503227 Yakka Grass *Sporobolus caroli*
										0.810	0.007	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.810	0.007	503924 Sandhill Spurge *Phyllanthus lacunellus*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.810	0.007	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.810	0.007	505616 Cotton Sneezeweed *Centipeda nidiformis*
8-A	Patch	robp0810	Depleted	1	no	0.690	0.893	0.893	0.866	0.814	1.118	13207 Growling Grass Frog *Litoria raniformis*
										0.934	1.192	62969 Carpet Python *Morelia spilota metcalfei*
										0.509	1.098	503316 Hairy Darling-pea *Swainsona greyana*
										0.038	0.931	12492 Dwarf Burrowing Skink *Lerista timida*
										0.778	1.096	500003 Desert Lantern *Abutilon otocarpum*
										0.778	1.096	500202 Jerry-jerry *Ammannia multiflora*
										0.778	1.096	500322 Spreading Saltbush *Atriplex limbata*
										0.778	1.096	500331 Silver Saltbush *Atriplex rhagodioides*
										0.778	1.096	500874 Darling Lily *Crinum flaccidum*
										0.565	1.097	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.778	1.096	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.509	1.098	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.778	1.096	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.778	1.096	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.509	1.098	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.778	1.096	502117 Goat Head *Malacocera tricornis*
										0.509	1.098	502200 Woolly Minuria *Minuria denticulata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.778	1.096	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.778	1.096	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.501	1.096	503227 Yakka Grass *Sporobolus caroli*
										0.778	1.096	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.778	1.096	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.632	1.098	504945 Kneed Swainson-pea *Swainsona reticulata*
9-A	Patch	msb_0103	Depleted	4	no	0.720	1.565	1.565	0.835	0.838	2.071	13207 Growling Grass Frog *Litoria raniformis*
										0.936	2.182	62969 Carpet Python *Morelia spilota metcalfei*
										0.434	2.008	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.777	2.002	503316 Hairy Darling-pea *Swainsona greyana*
										0.142	2.026	503881 Soda Bush *Neobassia proceriflora*
										0.258	2.016	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.305	1.747	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.725	2.090	12492 Dwarf Burrowing Skink *Lerista timida*
										0.777	2.002	500003 Desert Lantern *Abutilon otocarpum*
										0.777	2.002	500202 Jerry-jerry *Ammannia multiflora*
										0.777	2.002	500322 Spreading Saltbush *Atriplex limbata*
										0.777	2.002	500331 Silver Saltbush *Atriplex rhagodioides*
										0.777	2.002	500874 Darling Lily *Crinum flaccidum*
										0.591	2.004	501041 Silky Umbrella-grass *Digitaria ammophila*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.777	2.002	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.777	2.002	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.777	2.002	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.777	2.002	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.258	2.016	501333 Plains Spurge *Euphorbia planiticola*
										0.777	2.002	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.777	2.002	502117 Goat Head *Malacocera tricornis*
										0.777	2.002	502200 Woolly Minuria *Minuria denticulata*
										0.777	2.002	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.737	2.003	502397 Desert Glasswort *Tecticornia triandra*
										0.777	2.002	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.777	2.002	503227 Yakka Grass *Sporobolus caroli*
										0.777	2.002	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.777	2.002	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.777	2.002	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.766	2.002	504945 Kneed Swainson-pea *Swainsona reticulata*
										0.427	2.008	505616 Cotton Sneezeweed *Centipeda nidiformis*
10-A	Patch	msb_0103	Depleted	3	no	0.720	1.567	1.567	0.843	0.806	2.038	13207 Growling Grass Frog *Litoria raniformis*
										0.936	2.185	62969 Carpet Python *Morelia spilota metcalfei*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.252	2.020	503316 Hairy Darling-pea *Swainsona greyana*
										0.164	1.714	12492 Dwarf Burrowing Skink *Lerista timida*
										0.785	2.015	500003 Desert Lantern *Abutilon otocarpum*
										0.605	2.017	500202 Jerry-jerry *Ammannia multiflora*
										0.785	2.015	500322 Spreading Saltbush *Atriplex limbata*
										0.785	2.015	500331 Silver Saltbush *Atriplex rhagodioides*
										0.785	2.015	500874 Darling Lily *Crinum flaccidum*
										0.289	2.015	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.785	2.015	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.253	2.020	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.785	2.015	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.785	2.015	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.043	2.020	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.785	2.015	502117 Goat Head *Malacocera tricornis*
										0.253	2.020	502200 Woolly Minuria *Minuria denticulata*
										0.785	2.015	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.785	2.015	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.758	2.015	503227 Yakka Grass *Sporobolus caroli*
										0.606	2.017	503924 Sandhill Spurge *Phyllanthus lacunellus*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.785	2.015	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.747	2.016	504945 Kneed Swainson-pea *Swainsona reticulata*
11-A	Patch	msb_0103	Depleted	1	no	0.720	0.300	0.300	0.820	0.810	0.390	13207 Growling Grass Frog *Litoria raniformis*
										0.940	0.418	62969 Carpet Python *Morelia spilota metcalfei*
										0.257	0.328	12492 Dwarf Burrowing Skink *Lerista timida*
										0.795	0.387	500003 Desert Lantern *Abutilon otocarpum*
										0.795	0.387	500322 Spreading Saltbush *Atriplex limbata*
										0.795	0.387	500331 Silver Saltbush *Atriplex rhagodioides*
										0.795	0.387	500874 Darling Lily *Crinum flaccidum*
										0.795	0.387	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.795	0.387	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.795	0.387	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.795	0.387	502117 Goat Head *Malacocera tricornis*
										0.399	0.386	502200 Woolly Minuria *Minuria denticulata*
										0.795	0.387	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.795	0.387	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.795	0.387	503227 Yakka Grass *Sporobolus caroli*
										0.795	0.387	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.795	0.387	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
12-A	Patch	robp0813	Depleted	2	no	0.690	0.838	0.838	0.869	0.811	1.047	13207 Growling Grass Frog *Litoria raniformis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.933	1.118	62969 Carpet Python *Morelia spilota metcalfei*
										0.230	1.035	503316 Hairy Darling-pea *Swainsona greyana*
										0.250	0.874	12492 Dwarf Burrowing Skink *Lerista timida*
										0.772	1.025	500003 Desert Lantern *Abutilon otocarpum*
										0.759	1.025	500202 Jerry-jerry *Ammannia multiflora*
										0.772	1.025	500322 Spreading Saltbush *Atriplex limbata*
										0.772	1.025	500331 Silver Saltbush *Atriplex rhagodioides*
										0.772	1.025	500874 Darling Lily *Crinum flaccidum*
										0.591	1.024	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.772	1.025	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.230	1.035	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.772	1.025	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.772	1.025	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.206	1.035	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.759	1.025	502117 Goat Head *Malacocera tricornis*
										0.230	1.035	502200 Woolly Minuria *Minuria denticulata*
										0.772	1.025	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.772	1.025	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.696	1.024	503227 Yakka Grass *Sporobolus caroli*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.759	1.025	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.772	1.025	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.345	1.033	504945 Kneed Swainson-pea *Swainsona reticulata*
13-A	Patch	robp0813	Depleted	4	no	0.690	2.193	2.193	0.859	0.814	2.745	13207 Growling Grass Frog *Litoria raniformis*
										0.923	2.922	62969 Carpet Python *Morelia spilota metcalfei*
										0.649	2.673	503316 Hairy Darling-pea *Swainsona greyana*
										0.055	2.702	12492 Dwarf Burrowing Skink *Lerista timida*
										0.768	2.675	500003 Desert Lantern *Abutilon otocarpum*
										0.768	2.675	500202 Jerry-jerry *Ammannia multiflora*
										0.768	2.675	500322 Spreading Saltbush *Atriplex limbata*
										0.768	2.675	500331 Silver Saltbush *Atriplex rhagodioides*
										0.768	2.675	500874 Darling Lily *Crinum flaccidum*
										0.550	2.678	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.768	2.675	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.544	2.679	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.768	2.675	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.768	2.675	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.280	2.686	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.768	2.675	502117 Goat Head *Malacocera tricornis*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.649	2.673	502200 Woolly Minuria *Minuria denticulata*
										0.768	2.675	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.013	2.678	502397 Desert Glasswort *Tecticornia triandra*
										0.768	2.675	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.669	2.675	503227 Yakka Grass *Sporobolus caroli*
										0.070	2.670	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.768	2.675	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.768	2.675	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.705	2.675	504945 Kneed Swainson-pea *Swainsona reticulata*
14-A	Patch	robp0808	Least Concern	0	no	0.710	0.088	0.088	0.880	0.850	0.116	13207 Growling Grass Frog *Litoria raniformis*
										0.940	0.122	62969 Carpet Python *Morelia spilota metcalfei*
										0.792	0.112	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.792	0.112	503316 Hairy Darling-pea *Swainsona greyana*
										0.500	0.113	503881 Soda Bush *Neobassia proceriflora*
										0.792	0.112	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.556	0.098	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.886	0.118	12492 Dwarf Burrowing Skink *Lerista timida*
										0.792	0.112	500003 Desert Lantern *Abutilon otocarpum*
										0.792	0.112	500202 Jerry-jerry *Ammannia multiflora*
										0.792	0.112	500322 Spreading Saltbush *Atriplex limbata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.792	0.112	500331 Silver Saltbush *Atriplex rhagodioides*
										0.792	0.112	500874 Darling Lily *Crinum flaccidum*
										0.792	0.112	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.792	0.112	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.792	0.112	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.792	0.112	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.792	0.112	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.792	0.112	501333 Plains Spurge *Euphorbia planiticola*
										0.792	0.112	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.792	0.112	502117 Goat Head *Malacocera tricornis*
										0.792	0.112	502200 Woolly Minuria *Minuria denticulata*
										0.792	0.112	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.792	0.112	502397 Desert Glasswort *Tecticornia triandra*
										0.792	0.112	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.792	0.112	503227 Yakka Grass *Sporobolus caroli*
										0.792	0.112	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.792	0.112	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.792	0.112	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.792	0.112	504945 Kneed Swainson-pea *Swainsona reticulata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.792	0.112	505616 Cotton Sneezeweed *Centipeda nidiformis*
15-A	Patch	robp0808	Least Concern	0	no	0.710	0.246	0.246	0.820	0.808	0.315	13207 Growling Grass Frog *Litoria raniformis*
										0.940	0.338	62969 Carpet Python *Morelia spilota metcalfei*
										0.394	0.265	12492 Dwarf Burrowing Skink *Lerista timida*
										0.798	0.314	500003 Desert Lantern *Abutilon otocarpum*
										0.192	0.312	500202 Jerry-jerry *Ammannia multiflora*
										0.798	0.314	500322 Spreading Saltbush *Atriplex limbata*
										0.798	0.314	500331 Silver Saltbush *Atriplex rhagodioides*
										0.798	0.314	500874 Darling Lily *Crinum flaccidum*
										0.798	0.314	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.798	0.314	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.798	0.314	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.798	0.314	502117 Goat Head *Malacocera tricornis*
										0.798	0.314	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.798	0.314	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.798	0.314	503227 Yakka Grass *Sporobolus caroli*
										0.798	0.314	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.798	0.314	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.192	0.312	504945 Kneed Swainson-pea *Swainsona reticulata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
16-A	Patch	robp0813	Depleted	5	no	0.690	0.617	0.617	0.870	0.810	0.770	13207 Growling Grass Frog *Litoria raniformis*
										0.940	0.826	62969 Carpet Python *Morelia spilota metcalfei*
										0.554	0.762	503316 Hairy Darling-pea *Swainsona greyana*
										0.288	0.670	12492 Dwarf Burrowing Skink *Lerista timida*
										0.788	0.761	500003 Desert Lantern *Abutilon otocarpum*
										0.787	0.761	500202 Jerry-jerry *Ammannia multiflora*
										0.788	0.761	500322 Spreading Saltbush *Atriplex limbata*
										0.788	0.761	500331 Silver Saltbush *Atriplex rhagodioides*
										0.788	0.761	500874 Darling Lily *Crinum flaccidum*
										0.697	0.761	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.788	0.761	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.787	0.761	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.788	0.761	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.788	0.761	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.398	0.762	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.788	0.761	502117 Goat Head *Malacocera tricornis*
										0.787	0.761	502200 Woolly Minuria *Minuria denticulata*
										0.788	0.761	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.788	0.761	502502 Lagoon Spurge *Phyllanthus lacunarius*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.407	0.760	503227 Yakka Grass *Sporobolus caroli*
										0.788	0.761	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.788	0.761	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.697	0.761	504945 Kneed Swainson-pea *Swainsona reticulata*
17-D	Patch	msb_0103	Depleted	1	no	0.660	2.632	2.632	0.697	0.932	3.356	62969 Carpet Python *Morelia spilota metcalfei*
										0.130	2.489	12492 Dwarf Burrowing Skink *Lerista timida*
										0.731	3.008	500003 Desert Lantern *Abutilon otocarpum*
										0.416	3.028	500322 Spreading Saltbush *Atriplex limbata*
										0.267	3.041	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.326	3.035	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.218	3.041	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.621	3.016	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
18-D	Patch	msb_0103	Depleted	1	no	0.660	0.011	0.011	0.643	0.940	0.015	62969 Carpet Python *Morelia spilota metcalfei*
										0.438	0.011	12492 Dwarf Burrowing Skink *Lerista timida*
										0.753	0.013	500003 Desert Lantern *Abutilon otocarpum*
										0.753	0.013	500322 Spreading Saltbush *Atriplex limbata*
										0.749	0.013	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.753	0.013	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.117	0.013	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.753	0.013	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
19-D	Patch	msb_0103	Depleted	0	no	0.570	0.197	0.197	0.701	0.933	0.217	62969 Carpet Python *Morelia spilota metcalfei*
										0.230	0.160	12492 Dwarf Burrowing Skink *Lerista timida*
										0.727	0.194	500003 Desert Lantern *Abutilon otocarpum*
										0.727	0.194	500322 Spreading Saltbush *Atriplex limbata*
										0.660	0.194	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.727	0.194	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.660	0.194	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.727	0.194	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
20-D	Patch	robp0806	Vulnerable	0	no	0.730	0.350	0.350	0.750	0.725	0.440	500003 Desert Lantern *Abutilon otocarpum*
										0.669	0.440	500322 Spreading Saltbush *Atriplex limbata*
										0.291	0.439	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.291	0.439	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.291	0.439	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.725	0.440	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
21-C	Patch	msb_0103	Depleted	0	no	0.750	0.026	0.026	0.910	0.920	0.037	13207 Growling Grass Frog *Litoria raniformis*
										0.930	0.037	62969 Carpet Python *Morelia spilota metcalfei*
										0.790	0.034	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.744	0.034	503881 Soda Bush *Neobassia proceriflora*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.790	0.034	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.033	0.030	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.034	0.031	12492 Dwarf Burrowing Skink *Lerista timida*
										0.790	0.034	500003 Desert Lantern *Abutilon otocarpum*
										0.790	0.034	500202 Jerry-jerry *Ammannia multiflora*
										0.790	0.034	500322 Spreading Saltbush *Atriplex limbata*
										0.790	0.034	500331 Silver Saltbush *Atriplex rhagodioides*
										0.790	0.034	500874 Darling Lily *Crinum flaccidum*
										0.790	0.034	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.790	0.034	501198 Bignonia Emu-bush *Eremophila bignoniiflora*
										0.790	0.034	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.790	0.034	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.790	0.034	501333 Plains Spurge *Euphorbia planiticola*
										0.790	0.034	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.790	0.034	502117 Goat Head *Malacocera tricornis*
										0.790	0.034	502200 Woolly Minuria *Minuria denticulata*
										0.790	0.034	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.790	0.034	502397 Desert Glasswort *Tecticornia triandra*
										0.790	0.034	502502 Lagoon Spurge *Phyllanthus lacunarius*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.744	0.034	503074 Poverty Bush *Sclerolaena intricata*
										0.790	0.034	503227 Yakka Grass *Sporobolus caroli*
										0.790	0.034	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.790	0.034	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.790	0.034	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
22-C	Patch	robp0808	Least Concern	0	no	0.750	3.501	3.501	0.936	0.915	5.028	13207 Growling Grass Frog *Litoria raniformis*
										0.106	5.054	62969 Carpet Python *Morelia spilota metcalfei*
										0.311	4.671	501206 Twiggy Emu-bush *Eremophila polyclada*
										0.448	4.622	503881 Soda Bush *Neobassia proceriflora*
										0.772	4.653	505775 Native Madder *Synaptantha tillaeacea var. tillaeacea*
										0.061	4.115	10680 Spotted Bowerbird *Ptilonorhynchus maculatus*
										0.485	4.455	12492 Dwarf Burrowing Skink *Lerista timida*
										0.772	4.653	500003 Desert Lantern *Abutilon otocarpum*
										0.772	4.653	500202 Jerry-jerry *Ammannia multiflora*
										0.772	4.653	500322 Spreading Saltbush *Atriplex limbata*
										0.680	4.644	500331 Silver Saltbush *Atriplex rhagodioides*
										0.772	4.653	500874 Darling Lily *Crinum flaccidum*
										0.715	4.650	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.772	4.653	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.772	4.653	501198 Bignonia Emu-bush *Eremophila bignoniiflora*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.772	4.653	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.772	4.653	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.772	4.653	501333 Plains Spurge *Euphorbia planiticola*
										0.772	4.653	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.772	4.653	502117 Goat Head *Malacocera tricornis*
										0.772	4.653	502200 Woolly Minuria *Minuria denticulata*
										0.772	4.653	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.623	4.643	502397 Desert Glasswort *Tecticornia triandra*
										0.772	4.653	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.252	4.623	503074 Poverty Bush *Sclerolaena intricata*
										0.772	4.653	503227 Yakka Grass *Sporobolus caroli*
										0.772	4.653	503700 Small Pop Saltbush *Atriplex spongiosa*
										0.772	4.653	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.772	4.653	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
23-A	Patch	vriv0295	Vulnerable	0	no	0.560	0.112	0.112	0.835	0.810	0.113	13207 Growling Grass Frog *Litoria raniformis*
										0.922	0.120	62969 Carpet Python *Morelia spilota metcalfei*
										0.054	0.094	12492 Dwarf Burrowing Skink *Lerista timida*
										0.755	0.110	500003 Desert Lantern *Abutilon otocarpum*
										0.081	0.110	500202 Jerry-jerry *Ammannia multiflora*
										0.755	0.110	500322 Spreading Saltbush *Atriplex limbata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.755	0.110	500331 Silver Saltbush *Atriplex rhagodioides*
										0.755	0.110	500874 Darling Lily *Crinum flaccidum*
										0.224	0.110	501041 Silky Umbrella-grass *Digitaria ammophila*
										0.755	0.110	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.755	0.110	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.755	0.110	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.434	0.109	501907 Veined Peppercress *Lepidium phlebopetalum*
										0.612	0.110	502117 Goat Head *Malacocera tricornis*
										0.755	0.110	502234 Mallee Cucumber *Austrobryonia micrantha*
										0.755	0.110	502502 Lagoon Spurge *Phyllanthus lacunarius*
										0.755	0.110	503227 Yakka Grass *Sporobolus caroli*
										0.081	0.110	503924 Sandhill Spurge *Phyllanthus lacunellus*
										0.755	0.110	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
										0.097	0.111	504945 Kneed Swainson-pea *Swainsona reticulata*
24-D	Scattered Tree	msb_0103	Depleted	1	no	0.200	0.070	0.035	0.660	0.930	0.014	62969 Carpet Python *Morelia spilota metcalfei*
										0.420	0.010	12492 Dwarf Burrowing Skink *Lerista timida*
										0.740	0.012	500003 Desert Lantern *Abutilon otocarpum*
										0.740	0.012	500322 Spreading Saltbush *Atriplex limbata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
										0.740	0.012	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.740	0.012	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.740	0.012	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.740	0.012	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
25-D	Scattered Tree	msb_0103	Depleted	1	no	0.200	0.070	0.028	0.660	0.930	0.011	62969 Carpet Python *Morelia spilota metcalfei*
										0.420	0.008	12492 Dwarf Burrowing Skink *Lerista timida*
										0.740	0.010	500003 Desert Lantern *Abutilon otocarpum*
										0.740	0.010	500322 Spreading Saltbush *Atriplex limbata*
										0.740	0.010	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.740	0.010	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*
										0.740	0.010	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.740	0.010	504608 Spiny-fruit Saltbush *Atriplex spinibractea*
26-D	Scattered Tree	msb_0103	Depleted	1	no	0.200	0.070	0.060	0.660	0.935	0.023	62969 Carpet Python *Morelia spilota metcalfei*
										0.429	0.017	12492 Dwarf Burrowing Skink *Lerista timida*
										0.754	0.021	500003 Desert Lantern *Abutilon otocarpum*
										0.754	0.021	500322 Spreading Saltbush *Atriplex limbata*
										0.754	0.021	501074 Twin-flower Saltbush *Dissocarpus biflorus var. biflorus*
										0.754	0.021	501200 Spreading Emu-bush *Eremophila divaricata subsp. divaricata*

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
										0.754	0.021	501204 Spotted Emu-bush *Eremophila maculata subsp. maculata*
										0.754	0.021	504608 Spiny-fruit Saltbush *Atriplex spinibractea*

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Carpet Python	*Morelia spilota metcalfei*	62969	Endangered	Dispersed	Top ranking map	0.4193
Growling Grass Frog	*Litoria raniformis*	13207	Endangered	Dispersed	Top ranking map	0.0520
Native Madder	*Synaptantha tillaeacea var. tillaeacea*	505775	Vulnerable	Dispersed	Habitat importance map	0.0223
Spotted Bowerbird	*Ptilonorhynchus maculatus*	10680	Critically endangered	Dispersed	Habitat importance map	0.0138
Darling Lily	*Crinum flaccidum*	500874	Vulnerable	Dispersed	Habitat importance map	0.0118
Bignonia Emu-bush	*Eremophila bignoniiflora*	501198	Vulnerable	Dispersed	Habitat importance map	0.0115
Dwarf Burrowing Skink	*Lerista timida*	12492	Endangered	Dispersed	Habitat importance map	0.0099
Plains Spurge	*Euphorbia planiticola*	501333	Endangered	Dispersed	Habitat importance map	0.0096
Sandhill Spurge	*Phyllanthus lacunellus*	503924	Rare	Dispersed	Habitat importance map	0.0092
Spiny-fruit Saltbush	*Atriplex spinibractea*	504608	Endangered	Dispersed	Habitat importance map	0.0086
Hairy Darling-pea	*Swainsona greyana*	503316	Endangered	Dispersed	Habitat importance map	0.0086
Small Pop Saltbush	*Atriplex spongiosa*	503700	Endangered	Dispersed	Habitat importance map	0.0084
Kneed Swainson-pea	*Swainsona reticulata*	504945	Vulnerable	Dispersed	Habitat importance map	0.0083
Native Madder	*Synaptantha tillaeacea var. tillaeacea*	505775	Vulnerable	Dispersed	Top ranking map	0.0082
Lagoon Spurge	*Phyllanthus lacunarius*	502502	Vulnerable	Dispersed	Habitat importance map	0.0081
Veined Peppercress	*Lepidium phlebopetalum*	501907	Endangered	Dispersed	Habitat importance map	0.0079
Cotton Sneezeweed	*Centipeda nidiformis*	505616	Rare	Dispersed	Habitat importance map	0.0078
Mallee Cucumber	*Austrobryonia micrantha*	502234	Rare	Dispersed	Habitat importance map	0.0076
Jerry-jerry	*Ammannia multiflora*	500202	Vulnerable	Dispersed	Habitat importance map	0.0074

Soda Bush	*Neobassia proceriflora*	503881	Endangered	Dispersed	Habitat importance map	0.0072
Silver Saltbush	*Atriplex rhagodioides*	500331	Vulnerable	Dispersed	Habitat importance map	0.0070
Desert Glasswort	*Tecticornia triandra*	502397	Rare	Dispersed	Habitat importance map	0.0068
Twiggy Emu-bush	*Eremophila polyclada*	501206	Vulnerable	Dispersed	Habitat importance map	0.0060
Woolly Minuria	*Minuria denticulata*	502200	Rare	Dispersed	Habitat importance map	0.0059
Spreading Saltbush	*Atriplex limbata*	500322	Vulnerable	Dispersed	Habitat importance map	0.0059
Spreading Emu-bush	*Eremophila divaricata subsp. divaricata*	501200	Rare	Dispersed	Habitat importance map	0.0058
Lagoon Nightshade	*Solanum lacunarium*	503180	Vulnerable	Dispersed	Habitat importance map	0.0058
Yakka Grass	*Sporobolus caroli*	503227	Rare	Dispersed	Habitat importance map	0.0058
Desert Lantern	*Abutilon otocarpum*	500003	Vulnerable	Dispersed	Habitat importance map	0.0057
Goat Head	*Malacocera tricornis*	502117	Rare	Dispersed	Habitat importance map ; special site	0.0057
Spotted Emu-bush	*Eremophila maculata subsp. maculata*	501204	Rare	Dispersed	Habitat importance map	0.0055
Silky Umbrella-grass	*Digitaria ammophila*	501041	Vulnerable	Dispersed	Habitat importance map	0.0051
Twiggy Emu-bush	*Eremophila polyclada*	501206	Vulnerable	Dispersed	Top ranking map	0.0051
Twin-flower Saltbush	*Dissocarpus biflorus var. biflorus*	501074	Rare	Dispersed	Habitat importance map	0.0051
Hairy Darling-pea	*Swainsona greyana*	503316	Endangered	Dispersed	Top ranking map	0.0051
Soda Bush	*Neobassia proceriflora*	503881	Endangered	Dispersed	Top ranking map	0.0051
Poverty Bush	*Sclerolaena intricata*	503074	Vulnerable	Dispersed	Habitat importance map	0.0050
Poverty Bush	*Sclerolaena intricata*	503074	Vulnerable	Dispersed	Top ranking map	0.0049
Squat Picris	*Picris squarrosa*	504827	Rare	Dispersed	Habitat importance map	0.0048
Carpet Python	*Morelia spilota metcalfei*	62969	Endangered	Dispersed	Habitat importance map	0.0046
Plains Spurge	*Euphorbia planiticola*	501333	Endangered	Dispersed	Top ranking map	0.0043
Riverina Bitter-cress	*Cardamine moirensis*	505032	Rare	Dispersed	Habitat importance map	0.0043

Small Water-fire	*Bergia trimera*	500387	Vulnerable	Dispersed	Habitat importance map	0.0041
Flat Spike-sedge	*Eleocharis plana*	501144	Vulnerable	Dispersed	Habitat importance map	0.0041
Spear-fruit Copperburr	*Sclerolaena patenticuspis*	503079	Vulnerable	Dispersed	Habitat importance map	0.0040
Bristly Sea-heath	*Frankenia serpyllifolia*	501374	Rare	Dispersed	Habitat importance map	0.0040
Small Pop Saltbush	*Atriplex spongiosa*	503700	Endangered	Dispersed	Top ranking map	0.0040
Nealie	*Acacia loderi*	500052	Vulnerable	Dispersed	Habitat importance map	0.0039
Bush Minuria	*Minuria cunninghamii*	502199	Rare	Dispersed	Habitat importance map	0.0039
Green Copperburr	*Sclerolaena decurrens*	503071	Vulnerable	Dispersed	Habitat importance map	0.0039
Bignonia Emu-bush	*Eremophila bignoniiflora*	501198	Vulnerable	Dispersed	Top ranking map	0.0039
Small-leaf Swainson-pea	*Swainsona microphylla*	503320	Rare	Dispersed	Habitat importance map	0.0038
Yarran	*Acacia melvillei*	500058	Vulnerable	Dispersed	Habitat importance map	0.0037
Woolly Scurf-pea	*Cullen pallidum*	502772	Endangered	Dispersed	Habitat importance map	0.0036
Purple Love-grass	*Eragrostis lacunaria*	501190	Vulnerable	Dispersed	Habitat importance map	0.0035
Winged New Holland Daisy	*Vittadinia pterochaeta*	503542	Vulnerable	Dispersed	Habitat importance map	0.0034
Growling Grass Frog	*Litoria raniformis*	13207	Endangered	Dispersed	Habitat importance map	0.0034
Bramble Wattle	*Acacia victoriae subsp. victoriae*	500101	Rare	Dispersed	Habitat importance map	0.0033
Twin-leaf Bedstraw	*Asperula gemella*	500280	Rare	Dispersed	Habitat importance map	0.0033
Coral Saltbush	*Atriplex papillata*	500327	Rare	Dispersed	Habitat importance map	0.0032
Sand Sida	*Sida ammophila*	503140	Vulnerable	Dispersed	Habitat importance map	0.0032
Twiggy Sida	*Sida intricata*	503143	Vulnerable	Dispersed	Habitat importance map	0.0032
Three-wing Bluebush	*Maireana triptera*	502115	Rare	Dispersed	Habitat importance map	0.0031
Mealy Saltbush	*Atriplex pseudocampanulata*	500330	Rare	Dispersed	Habitat importance map	0.0031
Silky Swainson-pea	*Swainsona sericea*	504946	Vulnerable	Dispersed	Habitat importance map	0.0031
Red-chested Button-quail	*Turnix pyrrhothorax*	10019	Vulnerable	Dispersed	Habitat importance map	0.0030

Pearl Bluebush	*Maireana sedifolia*	502113	Rare	Dispersed	Habitat importance map	0.0030
Dookie Daisy	*Brachyscome gracilis*	505494	Vulnerable	Dispersed	Habitat importance map	0.0029
Swamp Sheoak	*Casuarina obesa*	500682	Endangered	Dispersed	Habitat importance map	0.0029
Dwarf Bitter-cress	*Rorippa eustylis*	502944	Rare	Dispersed	Habitat importance map	0.0029
Cane Grass	*Eragrostis australasica*	501184	Vulnerable	Dispersed	Habitat importance map	0.0029
Woolly Copperburr	*Sclerolaena lanicuspis*	503075	Endangered	Dispersed	Habitat importance map	0.0027
Riverine Flax-lily	*Dianella porracea*	504266	Vulnerable	Dispersed	Habitat importance map	0.0027
Tough Scurf-pea	*Cullen tenax*	502776	Endangered	Dispersed	Habitat importance map	0.0027
Rye Beetle-grass	*Tripogon loliiformis*	503455	Rare	Dispersed	Habitat importance map	0.0026
White Twin-leaf	*Zygophyllum simile*	504116	Rare	Dispersed	Habitat importance map	0.0025
Pop Saltbush	*Atriplex holocarpa*	500333	Vulnerable	Dispersed	Habitat importance map	0.0025
Regent Parrot	*Polytelis anthopeplus monarchoides*	10278	Vulnerable	Dispersed	Habitat importance map	0.0025
Pin Sida	*Sida fibulifera*	503142	Vulnerable	Dispersed	Habitat importance map	0.0024
Small Monkey-flower	*Elacholoma prostrata*	502196	Rare	Dispersed	Habitat importance map	0.0023
Prickly Bottlebrush	*Callistemon brachyandrus*	500561	Rare	Dispersed	Habitat importance map	0.0023
Milkwort Sunray	*Rhodanthe polygalifolia*	501649	Rare	Dispersed	Habitat importance map	0.0023
Smooth Minuria	*Minuria integerrima*	502201	Rare	Dispersed	Habitat importance map	0.0023
Wilga	*Geijera parviflora*	501419	Endangered	Dispersed	Habitat importance map	0.0022
Spiny Lignum	*Duma horrida subsp. horrida*	502230	Rare	Dispersed	Habitat importance map	0.0022
Pointed Saltbush	*Atriplex acutibractea subsp. karoniensis*	504228	Rare	Dispersed	Habitat importance map	0.0022
Bear's-ear	*Cymbonotus lawsonianus*	500902	Rare	Dispersed	Habitat importance map	0.0022
Bristly Love-grass	*Eragrostis setifolia*	501195	Vulnerable	Dispersed	Habitat importance map	0.0022
Northern Sandalwood	*Santalum lanceolatum*	503005	Endangered	Dispersed	Habitat importance map	0.0021
Small-flower Tobacco	*Nicotiana goodspeedii*	502273	Rare	Dispersed	Habitat importance map	0.0019

Pale Flax-lily	*Dianella sp. aff. longifolia (Riverina)*	507399	Vulnerable	Dispersed	Habitat importance map	0.0019
Pale Plover-daisy	*Leiocarpa leptolepis*	503782	Endangered	Dispersed	Habitat importance map	0.0018
Leafy Sea-heath	*Frankenia foliosa*	501373	Rare	Dispersed	Habitat importance map	0.0018
Bush Stone-curlew	*Burhinus grallarius*	10174	Endangered	Dispersed	Habitat importance map ; special site	0.0018
Sarcozona	*Sarcozona praecox*	503014	Rare	Dispersed	Habitat importance map	0.0018
Slit-wing Bluebush	*Maireana georgei*	503863	Vulnerable	Dispersed	Habitat importance map	0.0017
Slender Club-sedge	*Isolepis congrua*	501773	Vulnerable	Dispersed	Habitat importance map	0.0017
Small Elachanth	*Elachanthus pusillus*	501135	Rare	Dispersed	Habitat importance map	0.0016
Branching Groundsel	*Senecio cunninghamii var. cunninghamii*	503104	Rare	Dispersed	Habitat importance map	0.0016
Twining Purslane	*Calandrinia volubilis*	500556	Rare	Dispersed	Habitat importance map	0.0015
Blue-bush Daisy	*Cratystylis conocephala*	500868	Endangered	Dispersed	Habitat importance map	0.0015
Dwarf Lantern-flower	*Abutilon fraseri*	500002	Endangered	Dispersed	Habitat importance map	0.0014
Desert Jasmine	*Jasminum didymum subsp. lineare*	501801	Vulnerable	Dispersed	Habitat importance map	0.0014
Limestone Sida	*Sida spodochroma*	503146	Vulnerable	Dispersed	Habitat importance map	0.0014
Major Mitchell's Cockatoo	*Lophocroa leadbeateri*	10270	Vulnerable	Dispersed	Habitat importance map	0.0014
Burr-daisy	*Calotis cymbacantha*	500595	Rare	Dispersed	Habitat importance map	0.0014
Redthroat	*Pyrrholaemus brunneus*	10497	Endangered	Dispersed	Habitat importance map	0.0013
Blue Burr-daisy	*Calotis cuneifolia*	500594	Rare	Dispersed	Habitat importance map	0.0013
Dwarf Swainson-pea	*Swainsona phacoides*	503323	Endangered	Dispersed	Habitat importance map	0.0013
Round Templetonia	*Templetonia egena*	503340	Vulnerable	Dispersed	Habitat importance map	0.0012
Doubah	*Marsdenia australis*	501892	Vulnerable	Dispersed	Habitat importance map	0.0012
Scrambling Twin-leaf	*Zygophyllum angustifolium*	504117	Rare	Dispersed	Habitat importance map	0.0012
Port Lincoln Snake	*Parasuta spectabilis*	12813	Vulnerable	Dispersed	Habitat importance map	0.0012

Spiny Goosefoot	*Rhagodia ulicina*	502931	Rare	Dispersed	Habitat importance map	0.0012
Umbrella Wattle	*Acacia oswaldii*	500070	Vulnerable	Dispersed	Habitat importance map	0.0012
Waterbush	*Myoporum montanum*	502240	Rare	Dispersed	Habitat importance map	0.0011
Frosted Goosefoot	*Chenopodium desertorum subsp. desertorum*	504380	Rare	Dispersed	Habitat importance map	0.0011
Prickly Cudweed	*Stuartina hamata*	503299	Rare	Dispersed	Habitat importance map	0.0011
Mallee Annual-bluebell	*Wahlenbergia tumidifructa*	504060	Rare	Dispersed	Habitat importance map	0.0010
Sand Brome	*Bromus arenarius*	500497	Rare	Dispersed	Habitat importance map	0.0010
Long Tails	*Ptilotus polystachyus*	502830	Endangered	Dispersed	Habitat importance map	0.0010
Grey Wrinklewort	*Rutidosis helichrysoides subsp. helichrysoides*	502981	Endangered	Dispersed	Habitat importance map	0.0010
Dwarf Brooklime	*Gratiola pumilo*	503753	Rare	Dispersed	Habitat importance map	0.0009
Club-hair New Holland Daisy	*Vittadinia condyloides*	503536	Rare	Dispersed	Habitat importance map	0.0009
Club Spear-grass	*Austrostipa nullanulla*	503986	Vulnerable	Dispersed	Habitat importance map	0.0009
Silver Cassia	*Senna form taxon 'artemisioides'*	500663	Endangered	Dispersed	Habitat importance map	0.0008
Pointed Saltbush	*Atriplex acutibractea subsp. acutibractea*	504216	Vulnerable	Dispersed	Habitat importance map	0.0008
White-browed Treecreeper	*Climacteris affinis*	10561	Vulnerable	Dispersed	Habitat importance map	0.0008
Spear-grass	*Austrostipa trichophylla*	504512	Rare	Dispersed	Habitat importance map	0.0008
Hoary Sea-heath	*Frankenia crispa*	501372	Rare	Dispersed	Habitat importance map	0.0008
Finger-leaved Daisy	*Brachyscome exilis*	500457	Rare	Dispersed	Habitat importance map	0.0008
De Vis' Banded Snake	*Denisonia devisi*	19001	Critically endangered	Dispersed	Habitat importance map	0.0007
Silvery Emu-bush	*Eremophila scoparia*	501207	Rare	Dispersed	Habitat importance map	0.0007
Mallee Tussock-grass	*Poa lowanensis*	503890	Rare	Dispersed	Habitat importance map	0.0007
Scaly Poa	*Poa fax*	502592	Rare	Dispersed	Habitat importance map	0.0007
Dwarf Yellow-heads	*Trichanthodium baracchianum*	501476	Vulnerable	Dispersed	Habitat importance map	0.0005

South-eastern Long-eared Bat	*Nyctophilus corbeni*	61332	Endangered	Dispersed	Habitat importance map	0.0005
Purple Swainson-pea	*Swainsona purpurea*	503327	Endangered	Dispersed	Habitat importance map	0.0005
Purple Pentatrope	*Rhyncharrhena linearis*	502934	Vulnerable	Dispersed	Habitat importance map	0.0005
Twin-leaf Emu-bush	*Eremophila oppositifolia subsp. oppositifolia*	501205	Rare	Dispersed	Habitat importance map	0.0005
Finger Grass	*Dactyloctenium radulans*	500949	Rare	Dispersed	Habitat importance map	0.0005
Dwarf Cup-flower	*Gnephosis tenuissima*	500774	Rare	Dispersed	Habitat importance map	0.0004
Green-leaf Mallee	*Eucalyptus phenax subsp. phenax*	504270	Rare	Dispersed	Habitat importance map	0.0004
Heathy Bluebush	*Maireana oppositifolia*	502106	Rare	Dispersed	Habitat importance map	0.0004
Spreading Cress	*Phlegmatospermum eremaeum*	502495	Vulnerable	Dispersed	Habitat importance map	0.0004
Desert Rice-flower	*Pimelea simplex subsp. simplex*	502531	Rare	Dispersed	Habitat importance map	0.0004
Grey Falcon	*Falco hypoleucos*	10236	Endangered	Dispersed	Habitat importance map	0.0004
Wait-a-while	*Acacia colletioides*	500022	Rare	Dispersed	Habitat importance map	0.0003
Winged Peppercress	*Lepidium monoplocoides*	501905	Endangered	Dispersed	Habitat importance map	0.0003
Smooth Elachanth	*Elachanthus glaber*	503702	Rare	Dispersed	Habitat importance map	0.0003
Whiteseed Glasswort	*Tecticornia pterygosperma subsp. pterygosperma*	501594	Rare	Dispersed	Habitat importance map	0.0003
Needle Grass	*Triraphis mollis*	503456	Rare	Dispersed	Habitat importance map	0.0003
Small Burr-grass	*Tragus australianus*	503418	Rare	Dispersed	Habitat importance map	0.0003
Salt Paperbark	*Melaleuca halmaturorum*	502149	Vulnerable	Dispersed	Habitat importance map	0.0002
Frosted Goosefoot	*Chenopodium desertorum subsp. rectum*	504382	Vulnerable	Dispersed	Habitat importance map	0.0002
Grey-crowned Babbler	*Pomatostomus temporalis temporalis*	10443	Endangered	Dispersed	Habitat importance map	0.0002
Grassland Velleia	*Velleia arguta*	503487	Rare	Dispersed	Habitat importance map	0.0002
Woolly Mantle	*Eriochlamys behrii s.s.*	505666	Rare	Dispersed	Habitat importance map	0.0002
Grey Podolepis	*Podolepis aristata subsp. affinis*	502614	Rare	Dispersed	Habitat importance map	0.0002

Scarlet-chested Parrot	*Neophema splendida*	10303	Vulnerable	Dispersed	Habitat importance map	0.0002
Elegant Parrot	*Neophema elegans*	10307	Vulnerable	Dispersed	Habitat importance map	0.0002
Fleshy Groundsel	*Senecio gregorii*	503109	Rare	Dispersed	Habitat importance map	0.0002
Lace Monitor	*Varanus varius*	12283	Endangered	Dispersed	Habitat importance map	0.0001
Buloke Mistletoe	*Amyema linophylla subsp. orientalis*	500217	Vulnerable	Dispersed	Habitat importance map	0.0001
Strap Purslane	*Calandrinia corrigioloides*	500553	Rare	Dispersed	Habitat importance map	0.0001
Half-bearded Spear-grass	*Austrostipa hemipogon*	503985	Rare	Dispersed	Habitat importance map	0.0001
Buloke	*Allocasuarina luehmannii*	500678	Endangered	Dispersed	Habitat importance map	0.0001
Freckled Duck	*Stictonetta naevosa*	10214	Endangered	Dispersed	Habitat importance map	0.0001
Blue-billed Duck	*Oxyura australis*	10216	Endangered	Dispersed	Habitat importance map	0.0001
Common Dunnart	*Sminthopsis murina murina*	11061	Vulnerable	Dispersed	Habitat importance map	0.0001
Black Falcon	*Falco subniger*	10238	Vulnerable	Dispersed	Habitat importance map	0.0001
Intermediate Egret	*Ardea intermedia*	10186	Endangered	Dispersed	Habitat importance map	0.0001
Musk Duck	*Biziura lobata*	10217	Vulnerable	Dispersed	Habitat importance map	0.0001
Red Microcybe	*Microcybe multiflora subsp. multiflora*	502177	Vulnerable	Dispersed	Habitat importance map	0.0001
Baillon's Crake	*Porzana pusilla palustris*	10050	Vulnerable	Dispersed	Habitat importance map	0.0001
Hardhead	*Aythya australis*	10215	Vulnerable	Dispersed	Habitat importance map	0.0001
Australasian Shoveler	*Anas rhynchotis*	10212	Vulnerable	Dispersed	Habitat importance map	0.0001
Needle Wattle	*Acacia havilandiorum*	500043	Endangered	Dispersed	Habitat importance map	0.0000
Bandy Bandy	*Vermicella annulata*	12734	Vulnerable	Dispersed	Habitat importance map	0.0000
Sand Lily	*Corynotheca licrota*	500517	Rare	Dispersed	Habitat importance map	0.0000
Silky Glycine	*Glycine canescens*	501454	Endangered	Dispersed	Habitat importance map	0.0000
Slender Daisy-bush	*Olearia passerinoides subsp. passerinoides*	528481	Rare	Dispersed	Habitat importance map	0.0000

Square-tailed Kite	*Lophoictinia isura*	10230	Vulnerable	Dispersed	Habitat importance map	0.0000
Fuzzy New Holland Daisy	*Vittadinia cuneata var. hirsuta*	505068	Rare	Dispersed	Habitat importance map	0.0000
Yellow Burr-daisy	*Calotis lappulacea*	500598	Rare	Dispersed	Habitat importance map	0.0000
Mallee Emu-wren	*Stipiturus mallee*	10527	Endangered	Dispersed	Habitat importance map	0.0000
Black-eared Miner	*Manorina melanotis*	10967	Critically endangered	Dispersed	Habitat importance map	0.0000
Thick-leaf Emu-bush	*Eremophila crassifolia*	501199	Rare	Dispersed	Habitat importance map	0.0000
Wingwort	*Ceratogyne obionoides*	500722	Rare	Dispersed	Habitat importance map	0.0000
Large-fruited Millotia	*Millotia macrocarpa*	502190	Rare	Dispersed	Habitat importance map	0.0000
Woolly Yellow-heads	*Trichanthodium skirrophorum*	501478	Vulnerable	Dispersed	Habitat importance map	0.0000

Habitat group

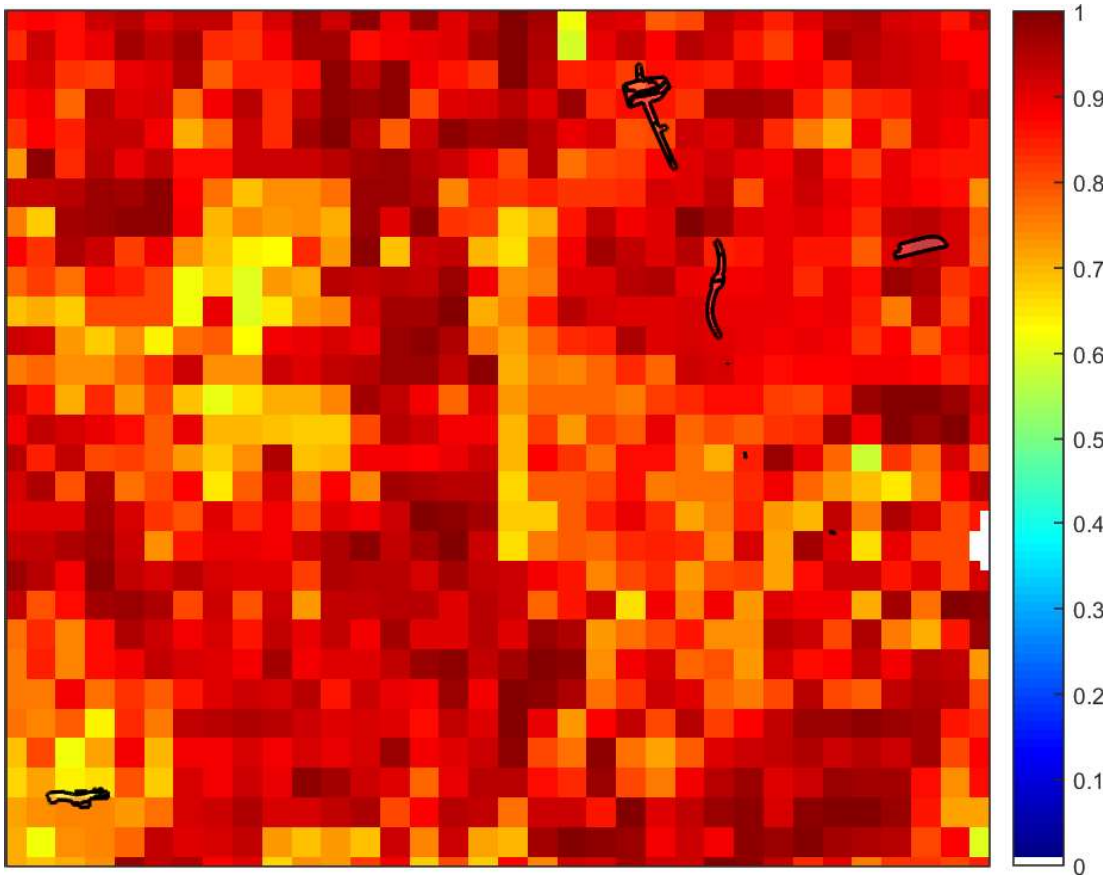
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

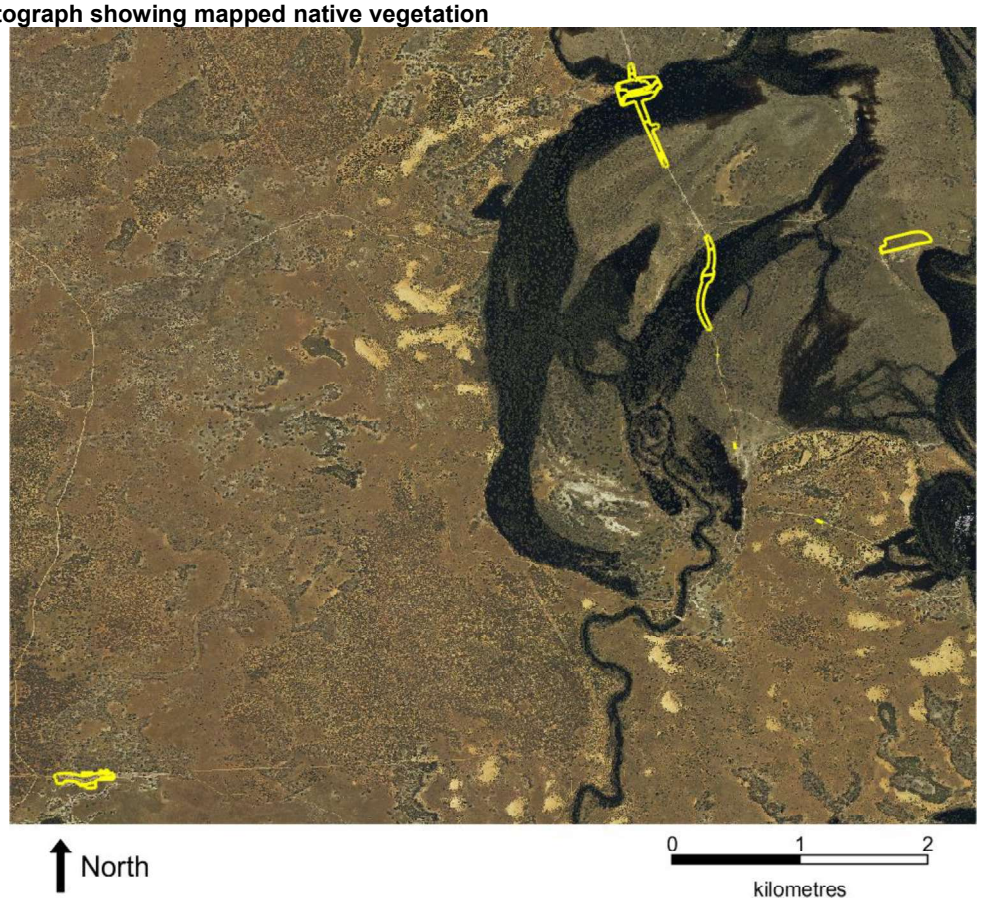
- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

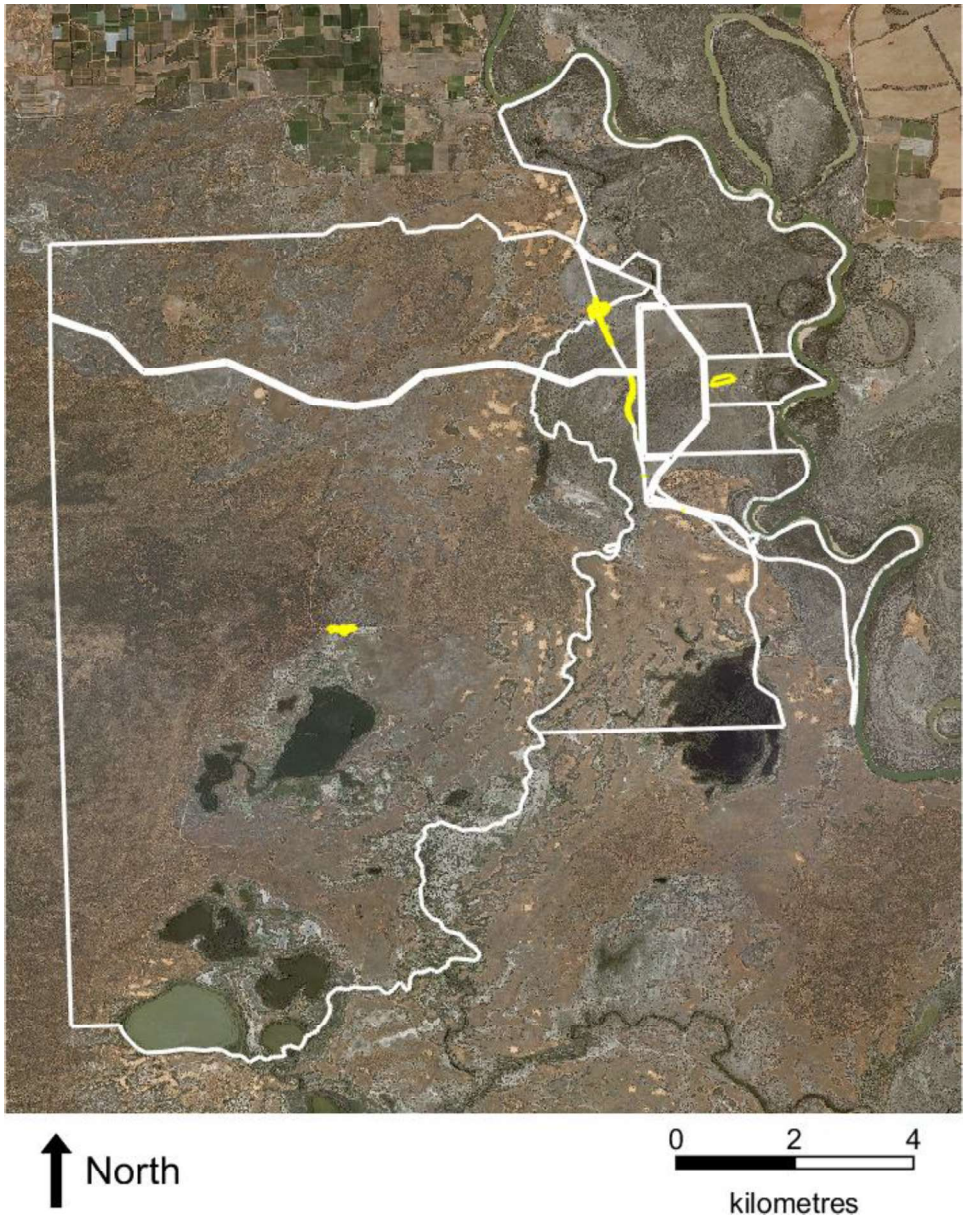
2. Strategic biodiversity values map



3. Aerial photograph showing mapped native vegetation



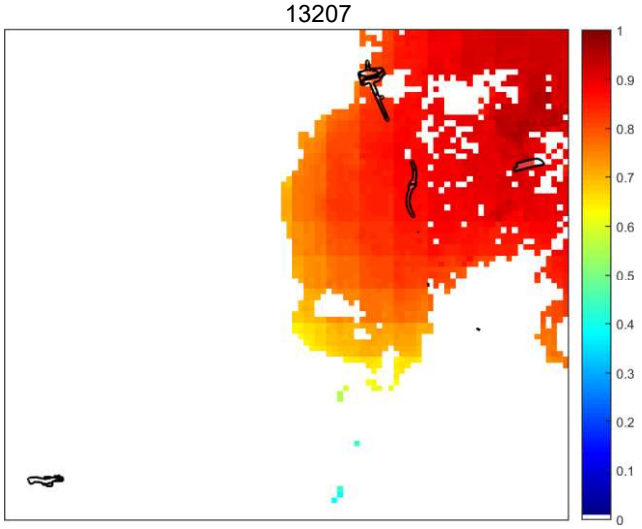
4. Map of the property in context



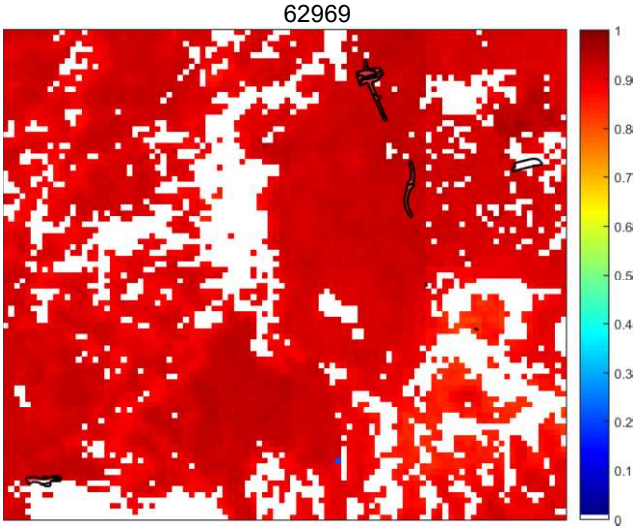
Yellow boundaries denote areas of proposed native vegetation removal.

4. Habitat importance maps

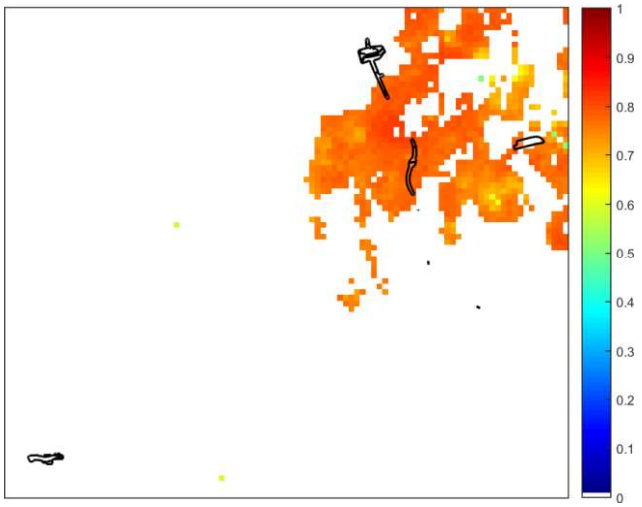
Growling Grass Frog
Litoria raniformis
13207



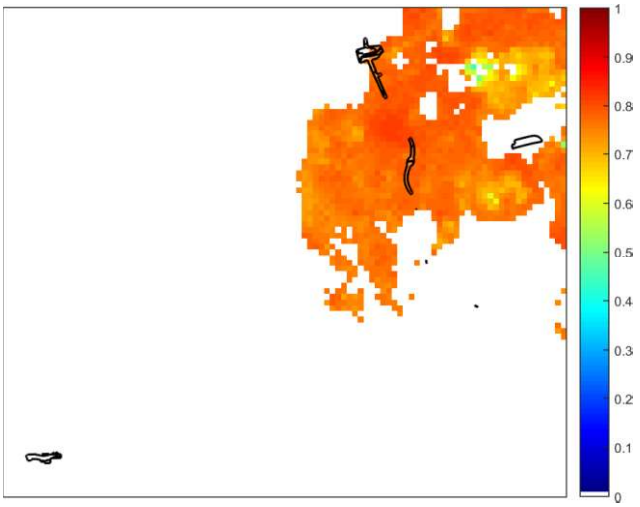
Carpet Python
Morelia spilota metcalfei
62969



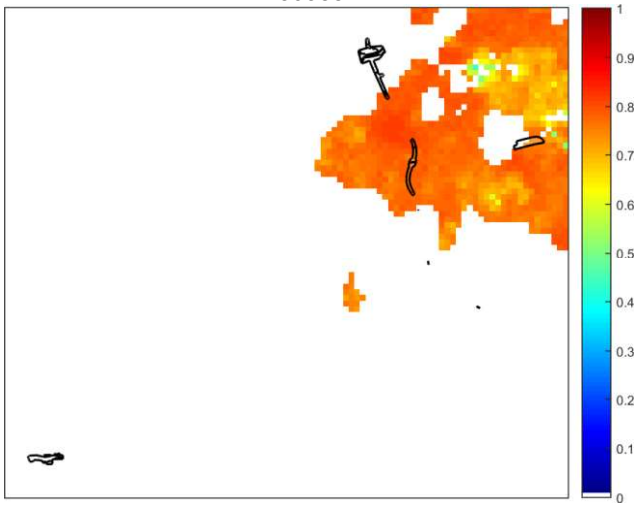
Twiggy Emu-bush
Eremophila polyclada
501206



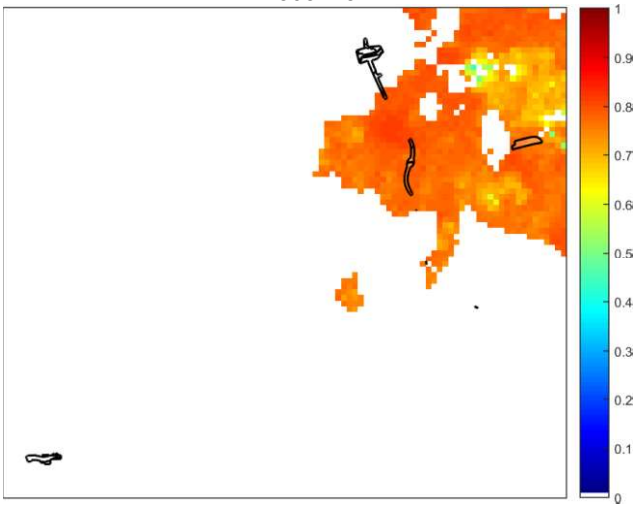
Hairy Darling-pea
Swainsona greyana
503316



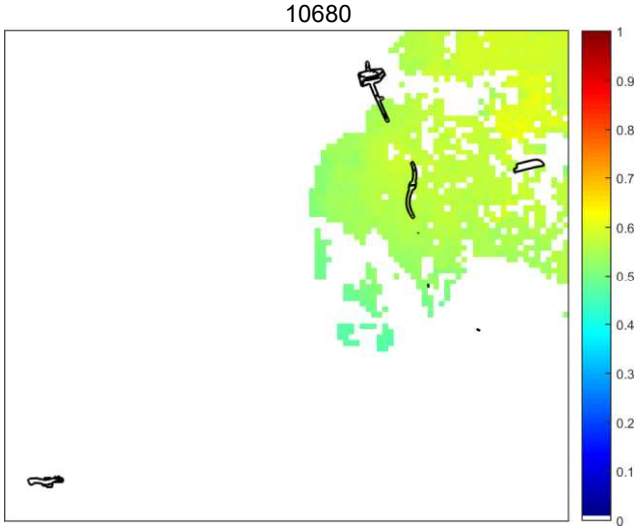
Soda Bush
Neobassia proceriflora
503881



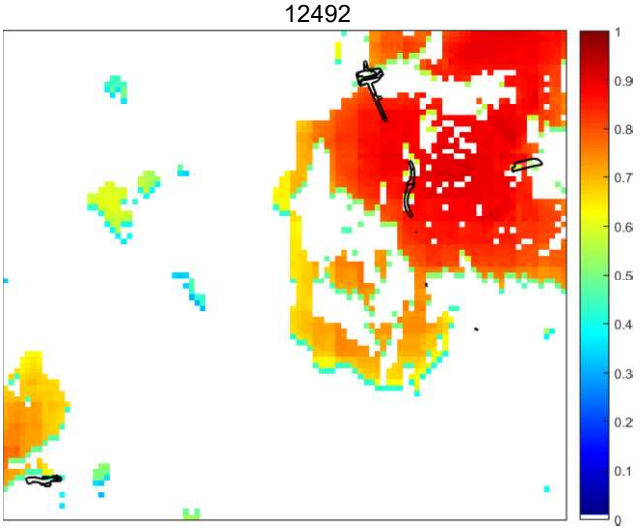
Native Madder
Synaptantha tillaeacea var. tillaeacea
505775



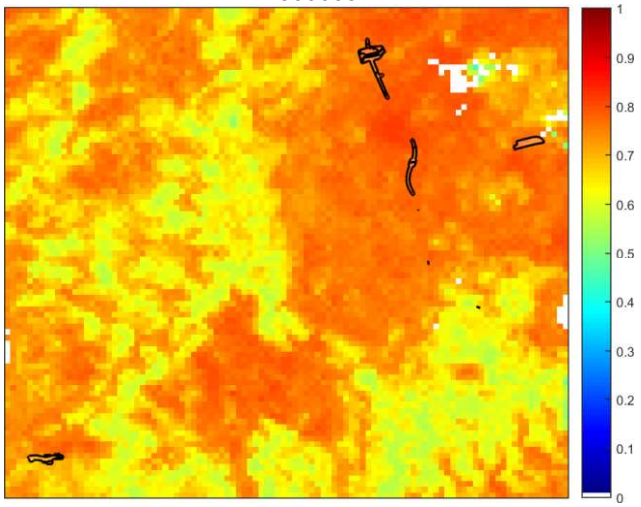
Spotted Bowerbird
Ptilonorhynchus maculatus
10680



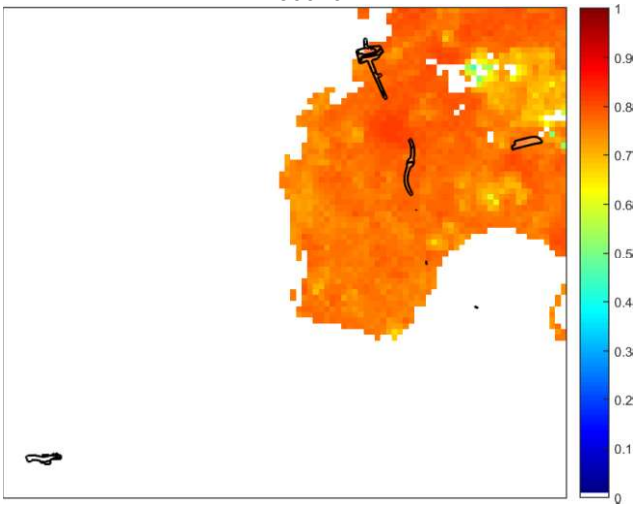
Dwarf Burrowing Skink
Lerista timida
12492



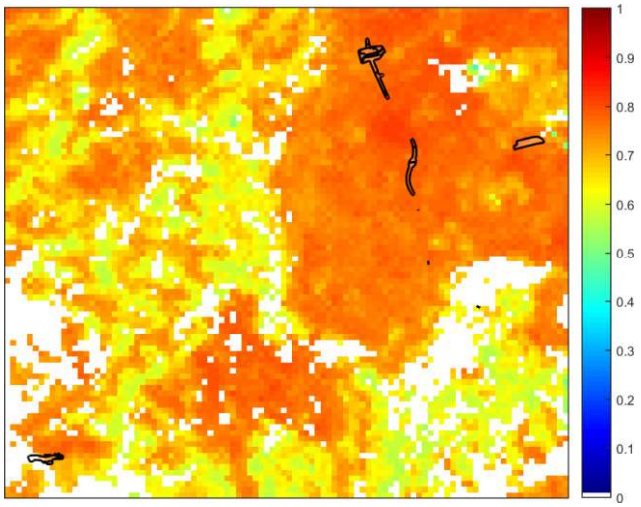
Desert Lantern
Abutilon otocarpum
500003



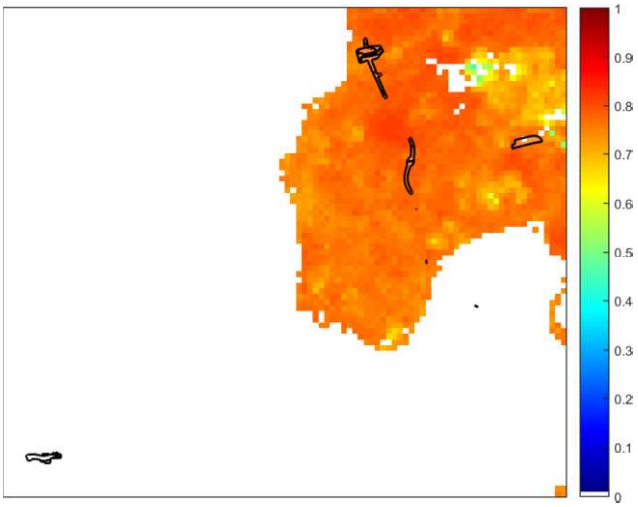
Jerry-jerry
Ammannia multiflora
500202



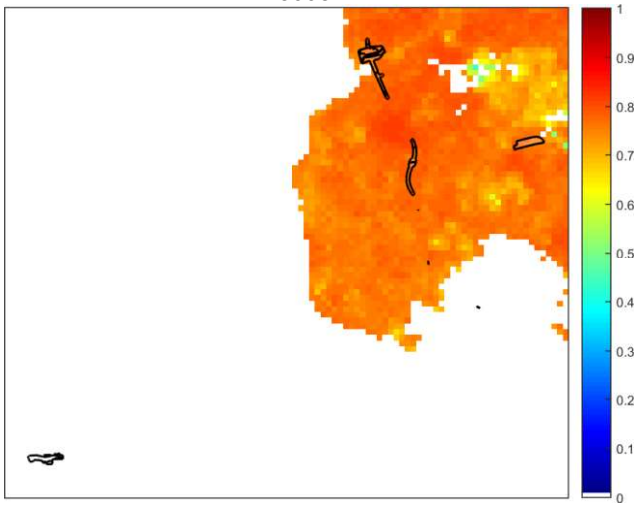
Spreading Saltbush
Atriplex limbata
500322



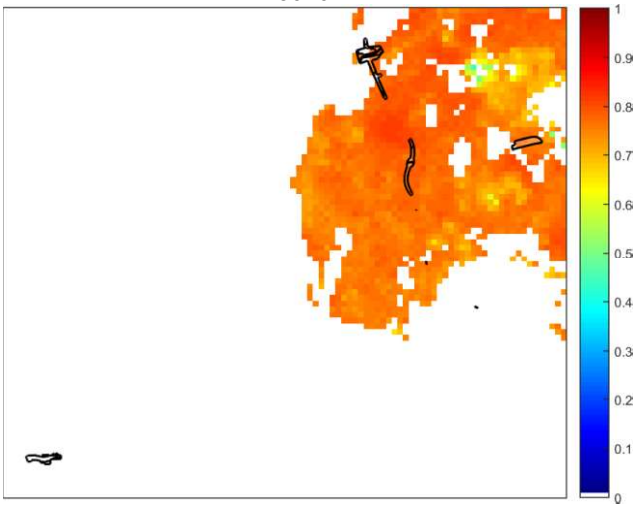
Silver Saltbush
Atriplex rhagodioides
500331



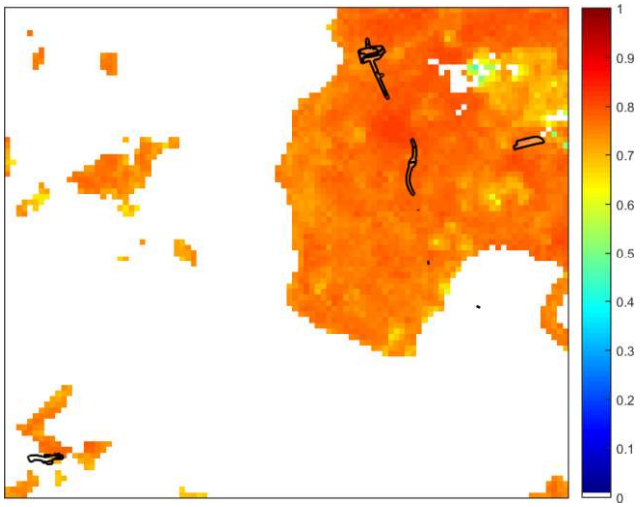
Darling Lily
Crinum flaccidum
500874



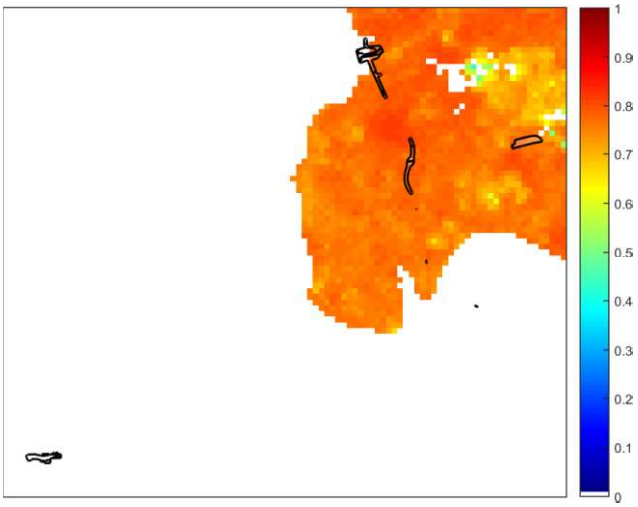
Silky Umbrella-grass
Digitaria ammophila
501041



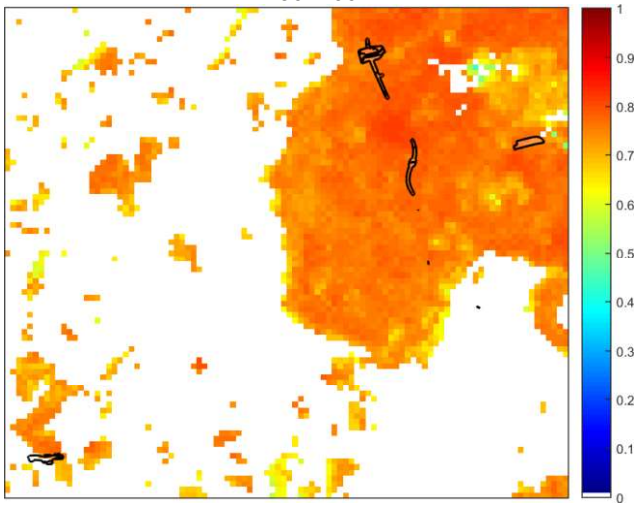
Twin-flower Saltbush
Dissocarpus biflorus var. biflorus
501074



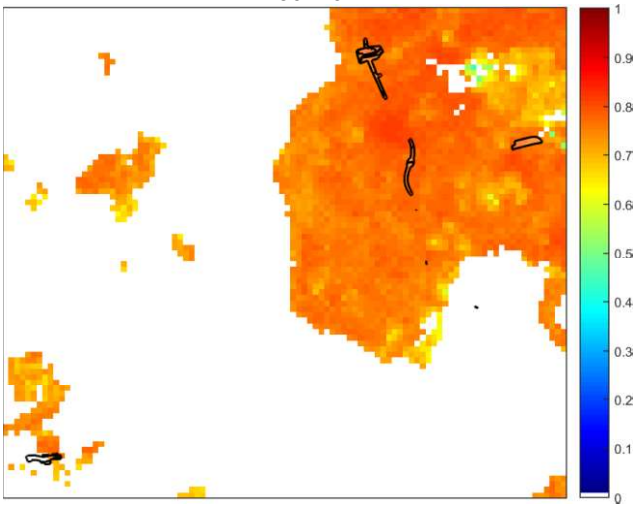
Bignonia Emu-bush
Eremophila bignoniiflora
501198



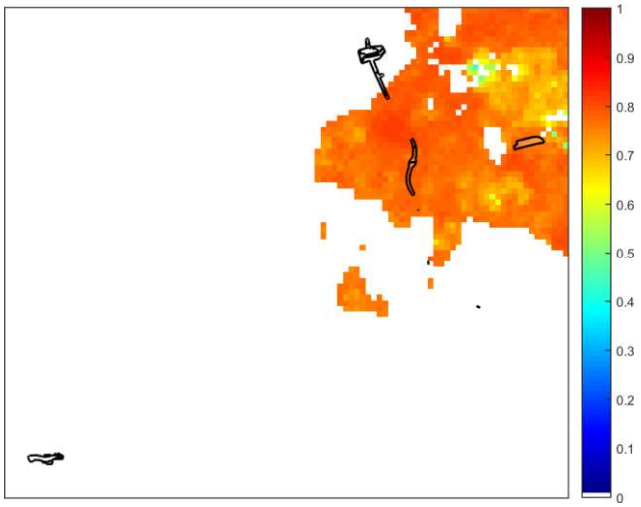
Spreading Emu-bush
Eremophila divaricata subsp. divaricata
501200



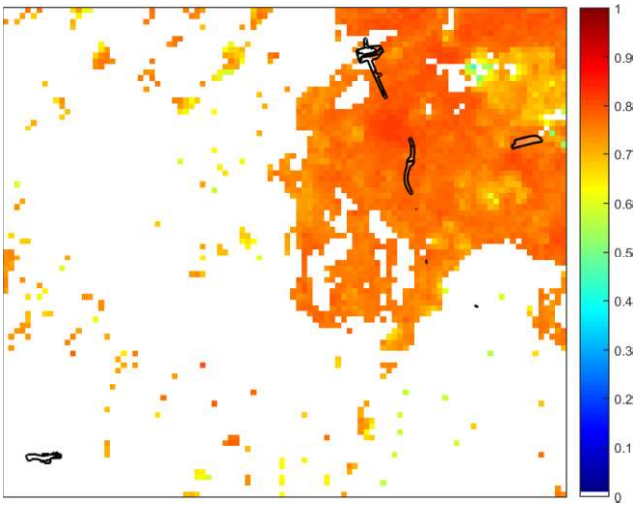
Spotted Emu-bush
Eremophila maculata subsp. maculata
501204



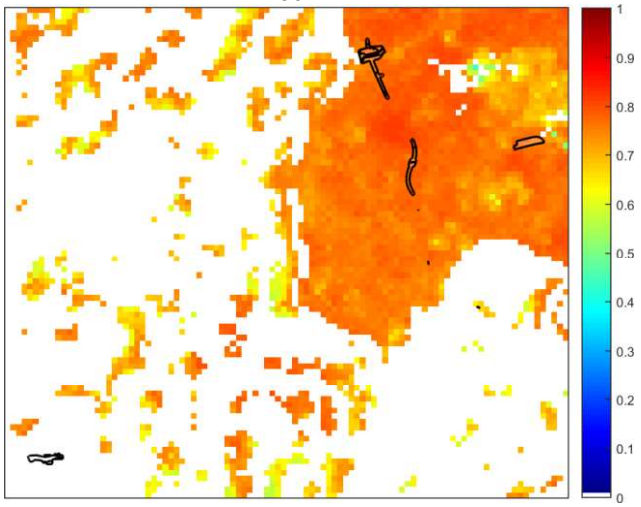
Plains Spurge
Euphorbia planiticola
501333



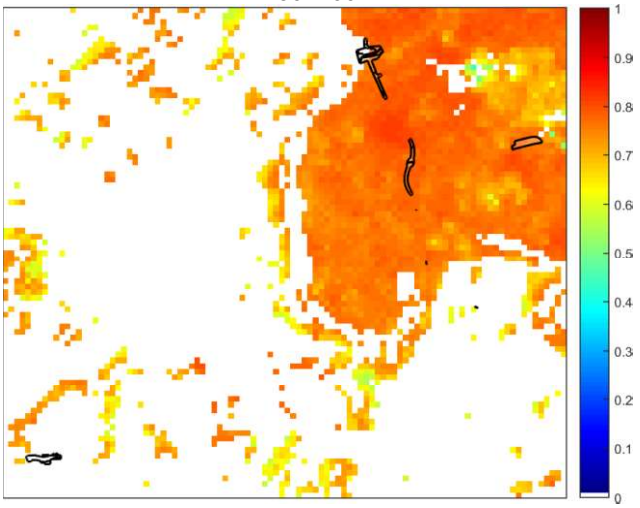
Veined Peppercress
Lepidium phlebopetalum
501907



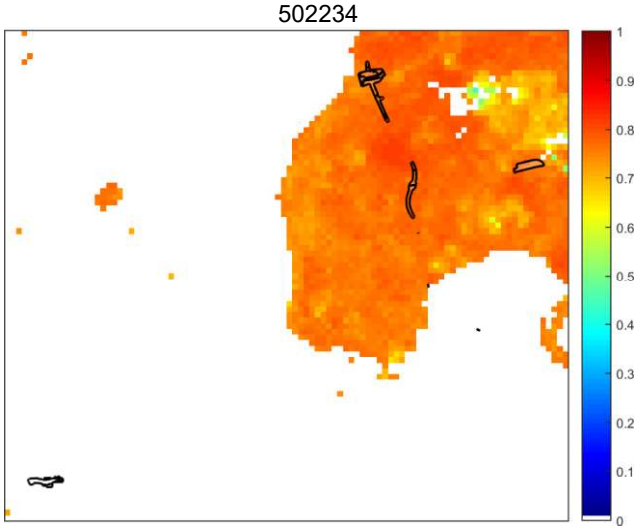
Goat Head
Malacocera tricornis
502117



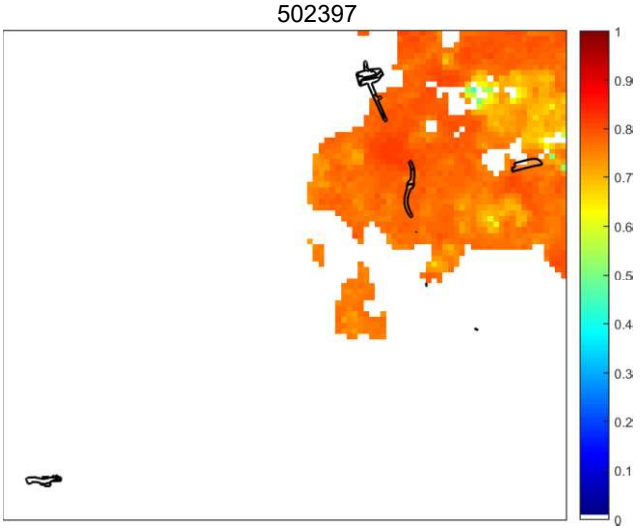
Woolly Minuria
Minuria denticulata
502200



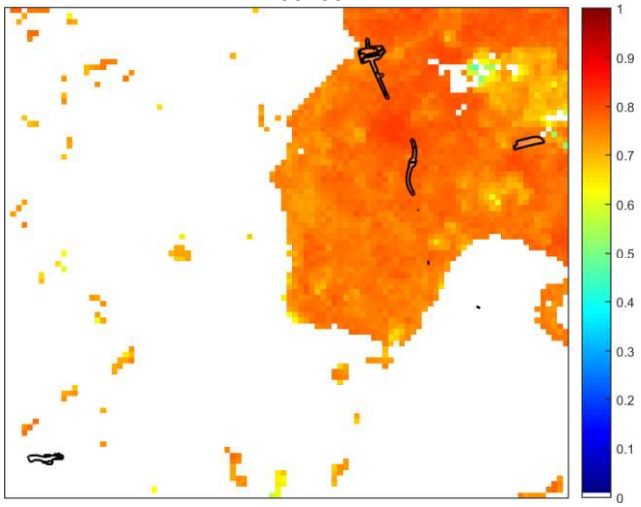
Mallee Cucumber
Austrobryonia micrantha
502234



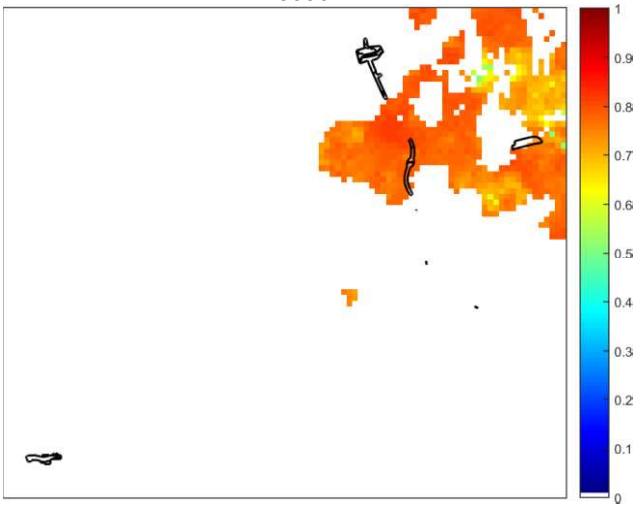
Desert Glasswort
Tecticornia triandra
502397



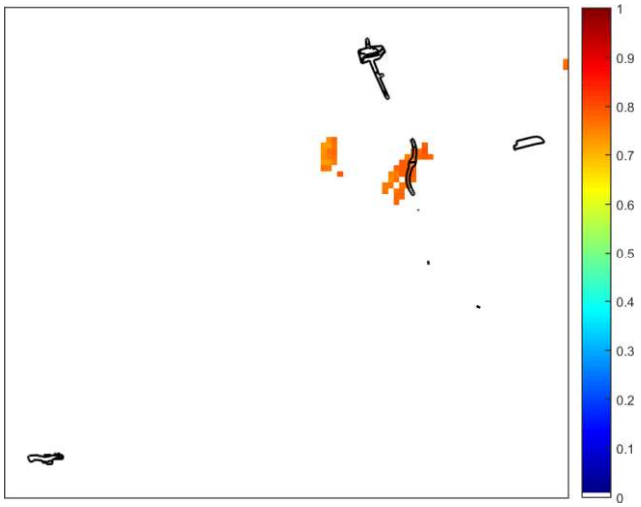
Lagoon Spurge
Phyllanthus lacunarius
502502



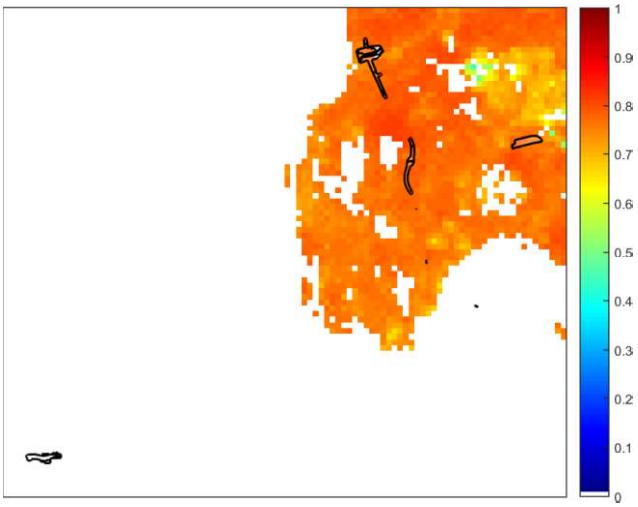
Poverty Bush
Sclerolaena intricata
503074



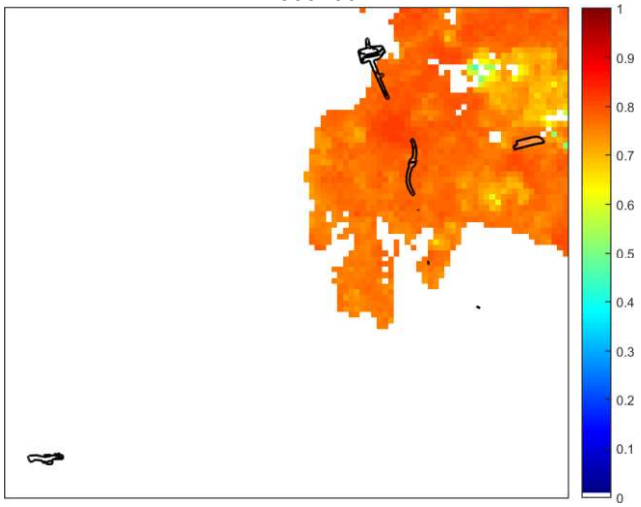
Lagoon Nightshade
Solanum lacunarium
503180



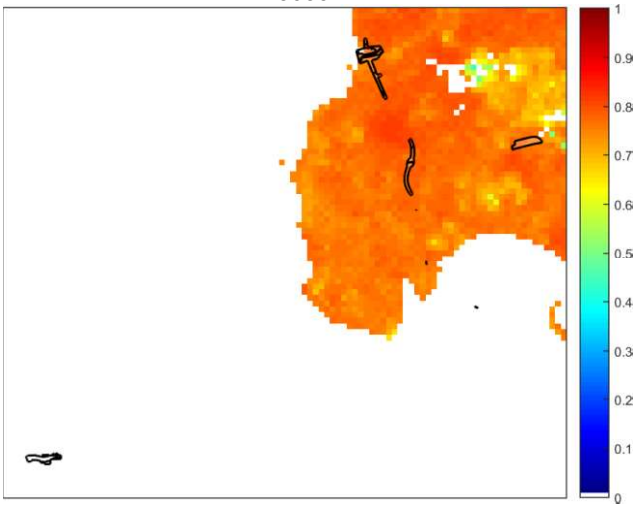
Yakka Grass
Sporobolus caroli
503227



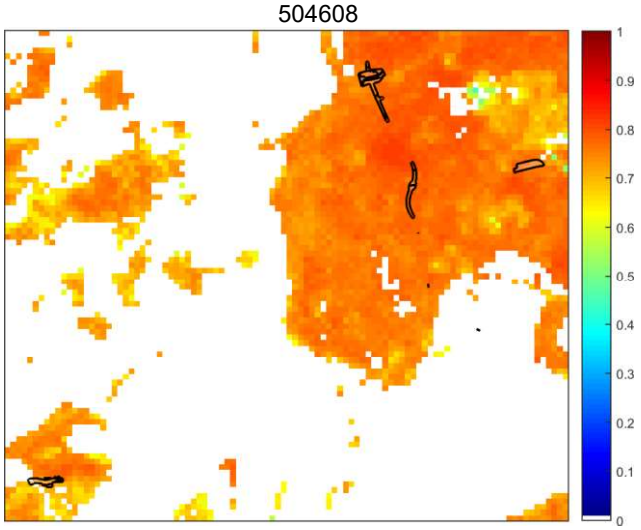
Small Pop Saltbush
Atriplex spongiosa
503700



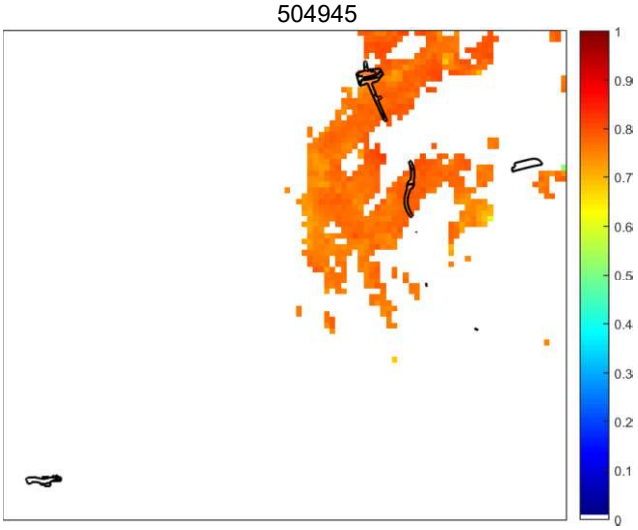
Sandhill Spurge
Phyllanthus lacunellus
503924



Spiny-fruit Saltbush
Atriplex spinibractea
504608



Kneed Swainson-pea
Swainsona reticulata
504945



Cotton Sneezeweed
Centipeda nidiformis
505616