Legend

- Canopy Tree
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Reserve
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Shrubland
- 103 Riverine Chenopod Woodland
- 818 Shrubby Riveine Woodland

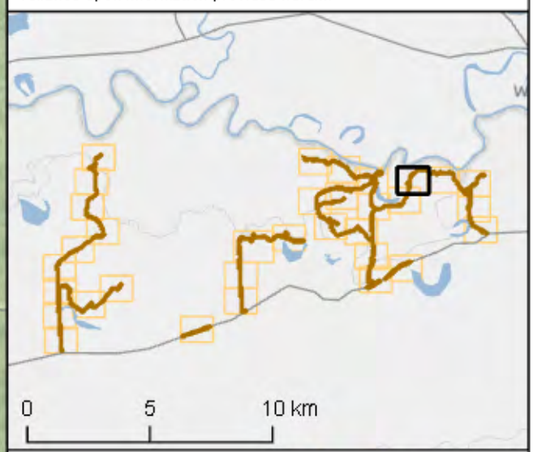
N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 55 110
Meters

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



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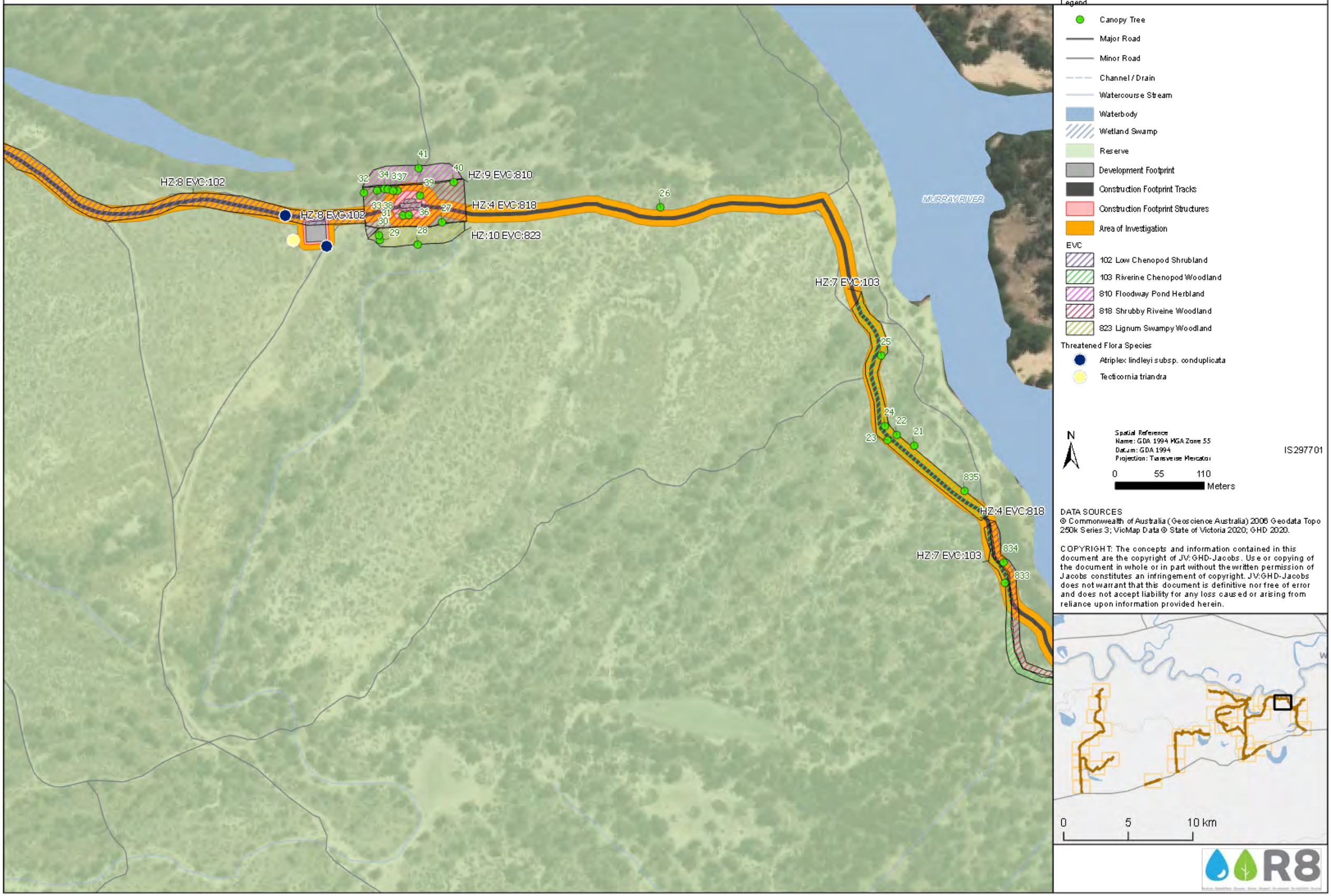

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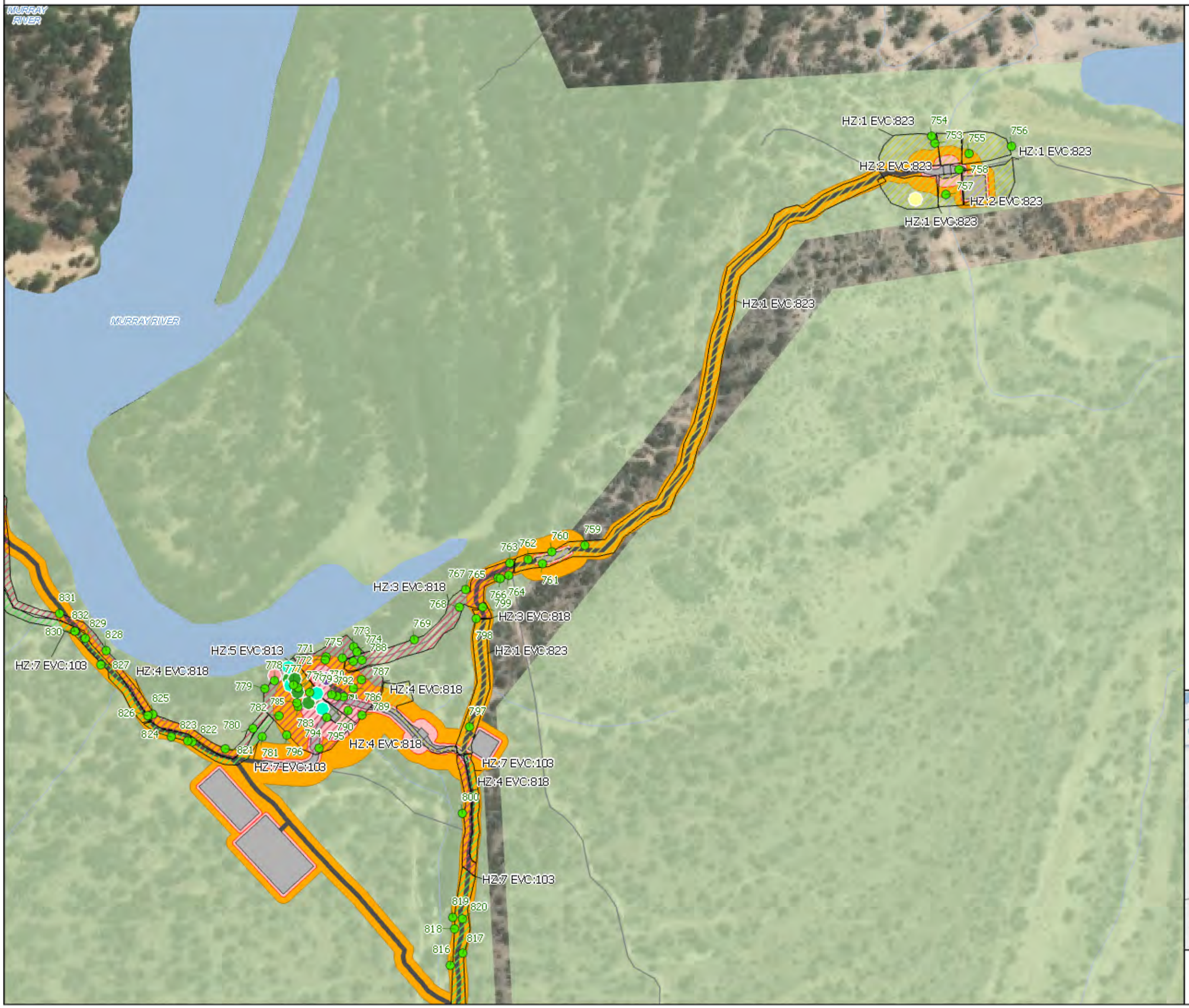


Legend

- Canopy Tree
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Reserve
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 103 Riverine Chenopod Woodland
- 813 Intermittent Swampy Woodland
- 818 Shrubby Riveine Woodland
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Calotis cuneifolia
- Crinum flaccidum
- Dianella porracea
- Sida fibulifera
- Tecticornia triandra

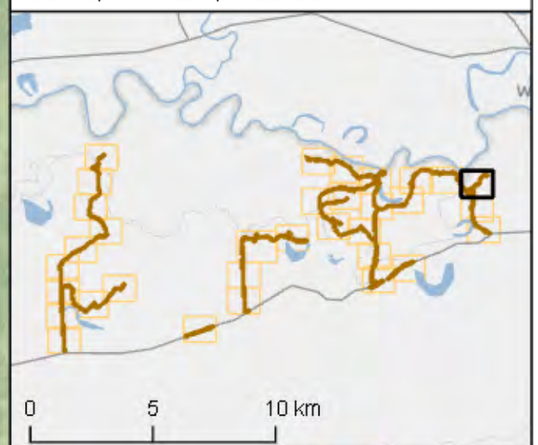
N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 55 110
Meters

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



Legend

- Canopy Tree
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Reserve
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 103 Riverine Chenopod Woodland
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Tecticornia triandra

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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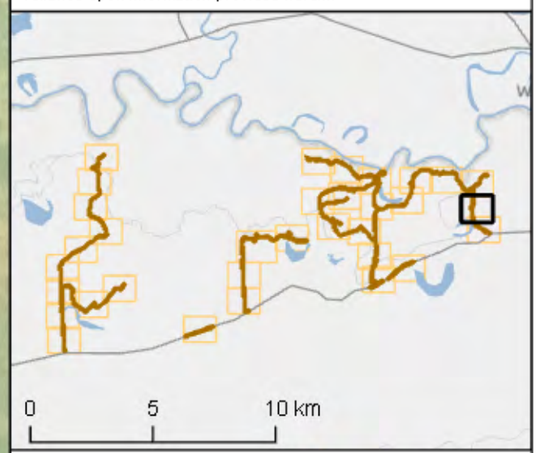
Meters



Legend

- Canopy Tree
- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Reserve
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

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- 103 Riverine Chenopod Woodland
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Tecticornia triandra

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

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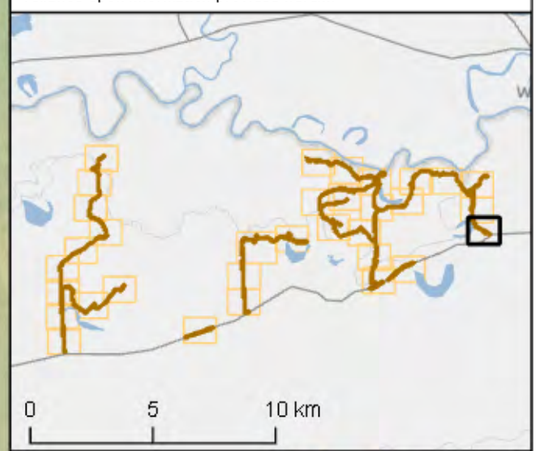

7 Area of inundation vegetation ground truthing assessment

7.1 Context

The project has been designed to facilitate environmental watering of up to 2,672 ha of the Wallpolla Island 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. It is expected that the application of environmental water to water dependent River 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.

7.2 Desktop assessment – Ecological Vegetation Classes (EVCs)

A summary of the vegetation communities making up the 2,672 hectares of vegetation proposed for inundation (along with the full extent of these EVCs in the broader Wallpolla Island area) is outlined in **Table 5**. One non-water dependent community was mapped (modelled 2005 DELWP EVC data) as receiving environmental water (see **Figure 3**), however, the vegetation mapping for the Inundation Areas has been ground-truthed and the on-ground inspection confirmed that this EVC had been incorrectly mapped, with Semi-arid Woodland not observed to be occurring anywhere within or immediately adjacent to the Inundation Area.

7.2.1 Listed flora communities

The EPBC Act-listed ecological community, *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions*, is consistent with one EVC modelled to occur within the Area of Inundation; EVC 98: Semi-arid Chenopod Woodland. Based on a desktop assessment, it was considered unlikely that this EVC would be present within the Area of Inundation. However, it was recommended that the areas modelled as potentially containing EVC 98 were ground-truthed to confirm the presence or absence of this EVC, and whether or not the EPBC Act-listed community, *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions,* and the associated FFG Act-listed flora community Semi-arid Shrubby Pine-Buloke Woodland Community, could be present within the Area of Inundation (refer Section 7.3 for outcomes of the field assessment).

Table 5 Ecological Vegetation Classes mapped by DELWP as occurring within the area proposed for inundation for Wallpolla

EVCs	EVC Conservation Significance	Modelled EVC extent within Inundation Area (ha)
Semi-arid Chenopod Woodland (EVC 98)	Depleted	0.02
Low Chenopod Shrubland (EVC 102)	Depleted	49.37
Riverine Chenopod Woodland (EVC 103)	Depleted	878.94
Lignum Swamp (EVC 104)	Vulnerable	32.68
Shallow Freshwater Marsh (EVC 200)	Vulnerable	3.11
Alluvial Plains Semi-arid Grassland (EVC 806)	Vulnerable	289.80
Lignum Shrubland (EVC 808)	Least Concern	716.53
Floodway Pond Herbland (EVC 810)	Depleted	35.84
Intermittent Swampy Woodland (EVC 813)	Depleted	216.34
Shrubby Riverine Woodland (EVC 818)	Least Concern	100.84
Spike-sedge Wetland (EVC 819)	Vulnerable	1.11
Sub-saline Depression Shrubland (EVC 820)	Vulnerable	39.55
Lignum Swampy Woodland (EVC 823)	Depleted	201.65
Water Body - Fresh (EVC 992)		93.95
Bare Rock/Ground (EVC 993)		11.86
Area of unmapped EVC*		0.31
Total		**2,672**

* A small area where EVCs have not been mapped which is due to gaps in the spatial data available

7.3 Field assessment

The field assessment focused 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 areas where there was no modelled EVC data available. Three discrete locations within the Inundation Area were assessed, and the field assessment confirmed the following:

- The mapping of the Inundation Area 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 Semi-arid Woodland identified within the Inundation Areas surveyed. Each of the discrete locations where this vegetation community was mapped by DELWP (in addition to the areas where no modelled EVC data was available) 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), EVC 808 (Lignum Shrubland) and occasionally EVC 810 (Floodway Pond Herbland). These EVCs are located on alluvial terraces and floodplains, and are prone to flooding and are likely to benefit from 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 or in areas where no modelled EVC data was available (see **Figure 7**). Native vegetation (EVC) mapping is only shown for the areas that were assessed during the field assessment.

	
Plate 1 – Patch of vegetation identified by DELWP modelled mapping as containing EVC 98 – Semi-arid Chenopod Woodland. The vegetation at this location consisted of Lignum Shrubland (EVC 808) dominated by *Duma florulenta* (Tangled Lignum).	Plate 2 – Patch of vegetation containing no modelled EVC data (DELWP 2005). The vegetation at this location consisted of Riverine Chenopod Woodland (EVC 103) dominated by *Eucalyptus largiflorens* (Black Box).

7.3.1 Listed vegetation communities

The ground-truthing field assessment confirmed that Semi-arid Chenopod Woodland (EVC 98) was not present in any areas where it had been modelled as occurring, or in any areas where modelled EVC data was not available. There was no vegetation 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 are present within the proposed area of inundation.

7.3.2 Listed flora

No incidental observations of listed flora species were recorded during the ground truthing surveys undertaken in June 2020. However, these surveys were rapid in nature, focusing on ground truthing EVCs and not identifying flora species within the broader area of inundation. Furthermore the surveys were not undertaken at an appropriate time of year to undertake targeted surveys for many listed flora species. A determination was made on the likelihood of occurrence for rare or threatened flora within the proposed Inundation Area based on the results of the desktop assessment and the vegetation (EVC) ground truthing field assessment (Appendix B).

Figure 6: Areas targeted during the EVC ground-truthing exercise within Inundation Areas at Wallpolla

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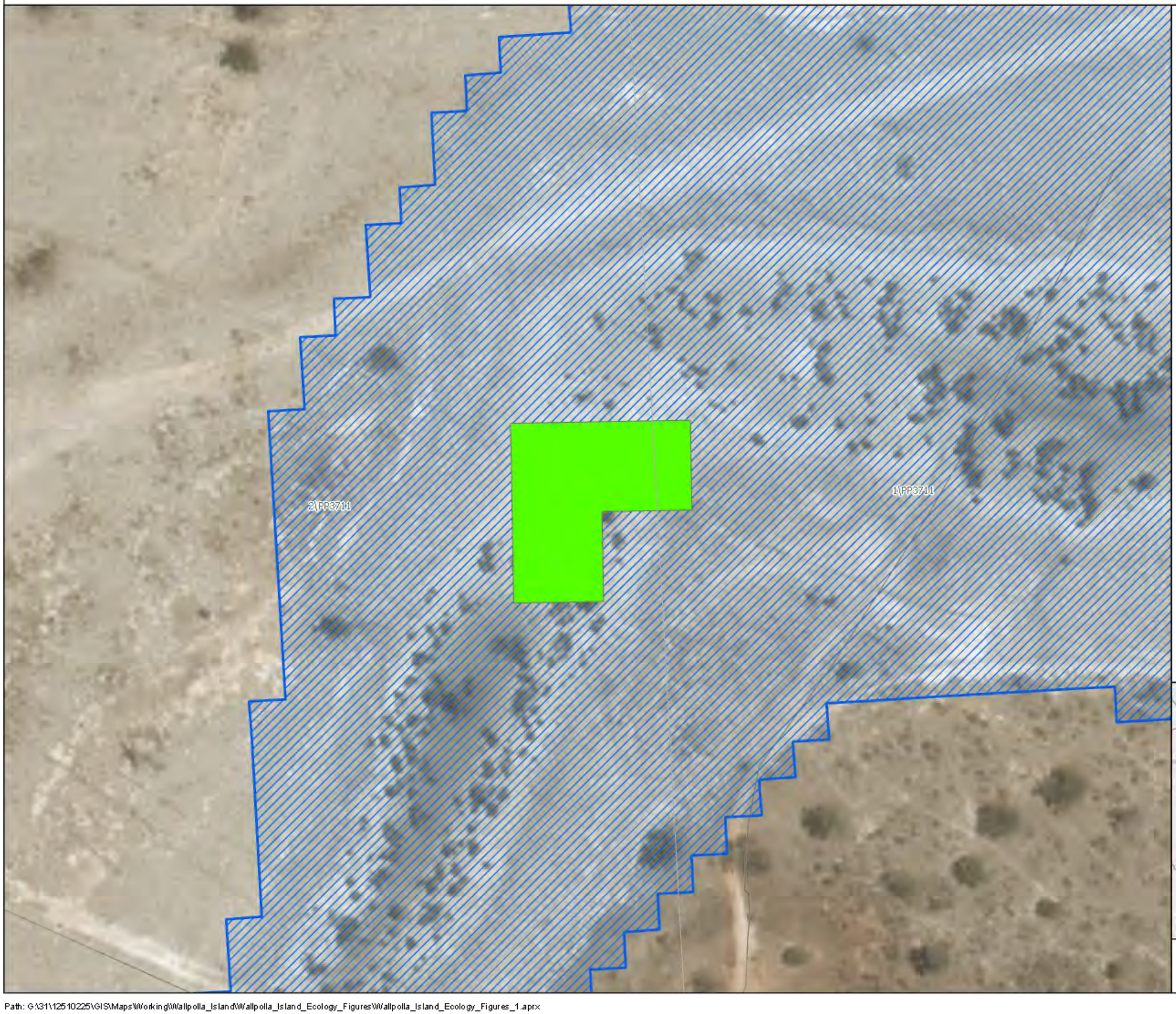

Legend

- Minor Road
- Inundation Area
- No modelled mapping available
- Parcel

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 12.5 25
Meters

DATA SOURCES
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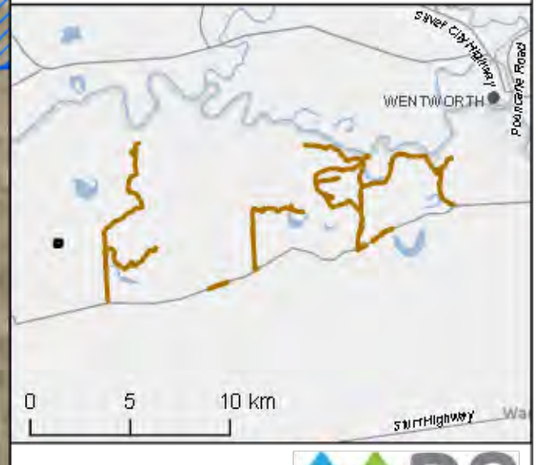

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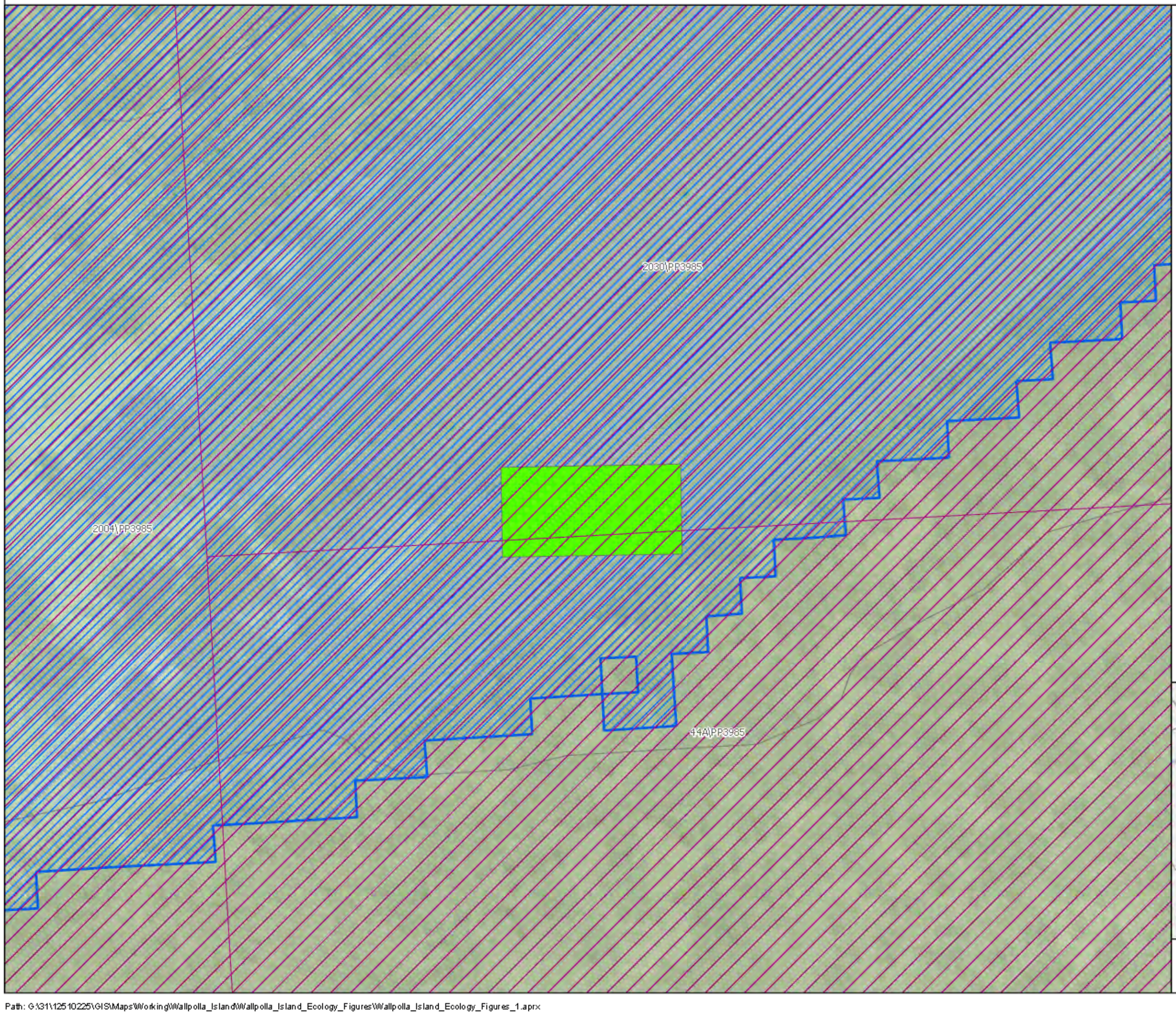
Figure 6: Areas targeted during the EVC ground-truthing exercise within Inundation Areas at Wallpolla

VMFRP



Legend

- Minor Road
- Wetland Swamp
- Reserve
- Inundation Area
- No modelled mapping available
- Crown and government parcel

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

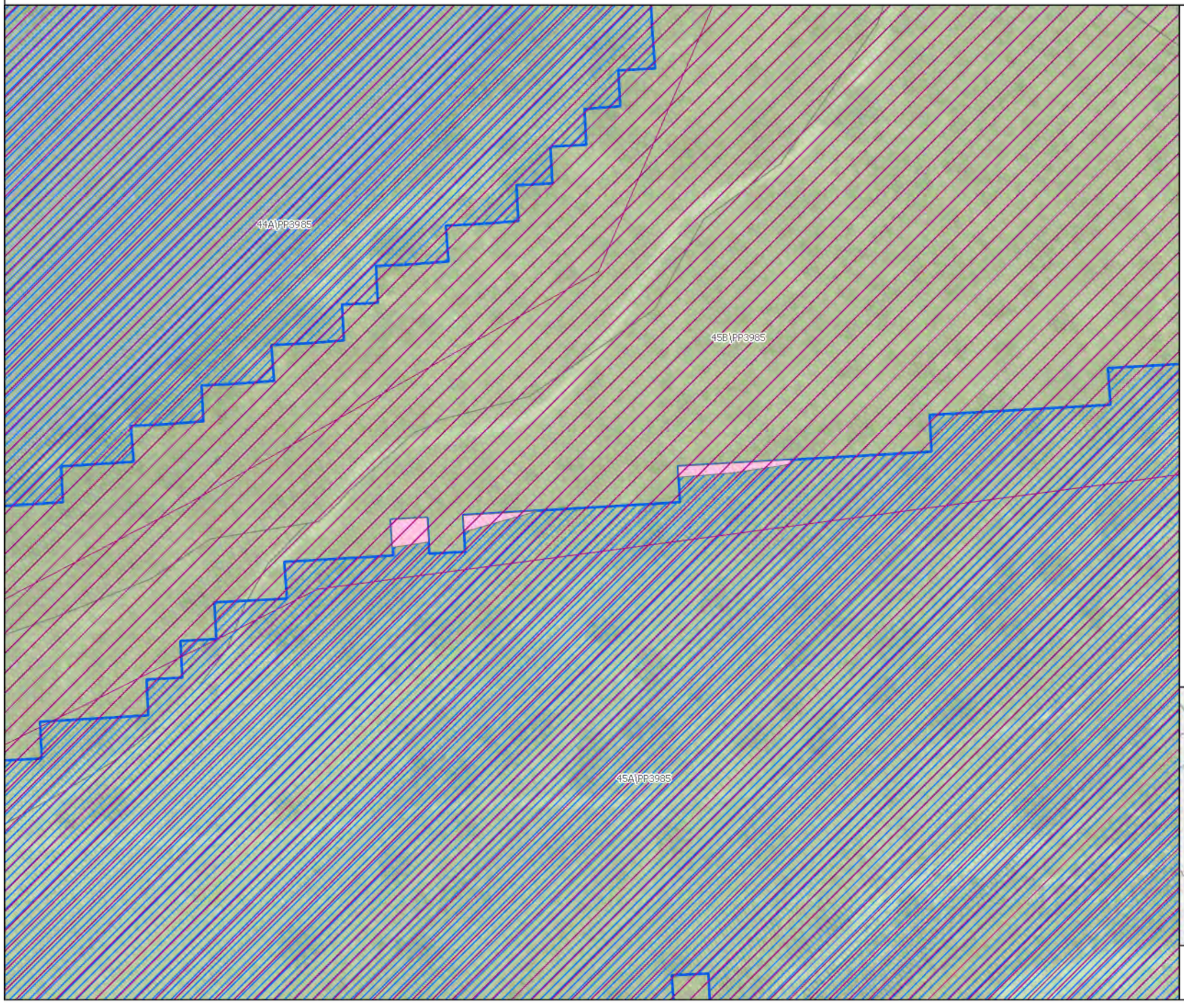
IS297701

0 12.5 25
Meters

R8

Figure 6: Areas targeted during the EVC ground-truthing exercise within Inundation Areas at Wallpolla

VMFRP



Legend

- Minor Road
- Watercourse Stream
- Wetland Swamp
- Reserve
- Inundation Area
- 98 Semi-arid Chenopod Woodland
- Crown and government parcel

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 12.5 25
Meters

DATA SOURCES
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R8

Path: G:\31\125110225\GIS\Maps\Working\Wallpolla_Island\Wallpolla_Island_Ecology_Figures\Wallpolla_Island_Ecology_Figures_1.aprx

Figure 7: Results of the EVC ground-truthing exercise within Inundation Areas at Wallpolla

VMFRP

Legend

- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Reserve
- Inundation Area
- Area of Investigation

EVC

- 808 Lignum Shrubland

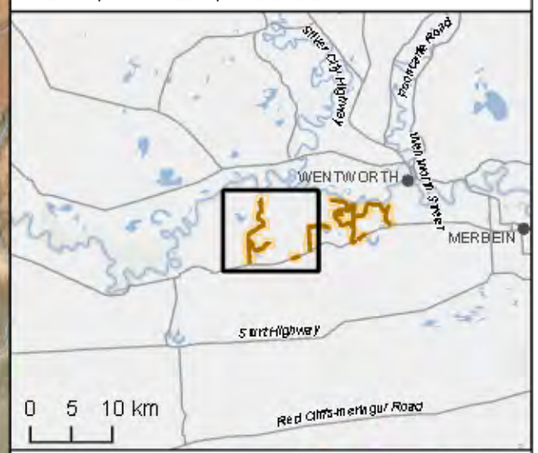
N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 500 1000 Meters

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



R8

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Figure 7: Results of the EVC ground-truthing exercise within Inundation Areas at Wallpolla

VMFRP

MURRAY RIVER
MURRAY RIVER
MURRAY RIVER
WALLPOLLA CREEK
WALLPOLLA CREEK
WALLPOLLA CREEK
HORSE SHOE LAGOON
Western Channel

Legend

- Major Road
- Minor Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- Reserve
- Inundation Area
- Area of Investigation

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 500 1000
Meters

DATA SOURCES
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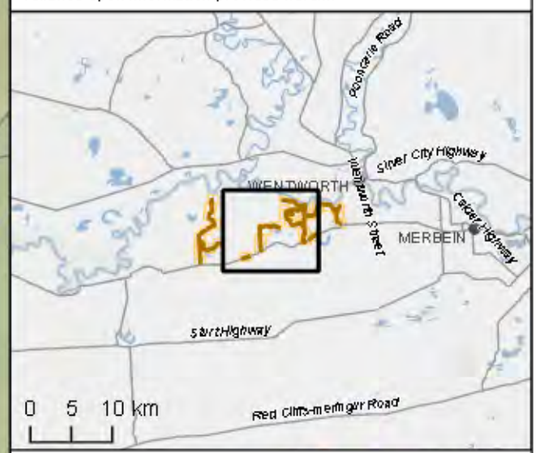
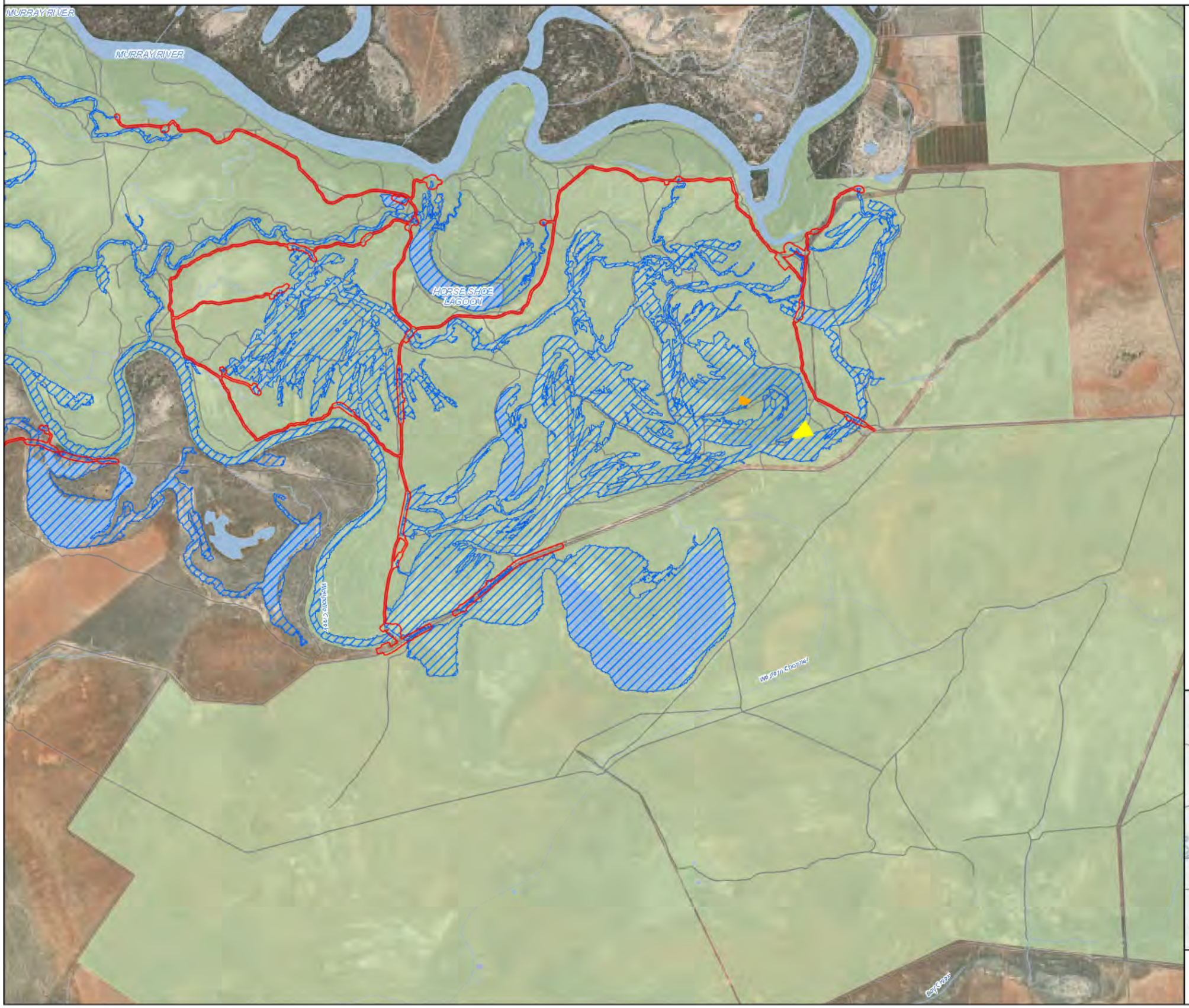


Figure 7: Results of the EVC ground-truthing exercise within Inundation Areas at Wallpolla

VMFRP



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8 Overview of potential impacts

This section provides an overview of the proposed project construction and operational activities and provides an overview of the associated potential impacts. The significance of these impacts on flora and fauna is assessed in Sections 9 and 10. Impact mitigation measures are discussed in Section 11.

8.1 Construction

Construction activities

It will be necessary to construct and/or upgrade a variety of water regulating structures and ancillary infrastructure in order to achieve the proposed environmental watering regimes and objectives (refer Sections 3.2, 3.3 and 3.4). Construction activities would be undertaken in accordance with a CEMP and a variety of sub plans which consider the management of water, soils, flora and fauna.

Construction activities would include:

- Establishment of construction sites, including removal of vegetation, stripping and stockpiling of topsoil, establishing temporary parking and truck turnaround areas, laydown and stockpiling areas
- Removal of existing structures / block banks where required
- Construction / installation of new structures
- Rehabilitation of disturbed areas post-construction

Construction activities may result in direct and indirect impacts (some permanent and some temporary) associated with:

- Removal, disturbance and lopping of native vegetation
- Borrow, import, excavation and placement of soil, clay, gravel and rock materials
- Movement of machinery, equipment and people
- Works in or adjacent to waterways and wetland areas
- Indirect impacts, e.g. noise, light, dust, etc. associated with construction

Changes to groundwater

As discussed in the Desktop Groundwater Assessment for the project (R8 2020), potential impacts may arise from drawdown in groundwater levels from construction dewatering of excavations. Depending on the duration and timing of the works, this could have an impact on local groundwater dependant ecosystems (GDEs) by temporarily reducing the groundwater recharge. For the Wallpolla project generally dewatering as part of construction activities would not be required, except for installation of regulator MS1 near Horseshoe Lagoon, installation of regulator MS2 at Wallpolla Creek. The CEMP to be prepared for the project would outline measures to avoid and minimise impacts on GDEs during construction, including the requirement to minimise the total volume and rate of groundwater extracted for construction and to minimise dewatering, provide make-up of offset water for potentially affected vegetation.

8.2 Operation

Operational activities

As identified in Section 3.6, preparation activities may result in a range of positive and negative impacts associated with the managed inundation activities. These activities would be undertaken in accordance with the Fish Management Plan, EWMP and operating plan. Adaptive management is proposed in order to maximise the benefits and minimise the impacts of environmental watering activities. Direct and indirect impacts are potentially associated with:

- Inundation of vegetation communities
- Changed hydraulic regime with consequent changes to aquatic and terrestrial flora and fauna habitat (including pest species)
- Changes in water quality within the floodplain and associated with return flows to the Murray River
- Changes to groundwater levels, quality and mobilising of salt (as discussed further below)

The proposed operating regime is intended to replicate a more natural flooding regime and to therefore improve the quality of floodplain vegetation and habitat across the inundation area. Potential impacts could however arise in the event that water regimes are not aligned to the requirements of the vegetation communities or listed threatened species. Further assessment would be carried out of ecological benefits, as well as potential impacts, associated with the proposed operating regime and strategies to avoid or mitigate these. This work would inform development of the final operating regime as well as monitoring, evaluation and reporting requirements.

Changes to groundwater

The Desktop Groundwater Assessment for the project (R8, 2020) identifies that the Wallpolla Island project area is underlain by shallow groundwater, with a water table aquifer that is predominantly highly saline, with fresher groundwater close to the Murray River and isolated sections of anabranches. Soil salinity is also known to be very high and groundwater is thought to be in direct connection with the Murray River and sections of the Wallpolla Creek, which generally lose water to groundwater (R8, 2020). Large areas of terrestrial and localised aquatic groundwater dependent ecosystems (GDEs) are thought to be present across the project area.

The Desktop Groundwater Assessment identifies that the risk to ecosystems as a result of the alteration of groundwater flow paths and levels from permanent below ground water barriers is expected to be low and there is likely to be a slight reduction in the salinity of the groundwater within the inundated area, which may have a net beneficial impact to ecosystems. However, there may be some areas on the fringe of the project's managed inundation area that could be impacted through near-surface salinization. Further assessment is required to identify and determine this potential impact. If further assessment identifies that changes to groundwater would adversely impact native vegetation, then additional mitigation measures would need to be developed and implemented as a part of the project through the Environmental Water Management Plan and the VMFRP Monitoring Evaluation and Reporting (MER) Plan.

9 Impacts to threatened flora and fauna and communities

The following chapter outlines the potential for impacts to threatened flora, fauna and communities resulting from the project. Further detail on potential impacts for EPBC Act-listed species is contained in Appendix F, Appendix H, Appendix I, Appendix J, and Appendix K.

9.1 Impacts to threatened vegetation communities

The PMST identified two EPBC Act-listed endangered ecological communities with potential to occur within 10 kilometres of the Construction Footprint:

- *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions*
- *Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions*

These communities are not consistent with vegetation mapped or modelled within either the Area of Investigation or Inundation Area.

No communities listed as threatened under the EPBC Act or FFG Act have been identified within the proposed Construction Footprint or within the Inundation Area, and therefore impacts to threatened vegetation communities are considered unlikely.

9.2 Impacts to threatened flora

The following assessment of likelihood of occurrence and impact to threatened flora considers the potential for listed species to occur at the Construction Footprints and/or the Inundation Area, based on the VBA and PMST searches, the habitat requirements of the species, and the habitat values observed within these areas. Table 6 summarises those species considered possible or present at one or both of the Construction Footprint and Inundation Area. An assessment of likelihood of occurrence and impact to all threatened flora is provided Appendix B for the Construction Footprint and Inundation Area.

A summary of the likely impacts to flora listed under the EPBC and FFG Acts are outlined below in sections 9.2.1 and 9.2.3.

Likelihood of occurrence:

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

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

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

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

Table 6 Summary of likelihood of occurrence assessments for EPBC and FFG listed flora species with the potential to occur

Scientific Name	Common Name	EPBC Act	FFG Act	VICADV	Habitat	Area of Investigation: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact Note: impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present.
Acacia oswaldii	Umbrella Wattle		L	vu	Widespread but rather uncommon throughout north-western Victoria, mainly on calcareous soils or loam (Walsh & Entwisle 1996)	**Present.** Recorded in 2013 surveys of the broader area and in the 2015 and 2019 surveys. **Impact unlikely.** Recorded in construction and road buffer areas. Mitigation measures will avoid and /or minimise impact to this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Atriplex holocarpa	Pop Saltbush		L	vu	In Victoria apparently confined to the far north-west (Hattah-Benetook area) where localised and uncommon on sandy soils prone to seasonal flooding (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Species not recorded during any previous surveys, which would suggest a population does not occur in Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Atriplex rhagodioides	Silver Saltbush		L	vu	In Victoria apparently confined to the Murray River floodplain in the far north west and recorded only from Natya area (between Swan Hill and Robinvale), Red Cliffs and Cowra. Fruits Mar., Oct. (2 records)	**Possible**. Suitable habitat recorded in Study Area, recorded in 2013 and 2015 surveys, but not re-recorded in 2019. Extremely dry conditions may be the reason. **Impact Possible.** Although not recorded in the most recent surveys, could reappear if conditions become suitable. Mitigation measures will avoid and /or minimise impact to this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific Name	Common Name	EPBC Act	FFG Act	VICADV	Habitat	Area of Investigation: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact Note: impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present.
Crinum flaccidum	Darling Lily		L	vu	Rare in Victoria, confined to the extreme north-west along the Murray River floodplain west of its junction with the Darling River.	**Present**. Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact possible.** Recorded in Construction Footprint in 2019. Mitigation measures will avoid and /or minimise impact to this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Eremophila bignoniiflora	Bignonia Emu-bush		L	vu	In Victoria confined to the far north-west and considered endangered in this State. Found along river flats and in depressions in woodlands on heavy clay soils. (Walsh and Entwisle 1999)	**Possible.** Suitable habitat was identified during survey, and species was recorded in 2015 surveys, but not recorded during 2019 targeted surveys. **Impact possible.** Even though not recorded in 2019 surveys, could still appear in Construction Footprint in future if conditions are suitable. Mitigation measures will avoid and /or minimise impact to this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Eremophila maculata subsp. *maculata*	Spotted Emu-bush		L	r	In Victoria confined to the north-west, mainly in *Eucalyptus largiflorens* forests or woodlands on heavy clay soils.	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact Possible.** One specimen recorded in Construction Footprint and another three in buffer areas. A large shrub, easily identifiable. Mitigation measures will avoid and /or minimise impact to this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific Name	Common Name	EPBC Act	FFG Act	VICADV	Habitat	Area of Investigation: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact Note: impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present.
Euphorbia planitiicola	Plains Spurge		L	en	Known in Victoria only from near Boort, Inglewood, Kerang and Lake Wallawalla, where found on seasonally wet, cracking clay soils.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Sclerolaena ventricosa	Salt Copperburr		L	en	Known in Victoria from a few small populations on treeless, saline, alluvial flats at Neds Corner in the far north-west and in black box-chenopod woodland near Kerang.	**Unlikely.** This species is not cryptic and it is expected in would have been recorded during recent or previous surveys if it was present.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Swainsona reticulata	Kneed Swainson-pea		L	vu	Rare in Victoria, mainly in north west, usually growing on alluvial flats in grassland and grassy woodland. Flowers Aug.-Oct.	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

9.2.1 EPBC Act-listed threatened flora

No EPBC listed flora species were recorded during the 2013 flora census of the local area, the 2015 surveys of Construction Footprint (which has since been updated), or the targeted surveys in 2019 of the Area of Investigation.

Of the seven EPBC listed flora species that were raised in the protected matters search tool search (10 km radius of the Area of Investigation), none were considered to have the potential to occur based on the habitat requirements of the species and considering the habitats encountered during the recent and previous field surveys. Specifically:

- Two species are considered **highly unlikely** to occur as they are species only known to occur in NSW: *Atriplex infrequens* (Salt Bush) and *Solanum karsense* (Menindee Nightshade).
- Three species are considered **highly unlikely** due to the absence of suitable habitat within the Construction Footprint and/or area of inundation, and the lack of any records within 100 km of Wallpolla: *Caladenia tensa* (Greencomb Spider-orchid), *Swainsona murrayana* (Slender Darling-pea) and *Swainsona pyrophila* (Yellow Swainson-pea).
- Two species considered **unlikely** to occur, as despite their potentially being suitable habitat present, Wallpolla Island is outside of their known distribution and the nearest known records are over 50 km away: *Lepidium monoplocoides* (Winged peppercress) and *Pterostylis cheraphila* (Rusty Greenhood).

The likelihood of occurrence and impact for all listed flora species in the Construction Footprint is detailed in (Appendix B).

A conservative approach to EPBC listed flora species has been taken for this assessment and all EPBC listed flora species identified in the desktop assessment have been considered further. A significance assessment of impacts from the proposed construction and inundation have been considered in Appendix F. The assessment includes the Significant Impact Criteria under the EPBC Act and an assessment of the potential for a significant effect on EPBC Act listed species, and also an assessment under the EE Act, using the *'Ministerial guidelines for assessment of environmental effects under the Environmental Effects (EE) At 1978'* which lists a number of triggers for an Environmental Effects Statement (EES) referral.

Inundation Area

The likelihood of occurrence and impact for threatened flora in the Inundation Area has been assessed at a desktop level only. However, as described above it is considered unlikely that flora species listed under the EPBC Act would be present within the Area of Inundation (see Appendix B and **Table 3**). Changes to the hydrological regime within the Inundation Area during the operation phase of the project are not expected to negatively impact native vegetation within the Inundation Area (R8, 2020). However, there may be areas on the fringe of the project's managed inundation area that could be impacted through near-surface salinization. Further assessment is required to identify and determine this potential impact. If further assessment identifies that changes to groundwater would adversely impact native vegetation, then additional mitigation measures would need to be developed and implemented as a part of the project through the Environmental Water Management Plan and the VMFRP Monitoring Evaluation and Reporting (MER) Plan.

9.2.2 FFG Act-listed and DELWP Advisory listed flora

Three species listed as threatened under the FFG Act were identified during the recent surveys in October 2019, either within or nearby the Area of Investigation. This includes:

- *Acacia oswaldii* (Umbrella Wattle): Several individuals were recorded, mostly adjacent to roads (may not be impacted), not recorded within proposed Construction Footprints.
- *Crinum flaccidum* (Darling Lily): A small grouping (five individuals) of this species was recorded within the US1 Construction Footprint. A number of other small populations of this species also occur in close proximity to this structure.
- *Eremophila maculata* subsp. *maculata* (Spotted Emu-bush): No individuals were recorded within the Construction Footprint, however one individual was recorded in close proximity to the MS2 construction footprint. Another three individuals were recorded in other areas close to the construction footprints (which should be avoided).

Steps to avoid and minimise impacts to these species during construction of the project are outlined in Section 11.

The potential impact to five individual *Crinum flaccidum* plants is not considered to have a substantial impact on populations of this species in the local area. However, consideration should be given to avoid this species (if possible) and care should be taken to protect other individual plants in the same vicinity that are in close proximity to the construction.

The location of flora species listed as threatened under the FFG Act should be taken in to consideration when finalising the Construction Footprints and efforts should be made to avoid listed species where possible. Additional avoidance and mitigation measures outlined in this report should be followed where possible to minimise the impacts on these species.

Thirteen flora species listed under the DELWP Advisory list for threatened flora were identified during the recent surveys (**Table 4**) and have the potential to be impacted by the proposed works.

Inundation Area

The likelihood of occurrence and impact for threatened flora in the Inundation Area has only been assessed at a desktop level. However it is considered possible that 56 flora species listed under the FFG Act and/or listed as VROTS have the potential to be present within the Inundation Area (see Appendix B and **Table 3**). It is expected that if these species were present, any impacts resulting from the operational phase of the project would be positive to neutral.

9.2.3 FFG Act protected flora

During comprehensive surveys undertaken by Ogyris in 2013 and by GHD in late 2015, a total of 45 different flora species listed as protected under the FFG Act were recorded within the Area of Investigation **(Table 7**, Appendix B). Five of these species were also recorded incidentally during the 2019 targeted surveys for threatened flora species.

The populations of some of these species will vary from year to year. Some of these species are annuals, and/or may be dormant and unidentifiable during any one season, therefore it is difficult to estimate the exact number of each species that will be directly impacted by the vegetation removal associated with the proposed works when construction commences. However, an estimate of the number of individuals that will likely be impacted based on the current construction footprint is provided below, taking in to account the data from the 2015 and 2019 surveys.

However, as the protected flora outlined below are also likely to be present within the inundation area, it is expected that any impacts to these species will be offset by the broader benefits to these species across the Inundation Area.

Table 7 FFG Act protected flora recorded in the Area of Investigation in 2013, 2015 and 2019

Scientific name	Common Name	Possible Impacts within the Construction Footprint
Acacia oswaldii	Umbrella wattle	0
Acacia stenophylla	Eumong	20-50
Actinobole uliginosum	Flannel Cudweed	100-200
Atriplex rhagodioides	Silver Saltbush	0
Brachyscome ciliaris	Variable Daisy	200-300
Brachyscome dentata	Lobe-seed Daisy	50-100
Brachyscome lineariloba	Hard-head Daisy	50-100
Calocephalus sonderi	Pale Beauty Heads	20-50
Calotis cuneifolia	Blue Burr-daisy	100-200
Calotis hispidula	Hairy Burr-daisy	100-200
Calotis scapigera	Tufted Burr-daisy	50-100
Calotis sp.	Burr Daisy	<10
Centipeda cunninghamii	Common Sneezeweed	200-300
Centipeda minima subsp. *minima* s.s.	Spreading Sneezeweed	20-50
Chthonocephalus pseudevax	Groundheads	10-20
Crinum flaccidum	Darling Lily	5
Eclipta platyglossa subsp. *platyglossa*	Yellow Twin-heads	50-100
Eremophila bignoniiflora	Bignonia Emu-bush	0
Eremophila divaricata subsp. *divaricata*	Spreading Emu-bush	50-100
Eremophila maculata subsp. *maculata*	Spotted Emu-bush	0
Eremophila sp.	Emu Bush	0
Euchiton sphaericus	Annual Cudweed	50-100
Isoetopsis graminifolia	Grass Cushion	10-20
Minuria cunninghamii	Bush Minuria	20-50
Minuria integerrima	Smooth Minuria	20-50
Myriocephalus rhizocephalus	Woolly-heads	20-50
Olearia pimeleoides	Pimelea Daisy-bush	<5
Picris squarrosa	Squat Picris	20-50
Podolepis muelleri	Small Podolepis	0
Pogonolepis muelleriana	Stiff Cup-flower	20-50
Polycalymma stuartii	Poached-eggs Daisy	20-50
Pycnosorus pleiocephalus	Soft Billy-buttons	20-50
Rhodanthe corymbiflora	Paper Sunray	10-20
Rhodanthe pygmaea	Pygmy Sunray	10-20
Rhodanthe stuartiana	Clay Sunray	10-20
Senecio cunninghamii var. *cunninghamii*	Branching Groundsel	100-200
Senecio quadridentatus	Cotton Fireweed	100-200

Scientific name	Common Name	Possible Impacts within the Construction Footprint
Senecio runcinifolius	Tall Fireweed	100-200
Senecio sp.	Groundsel	<10
Sphaeromorphaea littoralis	Spreading Nut-heads	100-200
Vittadinia cervicularis	Annual New Holland Daisy	200-300
Vittadinia dissecta var. *hirta*	Dissected New Holland Daisy	200-300
Vittadinia sp.	New Holland Daisy	<10
Xerochrysum bracteatum	Golden Everlasting	10-20

9.3 Potential impacts to threatened fauna

Seventy-six fauna species listed under the EPBC Act, FFG Act and/or the DELWP Advisory List were identified in the VBA and PMST search of the 10 km buffer of the Construction Footprint and the Inundation Area, or recorded from previous reports conducted within the Construction Footprint (GHD 2016, Biosis 2013). Thirty-nine of these species (two mammals, 23 birds, eight reptiles, one amphibian and five fish) are listed under the EPBC Act and/or FFG Act and are considered to have the potential to occur within Construction Footprint and or Inundation Area (see Appendix C and Appendix D for rational). These species are summarised **Table 8**.

Impacts to these species are considered further in Section 9.3.1-9.3.3.

The following assessment of likelihood of occurrence and impact to threatened fauna considers the potential to occur at the Construction Footprints and Inundation Area, based on the VBA and PMST searches, the habitat requirements of the species, and the fauna habitat values observed within these areas. This table summarises those species considered possible, likely or present at one or both of the Construction Footprint and Inundation Area. An assessment of likelihood of occurrence and impact to all threatened fauna is provided in Appendix C for the Construction Footprint and Appendix D for the Inundation Area.

Likelihood of occurrence:

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

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

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

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

Table 8 FFG Act and EPBC Act listed threatened fauna species considered to have possible or present likelihood of occurrence, as developed from VBA and PMST searches within a 10 km radius of the Construction Footprints and Inundation Area

Key to status: L – Listed EN / en – Endangered. VU / vu – Vulnerable. nt – Near Threatened. cr – Critically Endangered. Mi - Migratory

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Mammals									
Planigale gilesi	Giles' Planigale		L		11	2013	VBA, Biosis 2013	**Present.** Recorded during 2013 survey. **Impact Possible.** Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.	**Present.** Recorded during 2013 survey. **Impact Unlikely.** Species likely to benefit from improved habitat condition following environmental watering.
Nyctophilus corbeni	South-eastern Long-eared Bat	VU	L	En	2	1999	VBA	**Possible**. Species is known from area. May occur in dry woodland and shrubland communities. **Impact Possible.** I Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix I).	**Possible**. Species is known from area. May occur in dry woodland and shrubland communities. **Impact Unlikely.** Species mobile and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Birds									
Struthidea cinerea	Apostlebird		L		34	2010	VBA	**Possible.** Suitable habitat in area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible.** Suitable habitat in area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Botaurus poiciloptilus	Australasian Bittern	EN	L	En	3	2017	VBA, PMST	**Unlikely.** Suitable habitat not present within Construction Footprints.	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Porzana pusilla	Baillon's Crake		L	Vu	17	2007	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Ninox connivens	Barking Owl		L	En	2	2006	VBA	**Possible.** Suitable habitat in area. **Impact Possible.** Localised impacts possible, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex	**Possible.** Suitable habitat in area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Falco subniger	Black Falcon		L	Vu	2	1985	VBA	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Oxyura australis	Blue-billed Duck		L	En	9	2006	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Burhinus grallarius	Bush Stone-curlew		L	En	2	2000	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species rare and highly mobile. Suitable surrounding habitat widespread.	**Possible**. Species is known from area. **Impact Unlikely.** Species rare and highly mobile. Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Sterna caspia	Caspian Tern	Mi	L		19	2010	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Ardea modesta (=alba)	Eastern Great Egret		L	Vu	44	2019	VBA, Biosis 2013, GHD 2016, R8 2019 (this study) (see Appendix G	**Present.** Recorded during 2013, 2016, and this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Present.** Recorded during 2013, 2016 and this survey. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water
Stictonetta naevosa	Freckled Duck		L	En	1	2006	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area. **Impact Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Falco hypoleucos	Grey Falcon		L	En	1	2000	VBA	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Coracina maxima	Ground Cuckoo-shrike		L	Vu	1	2007	VBA	**Possible**. Species is known from area, though rare. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area, though rare. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Aythya australis	Hardhead			Vu	20	2019	VBA, R8 2019 (this study) (see Appendix G)	**Present.** Recorded during this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Present.** Recorded during this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat conditions during and following environmental water.
Melanodryas cucullata	Hooded Robin		L		6	2019	VBA, Biosis 2013, GHD 2016, R8 2019 (this study) (see Appendix G)	**Present.** Recorded during 2013, 2016 and this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Present.** Recorded during 2013, 2016 and this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Ardea intermedia	Intermediate Egret		L	En	8	2019	VBA	**Possible.** Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Egretta garzetta	Little Egret		L	En	1	1977	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water
Cacatua leadbeateri	Major Mitchell's Cockatoo		L	Vu	16	2001	VBA	**Possible.** Suitable habitat, likely an occasional visitor to the area. **Impact Possible.** Species wide ranging and suitable surrounding habitat widespread. However, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.	**Possible.** Suitable habitat, likely an occasional visitor to the area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Grantiella picta	Painted Honeyeater	VU	L	Vu			PMST	**Possible.** Species not recorded previously but has potential to utilise woodland habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.	**Possible.** Species not recorded previously but has potential to utilise woodland habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Turnix pyrrhothorax	Red-chested Button-quail		L	Vu	1	2000	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Pyrrholaemus brunneus	Redthroat		L	En	1	1999	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Polytelis anthopeplus monarchoides	Regent Parrot	VU	L	Vu	3	1998	VBA, PMST	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Haliaeetus leucogaster	White-bellied Sea-Eagle		L	Vu	22	2013	VBA, Biosis 2013	**Present.** Recorded during 2013 survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Present.** Recorded during 2013 survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Climacteris affinis	White-browed Treecreeper		L	Vu	3	1999	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Reptiles									
Rhynchoedura ornata	Beaked Gecko		L	cr	6	2020	VBA, This Survey (see Appendix G)	**Present.** Recorded in this survey. Species has potential to utilise habitats within Construction Footprint. **Impact Possible.** Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.	**Present.** Recorded in this survey. Species likely to utilise habitats within Inundation Area. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Morelia spilota metcalfei	Carpet Python		L	En	7	2005	VBA	**Possible.** Suitable habitat in area. **Impact Possible.** Localised impacts possible, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.	**Possible.** Suitable habitat in area. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Denisonia devisi	De Vis' Banded Snake			cr	5	2019	VBA, Biosis 2013, GHD 2016, This Survey (see Appendix G)	**Present.** Recorded in 2013, 2016 and this survey. **Impact Possible.** Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.	**Present.** Recorded in 2013, 2016 and this survey. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Pygopus schraderi	Eastern Hooded Scaly-foot		L	cr	4	2010	VBA	**Possible**. Species is known from area. May occur in red clay and clay-loam soil areas with chenopod shrubland and native grassland vegetation. **Impact Possible.** Localised impacts possible as a result of vegetation removal and potential habitat loss.	**Possible**. Species is known from area. May occur in red clay and clay-loam soil areas with chenopod shrubland and native grassland vegetation. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Varanus varius	Lace Monitor			en	8	2016	VBA GHD 2016	**Present.** Recorded in 2016 surveys. **Impact Possible.** Localised impacts possible, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.	**Present.** Recorded in 2016 surveys. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Furina diadema	Red-naped Snake		L	vu	6	2013	VBA, Biosis 2013	**Present**. Recorded in 2013 surveys. **Impact Possible.** Potential impacts could occur from vegetation removal, including direct impacts/mortality and habitat loss. These would be managed through a Fauna Management Plan.	**Present**. Recorded in 2013 surveys. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Morethia adelaidensis	Samphire Skink		L	en	1	2000	VBA	**Possible**. Species is known from area. May occur in chenopod-dominated shrublands, often associated with woodlands. **Impact Unlikely.** Suitable habitats not present within Construction Footprints.	**Possible**. Species is known from area. May occur in chenopod-dominated shrublands, often associated with woodlands. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Chelodina expansa	Broad-shelled Turtle		L	en	1	1994	VBA	**Possible.** Species is known from the area. May occur in waterways and waterholes especially those that are permanent and have aquatic vegetation, including the Murray River and Wallpolla Creek. **Impact Possible**. Localised impacts possible, associated with coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from the construction footprint. A construction specific aquatic fauna management plan would be developed for all works around waterways.	**Possible.** Species is known from the area. May occur in waterways and waterholes especially those that are permanent and have aquatic vegetation, including the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Possible**. Species has the potential to benefit directly from enhanced habitat availability when environmental water is present and flowing habitat and connectivity is improved through the Wallpolla Creek, and indirectly from improved habitat condition following environmental watering. The remains some potential that adverse impacts could occur as a result of improperly planned designs that don't take into account turtle movement, dispersal and habitat use. This will need to be considered during the detailed design phase. An aquatic management plan would also address turtle requirements.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Frog									
Litoria raniformis	Growling Grass Frog	VU	L	en	9	2019	VBA, PMST, This Survey (see Appendix G)	**Present.** Recorded close to Construction Footprint (Regulator MSH) Previous records within Wallpolla Island within the VBA it is known to have been recorded on Wallpolla Island by Biosis in 2013 (Seran BL&A 2018). **Impact Possible.** Localised impacts possible as a result of habitat clearance, including direct impacts/mortality. Impacts from vegetation removal and habitat loss would be minimised and managed through a Fauna Management Plan. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix I).	**Present.** Recorded close to Construction Footprint Site 9. Previous records within Wallpolla Island within the VBA it is known to have been recorded on Wallpolla Island by Biosis in 2013 (Seran BL&A 2018). **Impact Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Fish									
Maccullochella peelii	Murray Cod	VU	L	vu	6	2017	VBA, PMST	**Possible.** Species has not been recorded during TLM monitoring of Wallpolla Creek between 2008 and 2018 but has been recorded from Dedmans Creek during this period. Favours permanent flowing river reaches and creeks with hydraulic complexity/diversity. Habitat present in the Murray River, Dedmans Creek and potentially Wallpolla Creek. **Impact Possible.** Wallpolla Creek is unlikely to support a significant population of Murray Cod under current conditions. The use of coffer dams to allow for construction of Regulator MS2 has the potential to restrict fish passage and negatively impact water quality in Wallpolla Creek which may impact any fish present. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Adoption of these measures would minimise the likelihood of impact to Murray Cod, if present during the construction period.	**Possible.** Species is known from area and suitable habitat present. Favours permanent flowing river reaches and creeks with hydraulic complexity/diversity. Habitat present in the Murray River, Dedmans Creek and potentially Wallpolla Creek. **Impact Possible.** Increased flows in Wallpolla Island creeks likely to benefit species during smaller inundation scenarios. Larger inundation scenarios are likely to reduce flows (thus reducing their preferred habitat) and allow for proliferation of carp in floodplain habitat, which may impact existing populations. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
								Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints. A construction specific aquatic fauna management plan would be developed for all works around waterways. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix I).	
Bidyanus bidyanus	Silver Perch	CR	L	vu	7	2017	VBA, PMST	**Present.** Species has been consistently recorded in low numbers during TLM monitoring of Wallpolla Creek and Dedmans Creek between 2008 and 2018. Inhabits rivers, lakes and reservoirs, preferring areas of rapid flow. Habitat present in the Murray River, Dedmans and Wallpolla Creeks. **Impact Possible.** The use of coffer dams to allow for construction of Regulator MS2 has the potential to restrict fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Although Wallpolla Creek is not likely to provide optimal habitat for the species, any fish present would be unable to pass through Wallpolla Creek when the coffer	**Present.** Species is known from area and suitable habitat present. Prefers rivers, lakes and reservoirs, preferring areas of rapid flow. Habitat present in the Murray River, Dedmans Creek and Wallpolla Creek. **Impact Possible.** Increased flows in Wallpolla Island creeks likely to benefit species during smaller inundation scenarios. Larger inundation scenarios are likely to reduce flows (thus reducing their preferred habitat) and allow for proliferation of carp in floodplain habitat, which may impact existing population. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4). Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix H).

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
								dams are in place during stage 2 of the construction phase. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints. A construction specific aquatic fauna management plan would be developed for all works around waterways. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix H).	

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Melanotaenia fluviatilis	Murray-Darling Rainbowfish		L	vu	17	2017	VBA	**Present.** Species has been regularly recorded during TLM monitoring between 2015 and 2018. Prefers streams, backwaters of larger rivers, drainage ditches, overflow ponds and reservoirs, especially near grassy banks. Habitat present in the Murray River, Dedmans Creek and Wallpolla Creek. **Impact Unlikely.** The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas. A construction specific aquatic fauna management plan would be developed for all works around waterways. For mitigation measures see Section 11.3	**Present.** Species is known from area and suitable habitat present. Prefers Streams, backwaters of larger rivers, drainage ditches, overflow ponds and reservoirs, especially near grassy banks. Possible habitat present in the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Unlikely.** Suitable habitat expected to increase during environmental watering. An increased risk of carp during inundation events (which may negatively impact the species) will remain during inundation events. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Craterocephalus stercusmuscarum fulvus	Unspecked Hardyhead		L		28	2017	VBA	**Present**. Species has been regularly recorded during TLM monitoring between 2008 and 2018. Prefers margins of large, slow-flowing, lowland rivers, and in lakes, backwaters and billabongs. Habitat present in the Murray River, Dedmans Creek and Wallpolla Creek. **Impact Unlikely**. The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas. A construction specific aquatic fauna management plan would be developed for all works around waterways. For mitigation measures see Section 11.3	**Present**. Species is known from area and suitable habitat present. Prefers margins of large, slow-flowing, lowland rivers, and in lakes, backwaters and billabongs. Possible habitat present in the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Unlikely.** Suitable habitat expected to increase during environmental watering. An increased risk of carp during inundation events (which may negatively impact the species) will remain during inundation events. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of occurrence and impact - Construction Footprint	Likelihood of occurrence and impact - Inundation Area
Tandanus tandanus	Freshwater Catfish		L	en	4	2017	VBA	**Construction Footprint** **Present**. Low numbers of this species have been recorded in Dedmans and Wallpolla Creeks. Prefers slow-moving streams, lakes and ponds with fringing vegetation. Habitat present in the Murray River, Wallpolla Creek and Dedmans Creek. **Impact Unlikely.** The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas. A construction specific aquatic fauna management plan would be developed for all works around waterways. For mitigation measures see Section 11.3.	**Possible**. Species is known from area and suitable habitat present. Prefers slow-moving streams, lakes and ponds with fringing vegetation. Possible habitat present in the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Unlikely.** Suitable habitat expected to increase during environmental watering. An increased risk of carp during inundation events (which may negatively impact the species) will remain during inundation events. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).

9.3.1 Impacts to EPBC Act listed fauna and communities

Six EPBC Act listed fauna species were identified as either present or as possibly occurring within the Construction Footprint and Inundation Area: South-eastern Long-eared Bat (*Nyctophilus corbeni*), Regent Parrot (*Polytelus anthopeplus monarchoides*), Growling Grass Frog (*Litoria raniformis*), Painted Honeyeater (*Grantiella picta*), Murray Cod (*Maccullochella peelii peelii*) and Silver Perch (*Bidyanus bidyanus*).

An assessment against the EPBC Act significant impact criteria for each of the EPBC Act species is provided in Appendix H and Appendix I. In addition, an assessment of the potential for a significant effect as defined under the EE Act was undertaken using the 'Ministerial guidelines for assessment of environmental effects under the Environmental Effects Act 1978' which lists a number of triggers for an EES referral, as provided in Appendix K.

A conservative approach to EPBC listed species has been taken for this assessment and an additional two EPBC listed species, Australasian Bittern (*Botaurus poiciloptilus*) and Australian Painted Snipe (*Rostratula australis*) which were not identified as either present or as possibly occurring within the Construction Footprint have also been considered further. Impacts from the proposed construction have been considered below.

South-eastern Long-eared Bat (*Nyctophilus corbeni)* (Vulnerable)

The South-eastern Long-eared Bat is a slow flying agile bat, utilising the understorey to hunt non-flying (volant) prey - especially caterpillars and beetles - and will even hunt on the ground. It inhabits a variety of tree vegetation types, including mallee, Buloke (*Allocasuarina luehmannii*) and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation. It roosts in tree hollows, crevices, and under loose bark (OEH 2012). Like most species of insectivorous bats in Victoria it roosts within tree hollows during the day (Lumsden 1994).

The species is more abundant where vegetation has a distinct canopy and a dense cluttered understorey layer (Churchill 1998), likely to enable it to forage for non-volant species. It has a scattered distribution in Victoria known from only four geographic locations all from the north-west of the state: Mopoke Tanks, Hattah, Yarrock and Bullock Creek. Victorian records are from *E. gracilis mallee*, Buloke and Black Box woodlands (Lumsden 1994). The closest records of the species are near Moorna, NSW from 1999[13]. In Victoria the nearest known records are in the southern part of the Murray-Sunset National Park (1962) and in Hattah State Forest, 2008) both over 70 km away.

Whilst the species has been recorded with 10 km of the construction and Inundation Areas, it has not been recorded for more than 20 years despite Wallpolla Island being subject to a number of fauna surveys, preferred habitat is also largely absent. Whilst it is possible it may occur within the Construction Footprint, impacts as a result of vegetation removal and potential habitat loss will be localised, and therefore resultant impacts to the species are expected to be negligible.

In the unlikely occurrence of this species in the Construction Footprint, impacts as a result of vegetation removal and potential habitat loss will be localised, and therefore resultant impacts to the species are expected to be negligible. However, broader mitigation measures for hollow-dependent species as outlined in Section 9.3.3 below will also apply to threatened bats (such as the South-eastern Long-eared Bat) including pre-clearance surveys and hollow-bearing tree management.

An assessment against the EPBC Act significant impact criteria has been completed (Appendix I) and found no significant impact is likely for this species from the proposed project.

[13] Australian Living Atlas, https://www.ala.org.au/, accessed 10/06/2020

Regent Parrot (*Polytelus anthopeplus monarchoides*) (Vulnerable)

There are only three records (most recently in 1998 – VBA) of this species within 10 km of the construction and Inundation Areas. The Regent Parrot is readily recognisable and Wallpolla Island has been subject to numerous ecology surveys including most recently GHD 2016 and Biosis 2013. Wallpolla Island contains limited potential habitat for this species and no known nesting colonies.

Impacts to Regent Parrots are expected to be marginal at most, and could include losses to a relatively small area (38 hectares within 9,000+ ha of high quality native vegetation within the surrounding Island) within the overall landscape of potential foraging habitat.

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

An assessment against the EPBC Act significant impact criteria has been completed (Appendix I) and found no significant impact is likely for this species from the proposed project.

Growling Grass Frog (*Litoria raniformis*) (Vulnerable)

The Growling Grass Frog is widespread throughout Victoria and is also known to occur along the Murray River (Seran BL&A 2018). This species was recorded once during this assessment approximately 60 metres west of the proposed regulator MSH on an anabranch of Wallpolla Creek, and is known from nine records across the project area (VBA), including records by Biosis within Wallpolla Island in 2013 (Seran BL&A 2018).

Despite the limited records, the presence of suitable habitat, and the ability of this species to recolonise areas suggests that it has the potential to occur at any of the wet sites on the Murray River or major creeks including the Wallpolla Creek, and localised impacts are possible. Consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints must consider these aquatic fauna. A construction specific aquatic fauna management plan should be developed as part of a CEMP for all works around waterways. The Growling Grass Frog is considered likely to benefit from expanded habitat during, and improved habitat condition following environmental water, and a reintroduction of more suitable ecological watering regimes is likely to facilitate this.

An assessment against the EPBC Act significant impact criteria has been completed (Appendix I) and found no significant impact is likely for this species from the proposed project.

Painted Honeyeater (*Grantiella picta*) (Vulnerable)

Painted Honeyeater, is considered to have potential to utilise habitats within the proposed Construction Footprint and broader Inundation Area. This species has not been previously recorded within 10 km of the Study Area, but may occasionally forage in woodland areas. However, the proposed Construction Footprint is 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.

An assessment against the EPBC Act significant impact criteria has been completed (Appendix I) and found no significant impact is likely for this species from the proposed project.

Murray Cod (*Maccullochella peelii peelii*) (Vulnerable) and Silver Perch (*Bidyanus bidyanus*) (Critically Endangered)

Two EPBC Act listed fish species are known to occur within the Area of Investigation; the Murray Cod and Silver Perch (both last recorded in 2017 from six and seven records respectively).

Both species are most likely to be present in the Murray River or moderate to fast flowing permanent creeks (e.g. Dedmans Creek) on Wallpolla Island but may also be present in low numbers in slow-flowing creeks (e.g. Wallpolla Creek). The Murray Cod National Recovery Plan lists Wallpolla as having an important largely wild population (National Murray Cod Recovery Team 2010). Previous surveys, carried out as part of TLM monitoring (see Henderson e*t al.* 2010), indicate that Silver Perch have been collected from Wallpolla Creek in low numbers but both species have the potential to be present.

The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction will allow for fish passage and flows to pass. Stage 2 of the construction will require closure of the waterway (and hence no fish passage) for up to three months. Adoption of the following mitigation measures will minimise impacts to both species during the construction phase:

- Limit fish passage restrictions during breeding season (October to December)
- Target construction period during colder months (e.g. June to August) to avoid water quality impacts caused by algal blooms and stratification
- Implement flow-through via pumping from upstream to downstream to maintain water quality and levels on both sides of the construction site
- Monitor water quality (specifically dissolved oxygen) and depths upstream and downstream of the construction site on Wallpolla Creek during construction period to maintain similar conditions on both sides of the construction site
- A construction-specific aquatic fauna management plan (as part of a broader CEMP) should be developed for the site. The plan should detail fish relocation or rescue methods and triggers (e.g. management responses to fish deaths or poor water quality).

Construction of Regulator MS1 on Finnigans Creek also has the potential to limit fish passage. Finnigans Creek is an intermittent waterway, that intermittently connects with the Murray River, but typically exists as a series of pools that periodically decline into smaller isolated pools with extended duration since inflows. Flow into Finigans Creek, and consequently fish passage, becomes active at Murray River flows of 12,000 ML/day at Lock 9. An assessment of physical habitat indicates that the creek is likely to periodically support a range of small-bodied native fish species but is unlikely to provide breeding habitat for EPBC-listed species such as Murray Cod and Silver Perch, or provide a migration route for either species. Under existing conditions it is likely that the creek dries out during summer and connection with the Murray River would be lost. It is expected that any native large-bodied fish present would attempt to exit Finnigans Creek by moving downstream to Wallpolla Creek. If the absence of flow in Finnigans Creek prevents connection with Wallpolla Creek, native fish may become stranded in the remaining Finnigans Creek pools. It is noted that there is an earthen bank within Finnigans Creek which was constructed as part of an existing environmental watering program which already restricts and fish passage in Finnigans Creek.

Construction of Regulator MS1 has the potential to limit fish passage in Finnigans Creek for up to nine months, blocking flows from the Murray River during this time and preventing fish exiting the system. To minimise the likelihood of impacts due to poor downstream water quality the project should:

- Implement flow-through via pumping from upstream to downstream to maintain downstream water quality in Finnigans Creek during periods that the creek would otherwise be connected to the Murray River

Other in-stream works, such as dewatering works and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints must be planned and managed considering these fish. The construction specific aquatic fauna management plan should be developed for all works around waterways, which are likely to minimise impacts to both species.

Two EPBC Act listed fish species, Murray Cod and Silver Perch have the potential to be impacted by inundation events. Impacts are generally likely to be beneficial to these species. Under the natural inundation and seasonal fresh scenarios flows will increase in Dedmans, Finnigans and Wallpolla Creeks, which are likely to provide conditions that will suit both Murray Cod and Silver Perch. During the floodplain inundation scenarios it is likely that some sections of Wallpolla Creek will become inundated, which will reduce flow – this is likely to benefit species that prefer slow moving/wetland habitat (Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish) but may lead to conditions that are not preferred by Silver Perch and Murray Cod in these sections. That said, the floodplain inundation will also lead to short-term foraging habitat for both species and since both species are currently present in low numbers the overall impact is not likely to be negative.

An assessment against the EPBC Act significant impact criteria has been completed (Appendix H and Appendix I) and found no significant impact is likely for these species from the proposed project.

Australasian Bittern (*Botaurus poiciloptilus*) (Endangered)

The Australasian Bittern occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats (Marchant and Higgins 2004). It favors wetlands with tall, dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water (Marchant and Higgins 2004). The species favors permanent freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g. *Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus*) or cutting grass (*Gahnia*) growing over muddy or peaty substrate (Marchant & Higgins 1990; within DoE 2016c).

In Victoria the species is recorded mostly in the southern coastal areas and in the Murray River region of central northern Victoria (Jaensch 2005, as cited in DSEWPaC 2011). The ebird database (accessed 11/6/20) identifies three main hotspots for this species in Victoria: along the south coast between Port Fairy and Portland, around Port Phillip Bay between Geelong and Carrum Downs and along the Murray River between Swan Hill and Yarrawonga.

The nearest record to the Area of Investigation is approximately 6 km to the north east at Wentworth (2010, Atlas of NSW), there are also two recent records from north and south of the Sturt Highway (2000 VBA) between 10 and 15 km away. All other records in the VBA and Atlas are over 20 years old. There are also three records in the ebird database in the vicinity of the Area of Investigation: Chowilla Game Reserve, South Australia, approximately 74 km to the north west, 2005; Martins Bend near Berri South Australia approximately 100 km to the south west, 2017; and Lake Culluleraine Recreation Reserve, Victoria approximately 12 km south west, 2018. Each of these records are of a single individual. Whilst there are sporadic records in the area there is a distinct paucity of records for an area so heavily surveyed.

There is limited data available about breeding requirements for this species, but the data that is available indicates that the Australasian Bittern breeds in relatively deep, densely vegetated freshwater swamps and pools, building its nests in deep cover over shallow water (Marchant & Higgins 1990; within DOE 2020a). In rush land, it may avoid breeding in the densest areas (Marchant & Higgins 1990; within DOE 2020a); alternatively, this may simply reflect the location of the few nests that have been found in wetlands that are difficult to access (Jaensch 2005, as cited in DoE 2020a).

The likelihood of this species using the Area of Investigation more than an occasional visitor is considered low given the bulk of the Area of Investigation lacks the required habitat features for this species (tall, dense aquatic vegetation) and is comprised predominately of woodland and shrubland (Table 10).

Australian Painted Snipe (*Rostratula australis*) (Endangered)

The Australian Painted Snipe is a rare, nomadic bird species that may turn up at any suitable wetland across Australia, when conditions are favourable. This species is widespread but rare throughout most of eastern Australia.

The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum *Muehlenbeckia* or canegrass or sometimes tea-tree (*Melaleuca*). The Australian Painted Snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber (Marchant & Higgins 1993 within DOE 2020b).

The species is reported to have been mainly recorded in the Murray-Darling region however in Victoria and NSW, known records (VBA, Atlas of NSW and ebird) indicate this to be more accurate for the region east of Swan Hill (DOE 2020b).

In the vicinity of the Area of Investigation there are very few records. The ebird database shows a vast area largely unoccupied by the species for 250 km or more in every direction with the exception of a single record at Merbein Common near Mildura from 2011. Whilst we know this not to be true with a handful of other records in the area (west of Morkalla approximately 70 km south west from 1973, south of Red Cliffs approximately 34 km south east from 1910 and east of Wentworth from 2011) it is reflective of the rarity of this species in the region.

The likelihood of this species using the Area of Investigation more than an occasional visitor is considered low given the bulk of the Area of Investigation lacks the required habitat features for this species (tall, dense aquatic vegetation) and is comprised predominately of woodland, shrubland and Lignum swamp (Table 10).

Communities

No EPBC Act listed fauna communities are known from within 10 km of the construction or Inundation Areas or are considered to have the potential to occur.

9.3.2 Impacts to EPBC Act listed migratory species

Thirteen species listed as migratory under the EPBC Act are predicted to occur, or were previously recorded from previous surveys and a VBA and PMST search of the Area of Investigation (10 km buffer) (Table 9). None of these species were considered as likely to occur within the Construction Footprint or Inundation Area during the time of the survey, mostly due to the lack of recent records within the and/or a lack of suitable habitat available (waterbodies, wetlands etc.).

It is highly unlikely that the Construction Footprint supports habitat that will be considered important for migratory species foraging or breeding activity or support an ecologically significant proportion of a population of migratory species, prior to the proposed construction. An assessment of the EPBC Act significant impact criteria to Migratory listed species from the proposed works is provided in Appendix J. The project is not likely to have a significant impact on EPBC Act-listed migratory species.

Reinstating historical environmental flows within Wallpolla Island floodplain will improve the quality of habitat present for water dependant avifauna, with several species of Migratory birds including Eastern Great Egret (*Ardea modesta*) and Glossy Ibis (*Plegadis falcinellus*) known to respond to environmental watering (Cook et al. 2011 and Wood et al. 2018). Such enhancements include increased productivity of floodplain vegetation communities, increased floral diversity and structure by reducing more dominant drought-tolerant species and increase overall health and integrity of the area to improve breeding, foraging and refuge resources for listed Migratory species, and other wetland-dependant bird species such as the Curlew Sandpiper (*Calidris ferruginea*) and Sharp-tailed Sandpiper (*Calidris acuminata*).

Table 9 Summary of EPBC Act listed migratory species known or with the potential to occur in the Study Area

Scientific Name	Common Name
Actitis hypoleucos	Common Sandpiper
Apus pacificus	Fork-tailed Swift
Calidris acuminata	Sharp-tailed Sandpiper
Calidris ferruginea	Curlew Sandpiper
Calidris melanotos	Pectoral Sandpiper
Gallinago hardwickii	Latham's Snipe
Motacilla flava	Yellow Wagtail
Myiagra cyanoleuca	Satin Flycatcher
Numenius madagascariensis	Eastern Curlew
Pezoporus occidentalis	Night Parrot
Plegadis falcinellus	Glossy Ibis
Sterna caspia	Caspian Tern
Tringa nebularia	Common Greenshank

9.3.3 Impacts to FFG Act listed fauna, fauna communities and other listed fauna species

Terrestrial fauna

Thirty-six FFG Act listed species (22 birds, two mammals, one amphibian, six reptiles, and five fish species) are considered as present, or to have potential to occur within the proposed Construction Footprints, these are listed in section 6.4, Table 8 and Appendix C). All species have been recorded within 10 km of one or more of the Construction Footprint and/or Inundation Area, or have potential habitat in this area, and most will be expected to utilise habitats such as those found within the Construction Footprint or broader Inundation Area. Most of the FFG Act listed species possibly occurring in the Construction Footprint are highly mobile bird and moderately mobile reptile species and all have access to large areas of suitable habitat in the immediate surrounding areas in which to disperse. None of the terrestrial species are considered likely to be significantly impacted by the proposed construction, though localised impacts on hollow-dependent species (e.g. Carpet Python and Barking Owl), ground dwelling species (e.g. Giles Planigale, Beaked Gecko and Red-naped Snake) and semi aquatic species (frogs and turtles) are possible. From a landscape perspective the proposed Construction Footprints represent an extremely small area of around 53.38 ha, of a total area of approximately 9,000 ha (0.59%) of Wallpolla Island, and are centred largely on existing tracks and degraded areas, within a very large intact area of tens of thousands of hectares of high quality native vegetation along the Murray River corridor. Impacts are expected to largely be constrained to the removal of vegetation as habitat for ground-dwelling and semi-aquatic species, which are expected to recover rapidly. For these reasons the proposed construction impacts are considered unlikely to significantly impact any threatened terrestrial fauna species. An assessment of the potential for significant effect on FFG Act listed flora and fauna under the EE Act has been completed and is summarised in Appendix K.

Most of the FFG Act listed species possibly occurring in the Construction Footprint are highly mobile species and all have access to large areas of suitable habitat in the immediate surrounding areas in which to disperse. From a landscape perspective the proposed Construction Footprints represent a relatively small area, centred on existing tracks and degraded areas wherever possible, within a very large intact area of many tens of thousands of hectares of high quality native vegetation along the Murray River corridor. For these reasons the proposed construction impacts are considered unlikely to significantly impact these threatened fauna species.

Direct impacts as a result of habitat removal (e.g. the removal of hollow-bearing trees) should be avoided and mitigated through the measures described in Section 11. An on-site ecologist with a Management Authorisation under the *Wildlife Act 1975* should be present during vegetation removal to readily relocate any pythons found within larger trees. Additionally, all hollow-bearing trees proposed for removal should be thoroughly inspected prior to removal for refuging wildlife and at risk of harm from felling. A Fauna Management Plan or equivalent should be developed and implemented (as part of the CEMP).

Aquatic fauna

Construction of regulator MS2 will require installation of coffer dams upstream and downstream of the regulator construction site. This has the potential to limit flow in Wallpolla Creek for up to three months. This is likely to temporarily restrict passage of any FFG Act listed species (Broad-shelled Turtle, Murray Cod, Silver Perch, Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish) present in Wallpolla Creek. An Aquatic Fauna Management Plan would be developed and implemented to manage impacts to aquatic values – with emphasis on threatened fish species that may be present in vicinity of construction sites, as well as turtles including the threatened (FFG-listed) Broad-shelled Turtle. Any construction activities that could lead to entrapment of fauna or temporary loss of habitat (e.g. due to the use of coffer dams and dewatering) should be considered.

Additional impacts (for example, dewatering works and the potential for increased sediment/ contaminant run-off into wet areas from Construction Footprints) are possible but likely to be temporary and minor if an aquatic fauna management plan is developed for the project detailing specific mitigation measures to minimise these impacts.

FFG Act listed fish species, Murray Cod, Silver Perch, Broad-shelled Turtle, Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish, have the potential to be impacted by inundation event. Impacts are generally likely to be beneficial to these species. Under the natural inundation and seasonal fresh scenarios flows will increase in Dedmans, Finnigans and Wallpolla Creeks, which are likely to provide conditions that will suit both Murray Cod and Silver Perch. The floodplain inundation scenarios are likely to provide an increase in wetland habitat which will be beneficial to small to medium bodied fish species (Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish) and the Broad-shelled Turtle. During the floodplain inundation scenarios it is likely that some sections of Wallpolla Creek will become inundated, which will reduce flow – this is likely to benefit species that prefer slow moving/wetland habitat (Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish) but may lead to conditions that are not preferred by Silver Perch and Murray Cod in these sections. That said, the floodplain inundation will also lead to short-term foraging habitat for both species and since both species are currently present in low numbers the overall impact is not likely to be negative. Turtle movement and habitat use will need to be taken into account during the detailed design phase to accommodate turtle passage through structures, provide appropriate flow velocities through infrastructure and avoid steep embankments and other structural features that could lead to turtle entrapment.

The ability for fish to exit the floodplain is of importance to avoid impacts to the species. The Fish Management Plan for the site (DELWP 2018) provides details of the recommended operational regime to minimise the risk of stranding during drawdown events. Additional impacts due to operation were identified by DELWP (2018) and included the risk that floodplain inundation will increase carp populations, which may impact native fish species present within the complex. Mitigation measures recommended to minimise this risk are in Section 11.4.

An assessment of the potential for significant effects on FFG Act listed aquatic fauna under the EE Act has been completed and is summarised in Appendix K.

The above-mentioned mitigation measures are not an exhaustive list. The mitigation measures should be incorporated with appropriate measures to minimise impacts to vertebrate fauna during vegetation clearing. All native animals encountered during the pre-clearance and other vegetation clearance activities must be treated humanely, ethically, and in accordance with relevant codes under the Victorian *Wildlife Act 1975* and *Wildlife Regulations 2002*. A full list of mitigation measures can be found in Section 11.

Impacts to FFG Act listed fauna communities

Three FFG Act listed fauna communities has the potential to occur within the broader Study Area:

- Victorian Temperate Woodland Bird Community (VTWBC)
- Victorian Mallee Bird Community (VMBC)
- Lowland Riverine Fish Community of the Southern Murray Darling Basin (LRFCSMDB)

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 Footprint or Inundation Areas as mallee habitats have not been observed within these locations.

The VTWBC is a community defined by a group of woodland dependent bird species, characteristically found in a range of woodland types, and over a broad geographic area. The geographic area is defined as the slopes and plains inland of the Great Dividing Range within Victoria. Riverine floodplains associated with the Murray River are not specifically included or excluded from the VTWBC description. Twenty-six bird species characteristic to the community, of which 10 are considered dependent, were identified in the desktop and field assessments. Impacts to this community are likely to be negligible as Wallpolla Island 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.

Loyn and Dutson (2017) have been studying woodland bird habitat use, abundance and diversity in Black Box habitats during and after 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.

The LRFCSMDB occurs in the lowland reaches and associated floodplains of the Murray, Darling and Murrumbidgee rivers and their tributaries within the States of Victoria, New South Wales and South Australia. The exact geographic extent of the ecological community is not clear but it is characterised by the fish community present, many of which occur in the vicinity of Wallpolla Island. As such, it can be assumed that this community is present.

9.4 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 Wallpolla project that have the potential to be exacerbated by either the construction process or proposed inundation:

9.4.1 Construction Phase

Threatening processes could include:

- 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
- Increase in sediment input into Victorian rivers and streams due to human activities
- Input of toxic substances into Victorian rivers and streams
- Alteration to the natural flow regimes of rivers and streams

The Construction Footprint has been reduced and minimized during the various phases of the project (see Section 12) from earlier assessment footprints (Australian Ecosystems 2015, GHD 2018) to the current Construction Footprint to minimize areas where possible and avoid hollow-bearing trees. 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 2,672 ha of primarily black box woodland is likely to contribute to the maintenance of hollow-bearing trees into the future.

A 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* and measures to minimise sedimentation inputs or toxic substances (e.g. fuel) to waterways.

Construction of the MS2 Regulator may lead to blockage of Wallpolla Creek for up to three months. This has the potential to temporarily limit fish passage. The following mitigation measures should be implemented to minimize impacts to fish and other aquatic fauna present in the creek:

- Limit fish passage restrictions during breeding season (October to February)
- Target construction period during colder months (e.g. June to August) to avoid water quality impacts caused by algal blooms and stratification
- Implement flow-through via pumping from upstream to downstream to maintain water quality and levels on both sides of the construction site
- Monitor water quality (specifically dissolved oxygen) and depths upstream and downstream of the construction site on Wallpolla Creek during construction period to maintain similar conditions on both sides of the construction site
- A construction-specific aquatic fauna management plan should be developed for the site. The plan should detail fish relocation or rescue methods and triggers (e.g. management responses to fish deaths or poor water quality).

9.4.2 Operation Phase (Inundation)

Threatening processes could include:

- 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)*
- Alteration to the natural flow regimes of rivers and streams

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 and funded within the inundation area, in consultation with Parks Victoria to expand current pest control programs within the park to target these areas during inundation events.

As mentioned in Section 9.2.1, changes to the hydrological regime within the Inundation Area during the operation phase of the project are not expected to negatively impact native vegetation within the Inundation Area (R8, 2020). However, there may be areas on the fringe of the project's managed inundation area that could be impacted through near-surface salinization. Further assessment is required to identify and determine this potential impact. If further assessment identifies that changes to groundwater would adversely impact native vegetation, then additional mitigation measures would need to be developed and implemented as a part of the project through the Environmental Water Management Plan and the VMFRP Monitoring Evaluation and Reporting (MER) Plan.

Additional mitigation measures provided by DELWP (2018) should be followed to minimise the risk of impact potential fish passage impacts during operation. Operating fishways to appropriate standards will reduce the risk of restricting fish passage.

9.5 Wetlands of International Importance

According to a PMST Search, three Ramsar Wetlands are downstream of Wallpolla Island; Banrock Station Wetland Complex (240 km downstream of Wallpolla), Riverland (100 km downstream of Wallpolla) and The Coorong and Lakes Alexandrina and Albert Wetland (555 km downstream of Wallpolla).Wallpolla Island is also listed under the Directory of Important Wetlands of Australia (DIWA). While reinstating a wetting and drying regime of appropriate frequency, duration and extent to Wallpolla Island is likely to impart significant ecological benefits for the floodplain, large infrastructure projects such as this can also have environmental risks, particularly localised, short-term impacts during the construction phase.

Whilst impacts to these three Ramsar Wetlands are expected to be negligible given their distance from the Study Area (Seran BL&A 2018) an Environmental Management Framework (EMF) will be developed that identifies potential environmental risks and puts in place mitigation strategies to avoid or minimise these risks. Any impacts will be localised and site rehabilitation will occur following completion. The EMF will require development of a CEMP that sets out specific measures that will be employed to minimise impacts during construction.

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. Operation of the proposed works may reduce the incidence of blackwater 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. Water quality monitoring prior to and during discharge events will inform adaptive management processes and will be detailed as part of the EWMP and Operating Plan.

Wallpolla Island is listed under the DIWA and some wetland areas of the Wallpolla Island floodplain within the listed area will be affected by both operational changes and construction impacts. However, overall the project is expected to benefit the Wallpolla Island wetlands by reinstating a more natural frequency and duration of floods of various sizes. However, construction activities have the potential to impact temporarily and permanently on wetlands, include:

- Physical disturbance where upgrades of existing roads are required and construction of banks and structures will take place
- Temporary and permanent wetland vegetation clearance
- Water quality impacts from dewatering works (if required) and disposal of saline groundwater. Impacts are also possible from runoff of sediment and contaminants into wet areas from construction activities
- Temporary reduction in groundwater recharge resulting in an impact to groundwater dependent ecosystems could possibly occur within the area of Horseshoe Lagoon
- Creation of temporary barriers to fish passage
- Shallow saline groundwater can impact on floodplain health and vegetation, at site and downstream
- Transport or proliferation of invasive weeds impacting upon the health of wetland and floodplain vegetation communities

Noting that the areas of individual wetlands within the project's construction footprint are relatively small and considering that mitigation measures would be implemented (as identified in the EMF and also in Section 11), it is unlikely that the project would lead to an extensive or major effect on the health or biodiversity of these wetlands over the long-term. In fact, it is expected that overall the project would have a positive impact increasing 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.

10 Impacts to native vegetation

This section summarises the likely impacts to native vegetation associated with the proposed works within the Construction Footprint. The impacts described in this section incorporate assessments undertaken at Wallpolla from 2015–2020. The combined Vegetation Quality Assessment (Habitat Hectare) results are outlined in Appendix L for all of the native vegetation currently proposed to be impacted.

10.1 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 provide direction on 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.

10.2 Proposed impacts to native vegetation

10.2.1 Ecological Vegetation Classes (EVCs)

The proposed direct loss of native vegetation for the project is 53.38 hectares, and occurs within the island (over 9,000 ha) and the broader area (which includes public land with native vegetation adjacent to the island), and approximately 18,000 ha of native vegetation. All of the impacts are associated with the installation of infrastructure, and efforts have been made during each iteration of the design, to avoid and minimise impacts to native vegetation and fauna habitat (including large trees where present).

The proposed works will involve impacts to 1.1 ha of vegetation in EVCs classified as vulnerable, 44.02 ha of vegetation in EVCs classified as depleted and 8.26 ha of vegetation in EVCs classified as least concern. However it is anticipated that any impacts to these EVCs associated with the proposed works, will be greatly outweighed by the benefits and improvements that these same EVCs will achieve through environmental watering within the area of inundation. The Inundation Area is expected to cover 2,672 hectares of Wallpolla and will directly benefit 366.25 ha of vegetation classified as vulnerable, 1382.16 ha of vegetation classified as depleted and 817.37 ha of vegetation classified as least concern.

Of the 53.38 ha of native vegetation that is proposed to be removed, 32.27 ha is potentially impacted by the Construction Footprint of proposed structures, containment banks, hardstands and laydown areas, and 21.11 ha is associated with potential maintenance works along existing access tracks (Table 10).

The scope and requirement for works along access tracks is still to be confirmed and will be designed to avoid and minimise native vegetation removal. The current estimate of potential vegetation removal along tracks assumes a minimum 5 metre buffer (i.e. 2.5 metres each side of the centreline) where vegetation removal has been accounted for along existing tracks. In some instances these works may be limited to minor maintenance and upgrades that require minimal if any vegetation clearance. Vegetation is not currently proposed to be cleared within this 5 m buffer, however it is acknowledged that use of the tracks by heavy machinery during the construction phase of the project may require some track maintenance that could impact trees. R8 has recommended that once the Construction Footprint and required track access has been confirmed, that a qualified arborist is engaged to undertake an assessment along the existing tracks, with a project engineer and construction contractor, to confirm the extent of works require (if any) and any potential losses to trees along the existing tracks either directly (through removal) or indirectly (through encroachment of their TPZs, or the removal of >30% of their canopy). Once this assessment has been undertaken, the extent of impacts result. It is anticipated that the actual impacts to native vegetation along the existing access tracks will be significantly lower than the conservative estimate (21.05 ha) that has been currently accounted for.

There are a number of small areas mapped as wetlands on the DELWP maintained Current wetlands map[14] that are present within the proposed Construction Footprint (Appendix M). Any impacts to areas mapped as a current wetlands will be accounted for using the modelled condition data for the wetland when determining the impact and offset requirements for the project.

During the process of preparing a Native Vegetation Removal Report (NVRR) for the project, one patch of vegetation that is proposed to be impacted was excluded from the EnSym[15] simulation. This patch is located on or nearby the Victoria / NSW boundary, and its proximity to the state boundary meant that one polygon (equating to 0.69 ha) was not able to be processed through the EnSym system as the modelling simulator rejected this polygon. Therefore the native vegetation impacts currently accounted for in the NVRR (Appendix N) account for the removal of only 52.69 ha. However, this additional area will be incorporated as native vegetation losses at a later stage (upon the finalisation of the Construction Footprint when another NVRR will be prepared for the project and the full set of data will be submitted to DELWP for processing) and the full 53.38 ha will be incorporated in to the overall impact calculations.

Table 10 Proposed impacts to each Ecological Vegetation Class (EVC)

EVC No.	EVC	EVC conservation significance	Area (ha) impacted by infrastructure	Area (ha) impacted by Tracks
102	Low Chenopod Scrubland	Depleted	5.98	5.57
103	Riverine Chenopod Woodland	Depleted	12.10	9.44
806	Alluvial Plains Semi-arid Grassland	Vulnerable	0.55	0.55
808	Lignum Shrubland	Least Concern	0.58	0.79
810	Floodway Pond Herbland	Depleted	0.12	N/A
813	Intermittent Swampy Woodland	Depleted	0.90	0.0006
818	Shrubby Riverine Woodland	Least Concern	5.66	1.23
823	Lignum Swampy Woodland	Depleted	6.38	3.53
	Total		32.27	21.11

[14] This layer was accessed through the DELWP maintained website: https://nvim.delwp.vic.gov.au/Biodiversity/ (last accessed by GHD 7 Nov 2019)

[15] EnSym – Environmental Systems Modelling platform – is a DELWP computer software package designed to estimate the impact of actions in the landscape.

10.2.2 Current Wetlands

There are a number of wetlands listed under the DELWP current wetland list that occur across the Wallpolla project site (Appendix M). Some of the areas that were mapped as native vegetation during the field assessment within the Construction Footprint, have been classified by DELWP as current wetlands (approximately 2.4 hectares)[16]. At the time of the field assessment, these areas were dry and had not received recent rainfall, therefore a VQA assessment was undertaken classifying these patches as the EVC modelled to be present and incorporated in to the current NVRR[17]. Once the Construction Footprint has been finalised for the project a new NVRR will be prepared for the works, with any areas mapped as current wetlands that are proposed to be impacted, accounted for using the DELWP modelled condition data.

10.2.3 Canopy trees

During the 2015 field assessments 846 trees were recorded within, or immediately adjacent to, the then current Area of Investigation. Since these assessments were undertaken, the Construction Footprint (including access tracks) has changed and areas of native vegetation currently proposed to be impacted will not have been assessed for the presence of large trees. 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 2017a). See Appendix O for the details of the trees that are proposed for removal.

A qualified arborist will 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 will take into 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 some eucalypts, the TPZ is determined by combining the DBH measurements of each individual stem).
An arborist assessment will 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 286 Large Trees will be impacted by the proposed works, this includes 112 large trees impacted by the construction footprints of proposed structures and 174 large trees impacted by the construction footprint associated with proposed access tracks (Appendix O).

10.3 Proposed operational impacts to native vegetation

The project aims to inundate approximately 2,672 ha of water-dependent floodplain ecosystems, containing habitat for rare or threatened flora, fauna and communities. The project aims to reinstate a more natural flooding regime across the area of inundation, whereas under the current post-river regulation regime, some areas that were formerly dominated by wetland vegetation are now persistently dry and occupied by terrestrial ground-layer vegetation.

The ecological assessments undertaken for the project to date have identified the known or modelled presence of 83 flora and 36 fauna species listed under the EPBC Act, FFG Act and/or the DELWP Advisory list for rare or threatened species, within the 2,672 ha area of inundation. As the overall project aim is to improve the extent and condition of native vegetation and fauna habitat within the park, an assessment has been made as to whether the proposed environmental watering will have an impact on native vegetation and habitat in the area of inundation, particularly any listed species or communities.

[16] http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit

[17] https://nvim.delwp.vic.gov.au/

Altering the hydrological regimes in the Wallpolla floodplain may cause minor adverse impacts to some terrestrial species, for instance flora that have adapted to drying conditions. However, these impacts are likely to be short term through the retention of surface water during inundation events, or through changes in water quality. It is considered unlikely that the proposed environmental watering will have a negative impact on the ongoing survival of any populations of listed flora that may be present in (or that may colonise) the area of inundation. In addition to the ecological benefits of Wallpolla Island from environmental watering highlighted in Section 11, it has been illustrated in past surveys within Wallpolla Island areas such as Horseshoe Lagoon and Wallpolla Creek, that watering events benefited a plethora of and fauna species, in including rare and threatened species (Bayes et al. 2010). Across multiple sites in Wallpolla and Lindsay Islands, a large diversity of flora species observed to respond to environmental watering including threatened, water-dependant species such as Mallee Cucumber (*Austrobryonia micrantha),* Jerry-Jerry (*Ammannia multiflora*), Small-water Fire (*Bergia trimera*), Lax Flat-Sedge (*Cyperus flaccidus*), Bignonia Emu-bush (*Eremophila bignoniiflora*), Wavy Marshwort (*Nymphoides crenata*) and so on (Bayes et al. 2010, GHD 2019). Areas of watered wetlands at Lindsay Island and Wallpolla Island show greater diversity, health and long-term viability, including greater diversity and abundances of threatened flora and fauna (Bayes et al. 2010, Mallee CMA 2016, Wood et al. 2018, and GHD 2019)

At Hattah-Kulkyne National Park, studies on environmental flows indicate that the introduction of environmental flows that mimic previous natural regimes, also have contributed to the colonization of new indigenous species for the State of Victoria in Applebush (*Pterocaulon sphacelatum*) and Winged-plains Bush (*Pluchea rubelliflora*) (Moxham et al. 2019a). Many studies have advocated that ongoing management of environmental watering is important for numerous flora species and communities, particularly those that are water dependent.

The project will maintain and enhance the health of more than 2,672 ha of native vegetation. This will increase the extent and condition of habitat for common indigenous and threatened 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, which will be of particular benefit during long dry periods and under current climate change scenarios.

The Arthur Rylah Institute (ARI) is currently developing a Monitoring, Evaluation and Reporting (MER) Plan designed to collect baseline condition data that will enable ongoing condition monitoring to be undertaken across the site to confirm the gains in the health and condition of native vegetation within the area of inundation that may result from the proposed environmental watering.

ARI specialists have been adopting and aligning methods with previous TLM projects (including the findings of the Hattah Lakes Offsets Monitoring Program and the Mulcra Island Offsets Monitoring Program). The aim here has been to (1) maximise consistency of methods across VMFRP and TLM, (2) take advantage of the current capability that has developed for the monitoring at the TLM sites, and (3) thereby provide maximised future opportunities for cross-VMFRP-TLM analysis and evaluation in order to help meet expectations for evaluation and reporting at state and Basin scales (pers. comm. Ashley Sparrow, ARI).

For the purposes of this assessment, 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 Area, and that native vegetation within the proposed Inundation Areas is expected to be benefited for the project rather than adversely impacted. A summary of the vegetation communities making up the 2,672 hectares of vegetation proposed for inundation is outlined in **Table 10**. One non-water dependent community was modelled as receiving environmental water comprising three EVCs: Semi-arid Chenopod Woodland (EVC 98), along with 0.31 ha of vegetation with no EVC modelled data available. These areas underwent a vegetation ground-truthing assessment in June 2020, and the surveys found no non-water dependent EVCs within the area of inundation (see Section 7 and **Table 5**).

10.4 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 11.**

The Construction Footprint all occur within a broad area that has been 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 Wallpolla project area, it is considered likely that the project will follow the Detailed Assessment pathway.

Table 11 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**

10.5 Summary of native vegetation impacts

The results of the Habitat Hectare (VQA) assessment used to calculate the impact and offset requirements for the project are outlined in Appendix L. The current Construction Footprint estimates that 53.38 hectares of native vegetation removal will be required for the project (52.69 ha of which is accounted for in the current NVRR). Further efforts will be made during design refinement to avoid and minimise impacts to native vegetation and fauna habitat.

The Habitat hectare assessments were undertaken at the time of the fieldwork in 2015 using the Construction Footprint that was current at the time. Due to changes in the Construction Footprint since the 2019 survey and the fact that vegetation along tracks hasn't been fully mapped, some areas of native vegetation proposed to be impacted have not yet been assessed (10.57 ha). However DELWP modelled condition data has been used to fill these gaps. Once the design process is complete and the Construction Footprint has been finalised, it is recommended that a Vegetation Quality Assessment (Habitat Hectares) is undertaken in these areas to confirm the condition and extent of native vegetation within these areas. The results of this are presented in this current and previous (GHD 2016) reports and presented in Appendix L.

Using the current Construction Footprint, a total of approximately 53.38 ha of native vegetation is proposed to be removed. The total proposed impacts to each individual EVC within the Construction Footprint is outlined in Table 10. During the process of preparing a Native Vegetation Removal Report (NVRR) for the project, a number of patches of vegetation that are proposed to be impacted were excluded from the EnSym simulation. These patches were located on or nearby the Victoria / NSW boundary, and their proximity to the state boundary meant that four polygons (equating to 0.69 ha) were not able to be processed through the EnSym system. Therefore the native vegetation impacts currently accounted for in the NVRR (Appendix N) account for the removal of only 52.69 ha. However, these additional areas will be incorporated as native vegetation losses at a later stage and the full 53.38 ha will be incorporated in to the overall impact calculations.

286 Large Trees (272 of which are accounted for in the current NVRR) (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 12 summarises the proposed impacts to native vegetation, as outlined in the NVR report prepared on 8 May 2020, see Appendix N.

Table 12 Summary of impacts to native vegetation for the project

Summary of Impacts	
Assessment Pathway	Detailed Assessment Pathway
Extent of proposed vegetation removal	52.69 ha
No. of Large Trees proposed to be removed	272
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 L outlines the results of the Habitat Hectare Assessments undertaken during the site assessments.

10.5.1 Offset requirements

The NVR report outlines the offset requirements for the project, including specific species offsets for 74 species of rare and threatened flora and fauna, and 272 Large Trees (Appendix O).

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 will be developed in consultation with DELWP.

11 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 small areas within a very large intact area of high quality native vegetation.

VMFRP are adopting specific design principles which minimise the footprint of the proposed containment banks, whilst also ensuring that the core functions of the bank which are to hold water (and secondly provide a safe trafficable route through the forest) are also being achieved. These principles include:

- **Freeboard:** has been designed to the minimum required to retain bank functionality with expected wearing and wave impacts.
- **Crest width:** is the minimum crest width for the relevant design speed and aligned to an existing Parks Vic asset classification. Furthermore, the verge zone has been reduced from 2 m to 0.5 m recognising that a table drain is not required on top of containment banks, further minimising impacts to native vegetation.
- **Batter slopes:** Adoption of the steepest batter slope which still meets batter stability and road safety requirements (i.e. 3H:1V), reducing the width of the batter and the associated vegetation removal.
- **Alignment:** banks to be located on top of existing tracks within already disturbed areas. The bank alignments will be further refined, taking in to account the results of the ecological and heritage site assessments, to avoid high value areas.

11.1 General mitigation measures

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

- Manage habitat clearing and removal of hollow-bearing trees/limbs with respect to fauna
- Avoid and minimise disturbance to the National Park where practicable
- 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 where there are potential impacts to Tree Protection Zones for the Construction Footprint area
- 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 practical, avoid areas of high quality vegetation and vegetation that supports rare or threatened flora

- Include the above points to develop and implement mitigation measures for incorporation into an EMP to minimise the potential for ecological impacts within and around the site before, during and after the construction process. These may also include:
    - 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 *Catchment and Land Protection Act 1994* (CaLP Act)
    - Standard vehicle hygiene measures to prevent the spread or transmission of Chytrid Fungus as per Murray et al (2011)
    - Management of run-off, spills and sediment to avoid impacts on the Murray River and any other waterways
    - 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

11.2 Design phase

The following mitigation measures have been and should continue to be implemented during the design phase to minimise and mitigate impacts to threatened flora and fauna identified in this report and previous ecological surveys within the Construction Footprint (Biosis 2013, GHD 2016 and Ogyris Ecological Research 2013):

- Through refinement of the detailed design, the project shall to the extent practicable, minimise the Construction Footprint and impacts on the environment through:
    - Siting of proposed structures primarily along or immediately adjacent to existing access tracks and other previously disturbed areas
    - Designing containment banks and batters in consultation with Parks Victoria to minimise extent of native vegetation removal and other construction impacts
    - Removal of redundant structures in consultation with Parks Victoria, where the removal is deemed the most appropriate action to minimise adverse environmental, heritage and visual effects
    - Consideration should be given to whether any branches may need to be lopped on access tracks, for example to allow heavy machinery such as cranes to access the proposed construction footprint areas and how this can be avoided

Specific recommendations to further avoid and minimise impacts to three FFG Act-listed flora species identified within the Wallpolla project area are outlined below:

- *Acacia oswaldii* (Umbrella Wattle): The individuals were recorded outside the Construction Footprint, in the Area of Investigation. It should be possible to avoid their removal during construction with individual no-go flagging.
- *Crinum flaccidum* (Darling Lily): A small grouping (five individuals) of this species was recorded within the 'US1' construction footprint area. If possible this species should be considered during the design and retained if possible.
- *Eremophila maculata* subsp. *maculata* (Spotted Emu-bush): No individuals were recorded within the Construction Footprint, however one individual was recorded in close proximity to the 'MS2' construction footprint. Another three individuals were recorded in other areas close to the construction footprints (which should be avoided). Individual no-go flagging should be used around each individual.
- Consideration should still be given to whether any branches may need to be lopped on access tracks, for example to allow heavy machinery such as cranes to access the proposed Construction Footprint areas.

- It is recommended that the final design refinements take in to account the presence of the Vulnerable EVC, Alluvial Plains Semi-arid Grassland, which has been identified within the construction footprint at both infrastructure sites and along tracks. Efforts should be made to avoid and minimise impacts to this EVC, and where this vegetation is present immediately adjacent to the construction footprint, and vegetation that hasn't been approved for removal should be fenced off as a No-Go zone.

11.3 Construction phase

The following mitigation measures are recommended to minimise and avoid impacts upon the identified threatened flora, fauna and community values:

- Follow the avoid, minimise protocol in determining the construction works footprint at each site (i.e. make every effort to avoid threatened flora species loss as a high priority).
- 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 as part of a CEMP to manage impacts to all flora and fauna values and particularly threatened species and the habitat preclearance and clearance process.
- For the protection of threatened flora:
    - Species listed under the FFG Act and EPBC Act that are not permitted to be removed, must be fenced off with temporary one metre high orange barrier mesh medium-heavy weight prior to construction commencing.
    - Fencing must be checked on a weekly basis and the population monitored on a monthly basis.
    - All staff onsite should be made aware through inductions and/or signage of the presence of threatened species and how to identify the species. Locations for stockpiles should be within existing cleared or areas of non-native vegetation where practicable.
    - If any threatened flora species additional to those already identified in site plans (i.e. listed as threatened under the EPBC Act, or the FFG Act) are found within the construction area the Project Ecologist will be notified. The number and location of individuals will be recorded and DELWP will be advised.
- Manage the removal of hollow-bearing trees within the Construction Footprint (if required, based on final footprints and potential impacts to tree root zones from track establishment, setdown areas) where construction may impact habitat trees of native fauna, particularly EPBC Act and/or FFG Act listed fauna species and communities:
    - Avoiding the breeding season of hollow-dependant species is recommended, however where this is not practical an assessment must include surveys undertaken by a suitably qualified ecologist of the hollow-bearing trees being removed during the breeding season. The survey should also include other native hollow-dependent fauna. A protocol needs to be developed prior to/during construction.
    - Where clearing is proposed outside the 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.

- To reduce the likelihood of impacts to threatened fish in Wallpolla Creek the following mitigation measures should be adopted during construction of the MS2 regulator:
    - Limit fish passage restrictions during breeding season (October to February).
    - Target construction period during colder months (e.g. June to August) to avoid water quality impacts caused by algal blooms and stratification.
    - Implement flow-through via pumping from upstream to downstream to maintain water quality and levels on both sides of the construction site.
    - Monitor water quality (specifically dissolved oxygen) and depths upstream and downstream of the construction site on Wallpolla Creek during construction period to maintain similar conditions on both sides of the construction site.
    - A construction-specific aquatic fauna management plan should be developed for the site. The plan should detail fish relocation or rescue methods and triggers (e.g. management responses to fish deaths or poor water quality).
- To reduce the likelihood of impacts due to poor downstream water quality during construction of the MS1 regulator the project should:
    - Implement flow-through via pumping from upstream to downstream to maintain downstream water quality in Finnigans Creek during periods that the creek would otherwise be connected to the Murray River.
- If the capture, handling or translocation of fish is required during construction (e.g. dewatering work sites) or operation of the project, persons undertaking these activities will need to hold the appropriate permit or licence under the *Fisheries Act 1995*. Any capture of fish must be carried out by a qualified aquatic ecologist
- Develop and implement an Aquatic Fauna Management Plan to manage impacts to aquatic values with emphasis on threatened fish species (including Murray Cod, Silver Perch, Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish) and turtles (including the FFG-Act listed Broad-shelled Turtle) that may be present in vicinity of construction sites. Any construction activities that could lead to entrapment of fauna or temporary loss of habitat (e.g. due to the use of coffer dams, dewatering and water quality impacts) should be considered.
- Develop and implement a CEMP for the construction phase. This CEMP should provide appropriate measures to avoid or minimise indirect impacts such as erosion, sedimentation and the accidental spill of oils or other chemicals. It will also provide a protocol for minimising impacts in ecologically sensitive areas. The CEMP should be audited during and following the construction process to check that works have been conducted appropriately.
- Implement hygiene and weed management measures to manage weeds during and after the construction phase
- On completion of works, the Construction Footprint should be rehabilitated, based on a developed CEMP, which for example should include:
    - 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 (based on modelled or ground truthed EVC mapping) may be undertaken in the following year
    - Ground debris that is temporarily removed to allow construction activities, should be reinstated

  - If planting does need to occur to rehabilitate construction areas, these areas also need to be monitored in the months and years following completion of construction works, to confirm success of planting regime

- All vehicles and plant must only operate on existing tracks and in areas marked as parking areas or construction zones

11.4 Operation phase

The following mitigation measures are recommended to minimise and avoid impacts upon the identified threatened flora, fauna and community values. These measures are general across the Inundation Area and are not site specific.

- Implement pest animal management and control. This may require Parks Victoria to expand and obtain additional funding under the current pest control programs within the park to target these areas during inundation events.
- Operational activities to be undertaken in accordance with the EWMP and operating plan. Adaptive management is be undertaken to maximise the benefits and minimise the impacts of environmental watering activities.
- Develop and implement an Aquatic Fauna Management Plan to manage impacts to aquatic values with emphasis on threatened fish species (including Murray Cod, Silver Perch, Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish) and turtles (including the FFG-Act listed Broad-shelled Turtle) during operation.
- Implementation of a blackwater management plan and related water quality monitoring program on-site and within the Murray River to adaptively manage risks to the downstream aquatic environment.
- Investigate the potential for native vegetation either within or immediately adjacent to the inundation area to be adversely impacted during the operation phase of the project due to changes in groundwater (as described in R8 2020). If further assessment identifies that changes to groundwater would adversely impact native vegetation, then additional mitigation measures will need to be developed and implemented as a part of the project through the Environmental Water Management Plan and the VMFRP Monitoring Evaluation and Reporting (MER) Plan.
- Mitigation measures to reduce proliferation of Carp should be implemented during the operation phase of the project. These include:
  - Implementing a winter fill regime
  - Develop a native fish exit strategy to strand carp
  - Drying of wetlands with high carp density
  - Installation of carp screens (within the regulators where considered suitable considering the fish way design and if monitoring has determined this to be required)

12 Legislative and policy requirements

There are a number of ecological values present within the Construction Footprint as discussed within this report, with the potential to trigger the requirement to obtain permits if impacted (e.g. the removal of native vegetation will require a permit under the Planning and Environment Act). **Table 13** below outlines the potential legislative implications for the project that may result from the removal of native vegetation and/or fauna habitat within the Construction Footprint and the environmental watering within the Inundation Area.

Table 13 Summary of probable legislative requirements

Commonwealth	Relevance to project
Environment Protection and Biodiversity Conservation Act 1999	No listed flora or ecological communities were identified during the assessment, nor are they considered likely to occur within the Construction Footprint. One listed community, *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions*, is consistent with one EVC modelled as occurring within the Area of Inundation, EVC 98: Semi-arid Chenopod Woodland (0.02 ha). A ground-truthing field assessment was undertaken in June 2020 in locations within the proposed area of inundation that had been mapped by DELWP as containing this EVC, and other non-water dependent communities. The fieldwork confirmed that there is no Semi-arid Chenopod Woodland present within the Inundation Area where its presence had been modelled by DELWP, and no vegetation was identified that is consistent with the listed community: *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions.* Therefore it is considered unlikely that the construction or operation phases of the project will impact the listed flora community. Six EPBC Act listed fauna species were identified as either present or as possibly occurring within the construction and/or Inundation Areas: South-eastern Long-eared Bat, Regent Parrot, Painted Honeyeater, Growling Grass Frog, Murray Cod, and Silver Perch. A conservative approach to EPBC Act listed species has been taken further two EPBC Act listed species not identified as either present or as possibly occurring within the Area of Investigation, Australasian Bittern (*Botaurus poiciloptilus*) and Australian Painted Snipe (*Rostratula australis*) but where considered as part of this assessment. An assessment against the significant impact criteria for each of these six species that were common to the construction and Inundation Areas was undertaken (see Appendix H and Appendix I); the Australasian Bittern and the Australian Painted Snipe was considered unlikely to be impacted as it was not considered likely to occur in the Construction Footprint. Following consideration of the significant impact criteria for critically endangered (Appendix H), vulnerable (Appendix I) and species specific criteria under the EE Act (Appendix K), the proposed action is not considered to have the potential to have significant impacts on threatened fauna. Silver Perch (*Bidyanus bidyanus*) have been recorded previously in the project area (Murray River and Wallpolla Creek). Murray Cod (*Maccullochella peelii peelii*) also have the potential to occur in the creeks within Wallpolla Island and in the Murray River. The use of coffer dams to allow for construction of regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek, which could impact both species. Stage 1 of construction will allow for fish passage and flows to pass. Stage 2 of the construction will require closure of the waterway (and hence no fish passage) for up to three months. Adoption of the following mitigation measures during the construction phase are likely to avoid significant impacts to both species: • Limit fish passage restrictions during breeding season (October to December) • Target construction period during colder months (e.g. June to August) to avoid water quality impacts caused by algal blooms and stratification. • Implement flow-through via pumping from upstream to downstream to maintain water quality and levels on both sides of the construction site.

Commonwealth	Relevance to project
	• Monitor water quality (specifically dissolved oxygen) and depths upstream and downstream of the construction site on Wallpolla Creek during construction period to maintain similar conditions on both sides of the construction site. • A construction-specific aquatic fauna management plan (as part of a broader CEMP) should be developed for the site. The plan should detail fish relocation or rescue methods and triggers (e.g. management responses to fish deaths or poor water quality). Consideration of any in-stream works such as dewatering works and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints must consider these species. A construction specific aquatic fauna management plan, as part of a broader CEMP, should be developed for all works around waterways. With these mitigation measures impacts are considered unlikely. Inundation of floodplain habitat during the operational phase has a high likelihood of increasing carp populations within wetland habitat and also in aquatic habitat that remains following flood events. Although already present on-site, increasing carp populations may be detrimental to native fish, including Murray Cod and Silver Perch, as they can compete for habitat and food sources favoured by large-bodied native fish. Therefore, although the project is likely to have beneficial impacts, the risk remains that conditions created may impact native fish by providing conditions preferred by non-native fish. Following recommended mitigation measures (see DELWP, 2018) to control carp may minimise their colonisation. These include: • Implementing a winter fill regime • Develop a native fish exit strategy to strand carp • Drying of wetlands with high carp density • Installation of carp screens (within the regulators where considered suitable considering the fish way design and if monitoring has determined this to be required) Thirteen migratory species were identified as having the potential to occur within the Construction Footprint, and Inundation Area (PMST and VBA). Most of these species are either highly unlikely to occur or will very rarely use airspace over these footprints. It is highly unlikely that the Construction Footprint supports habitat that will be considered important for migratory species foraging or breeding activity or support an ecologically significant proportion of a population of migratory species. An assessment of the EPBC Act significant impact criteria for impacts to Migratory listed species from the proposed works is provided in Appendix J. Three Ramsar Wetlands are downstream of Wallpolla Island; Banrock Station Wetland Complex (240 km downstream of Wallpolla), Riverland (100 km downstream of Wallpolla) and The Coorong and Lakes Alexandrina and Albert Wetland (555 km downstream of Wallpolla). It is unlikely that the project will negatively impact on the character of any of these the Ramsar sites. Whilst impacts to these sites are not expected (Seran BL&A 2018) a CEMP should developed that identifies potential environmental risks and puts in place mitigation strategies to avoid or minimise these risks (e.g. sediment runoff). ***It is unlikely that the proposed Wallpolla Project would have a significant impact to EPBC-listed fish and other EPBC listed species. A referral to the Commonwealth Environment Minister for a determination under the EPBC Act is being developed for Matters of National Environmental Significance MNES, as although it has been suggested that it is unlikely that a significant impact will occur on MNES (South-eastern Long-eared Bat, Regent Parrot, Painted Honeyeater, Growling Grass Frog, Murray Cod, Silver Perch and Australasian Bittern (inundation only) and Australian Painted Snipe.***

Commonwealth State	Relevance to project
Environment Effects Act 1978 (EE Act)	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 EE Act, 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 (although noting that this impact is to be positive) ***The project will therefore trigger an EES referral based on the extent of native vegetation identified within the Construction Footprint. This report will form part of the referral.***
National Parks Act 1975 (National Parks Act)	The proposed Construction Footprint, and most of the proposed Inundation Area, occur in the Murray-Sunset National Park and therefore are subject to the National Parks 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 objective of the National Parks Act have been considered during the detailed design phase to minimise the Construction Footprint and avoid important threatened species habitat. Furthermore, by aiming to restore a more natural inundation regime to about 2,672 ha of the Wallpolla Island 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 Footprint comprises 53.38 hectares of native vegetation (including 286 Large Trees), including 21.05 hectares of vegetation along existing access tracks. The scope and requirement for works along access tracks is still to be confirmed and will be designed to avoid and minimise native vegetation removal. In some instances these works may be limited to minor maintenance and upgrades that require minimal if any vegetation clearance. Approval under the P&E Act will be required for the removal of any native vegetation unless exemptions (as specified in Clause 52.17 of the Mildura Planning Scheme) apply.

Commonwealth	Relevance to project
Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017) – the Guidelines.	The current Construction Footprint will require the removal of 50.35 ha of native vegetation. As the location mapping identifies that the construction areas are classified as Location Risk 3 and 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 will 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 Appendix L. It is noted that Habitat hectare assessments were undertaken at the time of the fieldwork in 2015 using the Construction Footprint that was current at the time. Due to changes in the Construction Footprint since the 2019 survey, some areas of native vegetation proposed to be impacted have not yet been assessed including along access tracks, however DELWP modelled condition data has been used to fill these gaps. Once the design process is complete and the Construction Footprint has been finalised, it is recommended that a Vegetation Quality Assessment (Habitat Hectares) is undertaken in these areas to confirm the condition and extent of native vegetation within these areas. The results of this are presented in this current and previous (GHD 2016) reports and presented in Appendix L.
Flora and Fauna Guarantee Act 1988	**Fauna species and communities** Thirty-one FFG Act listed terrestrial species (22 birds, two mammals, one amphibian and six reptiles) are considered to have potential to occur within the proposed Construction Footprint, these are listed in **Table 8** and Appendix C). All species have been recorded within 10 km of one or more of the Construction Footprint, or have potential habitat in this area, and most will be expected to utilise habitats such as those found within the Construction Footprint or broader Inundation Area. However none of these species is considered likely to be significantly impacted by the proposed construction, though localised impacts on hollow-dependent species (e.g. Carpet Python and Barking Owl), ground dwelling species (e.g. Giles Planigale, Red-naped Snake, Beaked Gecko) and semi aquatic species (frogs and turtles) 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 53.38 ha, centred on existing tracks and degraded areas, within a very large intact area of over 9,000 ha of high quality native vegetation within the broader Island. 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 Footprint 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 project area: • Victorian Temperate Woodland Bird Community (VTWBC) • Victorian Mallee Bird Community (VMBC) 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 Wallpolla Island 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.

Commonwealth	Relevance to project
	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. **Aquatic fauna** Five FFG Act listed fish species and the Broad-shelled Turtle are considered to have potential to occur within the proposed Construction Footprint, these are listed in **Table 8** and Appendix C). The FFG Act listed *Lowland Riverine Fish Community of the Southern Murray Darling Basin* is likely to be present on the site and within the adjacent Murray River. The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage for any FFG Act listed species present (Murray Cod, Silver Perch, Murray-Darling Rainbowfish, Unspecked Hardyhead and Freshwater Catfish) and negatively impact water quality in Wallpolla Creek, which could impact these species. Stage 1 of construction will allow for fish passage and flows to pass. Stage 2 of the construction will require closure of the waterway (and hence no fish passage) for up to three months. Adoption of the mitigation measures listed in Section 11.3 during the construction phase are likely to avoid significant impacts to FFG-listed species. Construction of Regulator MS1 on Finnigans Creek also has the potential to limit fish passage. To minimise the likelihood of impacts due to poor downstream water quality the project should follow mitigation measures listed in Section 11.3 during the construction phase. For turtles, including the threatened (FFG-listed) Broad-shelled Turtle, the mitigation measures identified in Section 11 should be considered. All measures should be incorporated into an aquatic fauna management plan for the site. Additional impacts (for example, dewatering works and the potential for increased sediment/ contaminant run-off into wet areas from Construction Footprints) are possible but likely to be temporary and minor if an aquatic fauna management plan is developed for the project detailing specific mitigation measures to minimise these impacts. **Flora species and communities** No communities listed as threatened under the FFG Act have been identified within the proposed Construction Footprint. However, one FFG Act-listed community, Semi-arid Shrubby Pine-Buloke Woodland Community, is consistent with one EVC modelled as occurring within the Area of Inundation, EVC 98: Semi-arid Chenopod Woodland. A ground-truthing field assessment was undertaken in June 2020 in locations within the proposed area of inundation that had been mapped by DELWP as containing this EVC, or were unmapped. The fieldwork confirmed that there is no Semi-arid Chenopod Woodland present within the Inundation Area where its presence had been modelled by DELWP, and no vegetation was identified that is consistent with the listed community: Semi-arid Shrubby Pine-Buloke Woodland Community. Therefore it is considered unlikely that the construction or operation phases of the project will impact the listed flora community. Three FFG Act listed threatened flora species were identified in proposed Construction Footprint, *Acacia oswaldii* (Umbrella wattle), *Eremophila maculata subsp. maculata* (Spotted Emu-bush) and *Crinum flaccidum* (Darling Lily). These species have the potential to be impacted by the proposed works, and an FFG Permit will be required for their removal.

Commonwealth	Relevance to project
	Forty-five flora species listed as protected under the FFG Act were identified within the proposed Construction Footprint in previous and recent surveys (**Table 7**). 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 will almost certainly be required for this project as hollow-bearing trees and fauna habitat will likely be removed. The MA will be obtained at the time of the construction, and in the name of the ecologist who will handle/relocate the fauna.
Catchment and Land Protection Act 1994	Nine weeds listed under the CaLP Act were detected (including three 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.
Fisheries Act 1995 (Fisheries Act)	The Fisheries Act provides a legislative framework for the regulation, management and conservation of Victorian fisheries. A person must not take fish from marine waters or inland waters; or use or possess recreational fishing equipment in or next to Victorian water unless authorised to do so by a licence. Section 119 of the Fisheries Act requires that a person must not create an obstruction across a watercourse or water body that will obstruct the free passage of fish, leave fish stranded, or destroy immature fish without authorisation under the Act. Construction of the MS2 regulator will create a temporary barrier to fish movement during stage 2 of construction. However, remaining habitat present upstream and downstream of the site should allow for fish populations present to be maintained during the construction phase. Timing of stage 2 of the construction will avoid key migration windows for fish present. Construction of the MS1 regulator will also create a temporary barrier to fish movement. It should be noted that Finnigans Creek is an intermittent waterway that likely loses connectivity under existing conditions and that fish passage in the creek is also currently restricted by an earthen weir. During the construction phase, implementation of flow-through via pumping during periods that the creek would otherwise be connected to the Murray River will mitigate impacts to downstream water quality. Although the obstructions will be temporary, authorisation will be required under the Fisheries Act. If the capture, handling or translocation of fish is required during construction (e.g. dewatering work sites) or operation of the project, persons undertaking these activities will need to hold the appropriate permit or licence under the Fisheries Act.

Commonwealth	Relevance to project
Environment Protection Act 1970 (EP Act)	The EP Act empowers the Environment Protection Authority Victoria (EPA Victoria) to implement regulations, maintain State Environment Protection Policies (SEPPs) and protect the environment from pollution and the management of wastes. The EP Act allowed for the establishment of the *State Environmental Protection Policy (Waters) (SEPP Waters)*, which applies to all surface waters, estuarine and marine waters and groundwaters across the State (Vic. Gov. 2018). Relevant clauses of this policy must be adhered to. The following clauses (with a brief description of relevant aspects) are applicable to the project. Clause 40 – Management of instream works • A person undertaking works in or adjacent to surface waters must minimise risks to beneficial uses. • Minimise unnatural erosion, sediment re-suspension and other risks to aquatic habitat. • Ensure that existing and new in situ structures do not pose a barrier to fish movement. The CEMP (and aquatic fauna management plan) for the construction phase must provide details of how waterway values will be protected in terms of minimising sediment mobilisation. Construction of the MS2 regulator will create a temporary barrier to fish movement during stage 2 of construction. However, remaining habitat present upstream and downstream of the site should allow for fish populations present to be maintained during the construction phase. Timing of stage 2 of the construction will avoid key migration windows for fish present. Clause 42 - Construction activities • Minimise soil erosion, land disturbance and discharge of sediment and other pollutants to surface waters • Where construction activities impinge on surface waters, construction managers need to monitor affected surface waters to assess whether beneficial uses are being protected The CEMP (and aquatic fauna management plan) for the construction phase must provide details of how waterway values will be protected in terms of minimising sediment mobilisation. Clause 45 – Native vegetation protection and rehabilitation • Minimise the removal of and rehabilitate native vegetation within or adjacent to surface waters. Project design, including the assessment completed for this report, will aim to minimise impacts to native vegetation within or adjacent to waterways.
Water Act 1989 (Water Act)	The Water Act provides legislative framework for the allocation and management of water. A Works-on-Waterways permit is required to construct works on a waterway identified under section 67 of the Water Act. The project must apply for this permit, which will be approved by Mallee CMA.

13 Recommendations

The Wallpolla Island Floodplain Restoration Project has the opportunity to provide infrastructure which will allow the reintroduction of more natural flooding and drying regimes to the floodplain of much of Wallpolla Island and the surrounding area. This has the potential to sustain these ecosystems and the flora and fauna species and communities which inhabit them. The project 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 2,672 ha of floodplain and wetland habitats that support water dependent vegetation threatened by river regulation, on-going drought and a drying climate.

13.1 Next steps

R8 recommends the following next steps:

- Engage with DELWP, discussing the proposed approach for obtaining native vegetation offsets for the project and whether a conservation works exemption may apply to the works at Wallpolla Island. This approach may include the establishment of a vegetation condition monitoring regime within the proposed Inundation Areas that will identify changes in condition to the vegetation within these areas that results from the environmental watering regime. Once an approach is approved, prepare an Offset Plan for the project to support any application for planning approval to remove native vegetation under the *Planning and Environment Act 1987*.
- 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.
- Refine the Construction Footprint within the bounds of the 53.38 ha footprint utilising the existing ecological values mapping (**Figure 5**) to avoid and minimise impacts to native vegetation and threatened flora/fauna and communities within the Construction Footprint This should include the consideration of design alternatives as required to mitigate impacts to vulnerable EVCs.
- It is recommended that the final design refinements take in to account the presence of the Vulnerable EVC, Alluvial Plains Semi-arid Grassland, which has been identified within the construction footprint at both infrastructure sites and along tracks. Efforts should be made to avoid and minimise impacts to this EVC, and where this vegetation is present immediately adjacent to the construction footprint, and vegetation that hasn't been approved for removal should be fenced off as a No-Go zone.
- The Habitat hectare assessments were undertaken at the time of the fieldwork in 2015 using the Construction Footprint that was current at the time. Due to changes in the Construction Footprint since the 2019 survey and the fact that vegetation along tracks hasn't been fully mapped, some areas of native vegetation proposed to be impacted have not yet been assessed (10.57 ha). However DELWP modelled condition data has been used to fill these gaps. Once the design process is complete and the Construction Footprint has been finalised, it is recommended that a Vegetation Quality Assessment (Habitat Hectares) is undertaken in these areas to confirm the condition and extent of native vegetation within these areas. The results of this are presented in this current and previous (GHD 2016) reports and presented in Appendix L.
- 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 will take in to account direct impacts to trees (tree removal) and indirect impacts to trees (through encroachment of their TPZs). An arborist assessment will 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).
- Undertake a broad-scale ground-truthing assessment of the vegetation within the proposed Inundation Areas, and establish an approved method for monitoring the changes in the vegetation over time once the inundation regime commences. It is recommended that once a method has been developed for these assessments that DELWP review the method prior to undertaking any surveys within the Inundation Area.

- 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
- Develop and implement an Aquatic Fauna Management Plan (as part of the CEMP) to manage impacts to aquatic values – with emphasis on threatened fish species that may be present in the vicinity of construction sites. Any construction activities that could lead to entrapment of fauna or temporary loss of habitat (e.g. due to the use of coffer dams and dewatering) should be considered
- A CEMP should be developed for the project and implemented in full to further avoid and minimise impacts to areas of ecological value. The CEMP should be prepared once the footprint and construction methods for the proposed works have been finalised, and should include the measures described in this report and provisions relevant to protecting the ecological values identified within the Construction Footprints (**Figure 5**).
- Investigate the potential for native vegetation either within or immediately adjacent to the Inundation Area to be negatively impacted during the operation phase of the project due to changes in groundwater (as described in R8 2020). If the changes to groundwater are considered significant enough to negatively impact native vegetation, then additional mitigation measures will need to be developed and implemented as a part of the project through the Environmental Water Management Plan and the VMFRP Monitoring Evaluation and Reporting (MER) Plan.
- Any upstream or downstream hydrological changes or impacts in the Murray River associated with the delivery of environmental water to the Wallpolla Island floodplain will be assessed and managed by the River Murray Operations Committee (RMOC) as part of their responsibility to oversee the operation of the river which is managed by the Murray Darling Basin Authority on behalf of the relevant State and Commonwealth Governments. It is also proposed that the environmental water requirements for VMFRP sites will be added to the existing river flows and therefore managed to ensure minimal, if any, changes in flows experienced downstream of the project sites.

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Appendix A Summary of previous ecological studies

Report	Methods	Key findings	Recommendations
Biosis (2013). *Vertebrate fauna surveys of Wallpolla Island for SDL Offsets Project.* Report to the Mallee CMA.	Review of existing information Field surveys November 2013: • 15 sites • Ground dwelling vertebrates • Pitfall trapping using four pitfall buckets and six funnel traps for four days and four nights • Baited motion-activated fauna camera traps at each site for four days and four nights • Bird surveys: • Standard 20 minute 2 hectare area search at each site • Bat surveys • Anabat detectors for micro-bat calls at each site for four nights Nocturnal spotlight surveys: • 20 minute spotlighting and call-play back surveys at each site targeting nocturnal birds and frogs. • Recording of incidental observations	• 128 fauna species recorded • 84 native bird species • 4 native amphibian species • 5 native and 4 exotic terrestrial mammal species • 13 bat species • 17 native reptile species • 1 exotic fish species Significant and listed species included: • 3 bird, 1 mammal and 1 reptile species listed as threatened under FFG Act • 2 species of bird and 3 reptile listed under the DEPI Advisory List of Threatened Vertebrate Fauna in Victoria 2013	No recommendations

Report	Methods	Key findings	Recommendations
DELWP (2018) SDL Fish Management Plan. Report to the Mallee CMA	• Review of existing information. • Review of proposed SDL infrastructure and operation. • Review of existing ecological objectives and targets for the site. • Provision of recommended fish-related opportunities for the site.	• Listed species that are likely to occur at Wallpolla Island or its immediate 10 km vicinity include Murray Cod, Freshwater catfish, Silver Perch and Murray-Darling rainbowfish. • Floodplain currently not utilised often by fish. • Unclear how change in flow regime will impact fish species in creeks of Wallpolla Island.	• Floodplain inundation may allow for restoration of wetland fish community, provided a fish exit strategy is implemented. • Suggestion to experimentally test whether the Wallpolla Island wetlands can be managed as a Golden perch nursery/grow-out habitat to produce a major regional Golden perch recruitment event. • Fish monitoring prior to and during operation to understand of the effects that increased floodplain inundation and increased flows in Wallpolla and Dedmans Creeks has on fish population dynamics in the site. • Monitoring for carp and other non-native species during operation. • Monitoring during drawdown period to ascertain whether fish are able to exit through regulators.
Ogyris Ecological Research (2013). *Wallpolla Island Flora Census.* Report to the Mallee CMA.	Review of existing information Field surveys November 2013: • 33 quadrat sites (30 m x 30 m) • Four incidental sites • Floristic assessment • Estimate of plant cover where canopy projection estimates were recorded to the nearest 5% cover. • Plant cover-abundance scaling estimate (sensu Braun-Blanquet 1964)	• 13 out of 33 sites have EVCs that were correctly predicted • 195 flora species recorded • 31 Victorian rare or threatened plants • Two endangered species • Seven vulnerable species • 16 rare species • 6 poorly known species	• Flora surveys such as this are undertaken at the time of maximum expression of all plant life-forms, which in the Victorian Mallee is early spring (e.g. September). • Mallee CMA request a data search of an alternative plant flora database known as the SEAFIS which has a vastly greater number of species and site records than the Victorian VBA.

Report	Methods	Key findings	Recommendations
	• Photographs of all 33 quadrats • Data collection and compliance • Data curation by the VBA	• Two of those Victorian rare or threatened plants are also FFG Act-listed species • 42 exotic plant species • WoNS species: Bridal Creeper (*Asparagus asparagoides*)	Further feedback is also warranted on three concerning aspects of this study: • Requirement to record cover to the nearest 5%, except for uncommon species which were allocated +, 1% or 2%. • Data were collected in percentage form as the VBA has no capacity to accept data in this format. • Many of the Wallpolla Island sites (WALP01-WALP12) are part of an ongoing Murray Scroll Belt flora (and fauna) study where interval based data have been collected in the past (see Robertson and Sluiter 2010). Comparisons with data from late 2009 as collected in that study, and previously will not be valid unless interval based data are used.
GHD (2016). *Wallpolla Island SDL Project – Ecological Assessment.* Report prepared by GHD for Mallee CMA, Mildura, Victoria.	Review of existing information Field surveys December 2015: • Study Area encompasses a broad area of the Mallee Catchment Management Area and Murray Scroll Belt (MSB) Bioregion, within the Murray Sunset National Park (MSNP). Area of Investigation includes a network of access tracks within the MSNP as well as a suite of proposed work sites, with a total footprint of 198.85 ha. • Flora assessment • Habitat hectare assessment	Eight EVCs were identified during the field assessment • Low Chenopod Shrubland • Riverine Chenopod Woodland • Alluvial Plains Semi-arid Grassland • Lignum Shrubland • Floodway Pond Herbland • Intermittent Swampy Woodland • Shrubby Riverine Woodland • Lignum Swampy Woodland • 37 Habitat zones were identified • 847 LOTs were identified • 102 were classified as stags	Develop specific mitigation measures related to the works at each structure and along access tracks. These will need to be incorporated into a CEMP. Once the Construction Footprint has been finalised and the proposed impacts has been finalised determine the requirement for a referral under the *Environment Effects Act 1978.* Once the extent of impacts to fauna and fauna habitat has been finalised, determine the requirement for a permit under the *Victorian Wildlife Act 1975.*

Report	Methods	Key findings	Recommendations
	• Mapping location of large old trees (LOTs), recording species and Diameter at Breast Height (DBH) • Collecting inventory of flora species • Identification and mapping of threatened flora species or communities under EPBC or FFG Acts • Identifying presence of significant WoNS or CaLP Act noxious weeds • Fauna assessment • Opportunistic observations of all terrestrial fauna species • Diurnal bird surveys • Documentation of indirect faunal signals • Spotlighting sections of access tracks and infrastructure footprints • Temporary installation of 12 remote sensing fauna cameras and left in situ for approximately four weeks	• 180 were classified as *Eucalyptus camaldulensis* (River Red-gum) • 666 were classified as Eucalyptus largiflorens (Black Box) • Seven noxious weeds were identified. One of which is listed as WoNS: Opuntia stricta (Common Prickly-pear) • Two FFG Act listed fauna communities have the potential to occur within the Area of Investigation: • Victorian Temperate Woodland Bird Community (VTWBC) • Victorian Mallee Bird Community (VMBC) • Seventy-six threatened flora species were predicted to occur in the Study Area • Twenty-six threatened flora species were identified during the site visit. • No EPBC Act listed species were identified • Ten FFG Act listed species were identified • Twenty-six DELWP Advisory listed species were identified • There are 44 fauna species predicted to occur within the Area of Investigation • Fifty-six fauna species were identified during the surveys	Once the extent of native vegetation proposed to be removed has been determined, determine the risk pathway approach that will need to be taken in accordance with the Permitted clearing of native vegetation: Biodiversity Assessment Guidelines (DEPI 2013). Calculate the total area of native vegetation that will be impacted and, if the proposal follows the high (or moderate) risk pathway, submit the shapefiles of the impacted areas to DELWP. The offset requirements will be directly related to the risk based pathway the project takes and are likely to include a combination of both general and specific offsets. Obtain an FFG Permit for the removal of protected flora species located within the Study Area. The FFG Permit will need to be included in the overall application for a Planning Permit. Determine a plan for obtaining the offsets - this will need to be incorporated in an Offset Plan for the project. The Offset Plan will need to be approved by DELWP and MRCC. If the project is considered high risk then the offsets for the project will need to have been secured prior to receiving the application for a Planning Permit.

Report	Methods	Key findings	Recommendations
		• Eight threatened fauna species were identified in the Area of Investigation and surrounding area • No EPBC Act listed species were identified • Six FFG Act listed species were identified • Eight DELWP Advisory listed species were identified	Once the Offset Plan has been approved 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.*

Appendix B Likelihood of occurrence / impact – threatened flora – Construction Footprint and 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 Construction Footprint or Inundation Area and species' known range encompasses these areas. Species recorded historically in the 10-km search area, and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the Construction Footprint and/or Inundation Area, but suitable habitat does not present or likely to be present. Species recorded historically in the 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 Study Area.

Note that the discussion on impacts in the table below pertains to the hypothetical scenario in which the species is actually present.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Abutilon otocarpum	Desert Lantern			vu	1	2005	VBA	Rare, confined to red loam ridges and dunes near the floodplain of the Murray River in the far north-west (e.g. Hattah, Mildura and Robinvale areas). Flowering after summer rains (Walsh and Entwistle 1996)	**Unlikely.** No suitable habitat recorded in Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Acacia loderi	Nealie		L	vu	7	1985	VBA	In Victoria, restricted to near Merbein and Nyah in the north-west, and near Pyramid Hill and Nathalia in the central north. It exists now as mostly remnant stands on or near private land (Walsh and Entwistle 1996)	**Unlikely**. Suitable habitat was not identified within the Construction Footprint. This species is not cryptic and it is expected would have been recorded during recent or previous surveys if it was present.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Acacia oswaldii	Umbrella Wattle		L	vu	14	2013	VBA	Widespread but rather uncommon throughout north-western Victoria, mainly on calcareous soils or loam (Walsh & Entwisle 1996)	**Present.** Recorded in 2013 surveys of the broader area and in the 2015 and 2019 surveys. **Impact unlikely.** Recorded in construction and road buffer areas. Mitigation measures avoid and minimise impact to this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Acacia victoriae subsp. *victoriae*	Bramble Wattle			r	4	2010	VBA	Restricted in Victoria to the far north-west and apparently near Rainbow. It usually grows in clay or loam on alluvial flats but also in sand. (Walsh & Entwisle 1996)	**Unlikely.** This species is not cryptic and it is expected would have been recorded during recent or previous surveys if it was present.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Amaranthus grandiflorus	Large-flower Amaranth			vu	3	1979	VBA	In Victoria confined to sandy rises and sandy loam flats in the far north-west (e.g. Merbein, Red Cliffs, Koorlong), but uncommon to rare, and probably appearing in numbers only following summer rain (Walsh and Entwisle 1996).	**Unlikely**. No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Amaranthus macrocarpus var. *macrocarpus*	Dwarf Amaranth			vu	1	1986	VBA	Rather rare in Victoria, usually appearing only after summer rains along the Murray River floodplain downstream from about Echuca. Sometimes appears on roadsides and in rail yards where possibly introduced with grain etc. (Walsh & Entwisle 1996).	**Unlikely.** Suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys. No VBA records in over 30 years.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Ammannia multiflora	Jerry-jerry			vu	3	2017	VBA	Confined in Victoria to the north-west where found in wet places, sometimes in water, on heavy soils. (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified during survey, but not recorded in 2015 or 2019 surveys. Was recorded in local area during Ogyris 2013 census surveys outside of the Area of Investigation. **Impact unlikely.** This species was not recorded within the Construction Footprint during the 2019 (or earlier) surveys and is therefore considered unlikely to be impacted.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Amyema linophylla subsp. *orientalis*	Buloke Mistletoe			vu	1	2003	VBA	Widespread in western Victoria but scarce due to depletion off its main host-plant *Allocasuarina luehmannii* (Buloke) (Walsh & Entwisle 1999).	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Amyema pendula subsp. *longifolia*	Drooping Mistletoe			r	1	1933	VBA	Very rare in Victoria where known by a few collections near the Murray River in the north-west of the State: Wallpolla Island, west of Mildura (1933), Hattah-Kulkyne National Park (2019) and Tooleybuc (1971), in each case, parasitic on *Eucalyptus camaldulensis*. (Walsh & Entwisle 1999)	**Possible.** Suitable habitat was identified during survey (River Red-gums present within the Construction Footprint), but not recorded during the assessments. This species is not cryptic and it is anticipated it would have been identified if it was present within the Construction Footprint. **Impact unlikely.** This species was not recorded within the Construction Footprint during the 2019 (or earlier) surveys and is therefore considered unlikely to be impacted.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Angianthus brachypappus	Spreading Angianthus			vu	1	2010	VBA	Rare in Victoria and confined to the north-west, often on edges of saline depressions. (Walsh & Entwisle 1996).	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Asperula gemella	Twin-leaf Bedstraw			r	2	2013	VBA	Rare in Victoria where known only from moist riparian sites along the Murray River downstream from Kerang, and with an isolated record from the Avoca River (Walsh & Entwisle 1996).	**Unlikely**. No suitable habitat recorded in the Construction Footprint.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Atriplex acutibractea subsp. *karoniensis*	Pointed Saltbush			r	2	2003	VBA	Recorded from the eastern portion of the region (Annuello, Manangatang, Nyah) on loamy soils. Fruits Apr., Jul., Oct. (3 records) (Walsh & Entwisle 1996).	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Atriplex holocarpa	Pop Saltbush		L	vu	3	2005	VBA	In Victoria apparently confined to the far north-west (Hattah-Benetook area) where localised and uncommon on sandy soils prone to seasonal flooding (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Species not recorded during any previous surveys, which will suggest a population does occur in Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Atriplex infrequens		VU					PMST	Occurs in western NSW, within the northern and southern far western plains regions. It is not known to occur within a conservation reserve (Briggs & Leigh 1996) and has been recorded from the drier regions of the Bourke District, such as Lake Parnamaroo in 1860; Delalah Downs, undated; and Tarcoola in 1920; and from the Murray-Darling Depression (Wilson, 1984; Morton et al., 1995; Ayers et al., 1996). This species occurs within the Lower Murray Darling and Western (NSW) Natural Resource Management Regions.	**Highly Unlikely.** Some suitable habitat present, but only known from NSW. No previous VBA records.	**Highly Unlikely.** Some suitable habitat present, but only known from NSW. No previous VBA records.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Atriplex lindleyi subsp. *conduplicata*	Baldoo			r	6	2010	VBA	Apparently confined to the Murray River floodplain downstream of Robinvale (e.g. Hattah Lakes Red Cliffs, Merbein), occasionally occurring with the other 2 sub species but apparently remaining distinct. An invader of degraded and/or salted areas on heavier soils (Walsh & Entwisle 1996).	**Present**. Recorded during 2019 targeted surveys in the Construction Footprints/buffers. **Impact Likely.** Recorded in low numbers during 2019 targeted surveys within the Construction Footprint, will likely be impacted by proposed works.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Atriplex nummularia subsp. *omissa*	Dwarf Old-man Saltbush			r	5	2010	VBA	In Victoria apparently confined to floodplains or lake margins west of Mildura in the extreme north west (e.g. Wallpolla and Lindsay Islands). Fruits Oct.-Nov. (Walsh & Entwisle 1996).	**Present.** Recorded during 2019 targeted surveys in the Construction Footprints/buffers. **Impact Likely.** Recorded in moderate numbers during 2019 targeted surveys within the Construction Footprint, will likely be impacted by proposed works.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Atriplex pseudocampanulata	Mealy Saltbush			r	6	2013	VBA	Occurs mainly on heavier soils fringing lakes or rivers on the Murray River floodplain downstream of about Cohuna, also recorded from railyards at Bairnsdale and Toora in Gippsland where certainly inadvertently with stock or stock feed. Common in degraded, salted country. Fruits Sep.-May (Walsh & Entwisle 1996)	**Possible.** Recording in 2013 and 2015 surveys, but not recorded in 2019 surveys, possibly due to the extremely dry conditions. **Impact Possible.** Not identified during 2019 surveys but could reappear if conditions become suitable.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Atriplex rhagodioides	Silver Saltbush		L	vu	15	2013	VBA	In Victoria apparently confined to the Murray River floodplain in the far north west and recorded only from Natya area (between Swan Hill and Robinvale), Red Cliffs and Cowra. Fruits Mar., Oct. (2 records)	**Possible**. Suitable habitat recorded in Study Areas, recorded in 2013 and 2015 surveys, but not re-recorded in 2019. Extremely dry conditions may be the reason. **Impact Possible.** Although not recorded in the most recent surveys, could reappear if conditions become suitable.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Atriplex spongiosa	Small Pop Saltbush			en	1	1987	VBA	In Victoria apparently restricted to Ned's Corner Station in the far north west of the State, where it co-occurs with Atriplex holocarpa.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys, existence of a population within Construction Footprints unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Austrobryonia micrantha	Mallee Cucumber			r	4	2017	VBA	Occurs on drying or dried clay soils (e.g. lake-beds, ephemeral watercourses and lagoons) on the floodplain of the Murray River in the far north-west, with southerly occurrences at e.g. Lake Tyrrell, Wyperfeld National Park, but rare in Victoria.	**Possible.** Suitable habitat was identified during survey, but the species was not recorded in 2015 or 2019 surveys. The species was recorded in local area during Ogyris 2013 census surveys, outside of the Area of Investigation. **Impact Possible.** Not recorded in previous surveys of the Construction Footprint, but could appear on recently inundated soils if conditions are suitable therefore its possible the species could be impacted. The level of impact would depend on how extensively the species appeared locally under the right conditions, and the proportion of any population that cropped up that was proposed to be impacted at the time of construction.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Brachyscome exilis	Finger-leaved Daisy			r	1	1887	VBA	Occurring in the north-west of the State in a range of habitats, e.g. with saltbush on saline gypseous soils, in Mallee eucalypt communities and in Belah woodlands (Walsh & Entwisle 1996).	**Unlikely.** Some suitable habitat present. Only 1 previous record in area over 100 years old.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Bromus arenarius	Sand Brome			r	6	2010	VBA	Rather rare in Victoria, occurring on sand and clay-pan soils in the Mallee and on shallower soils over rock in rain-shadow areas of east Gippsland (Walsh & Entwisle 1996).	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Caladenia tensa	Greencomb Spider-orchid	EN		vu			PMST	In Victoria found mainly in the Little Desert area (also with an isolated record for near Wood Wood) in Eucalyptus/Callitris woodland on well-drained sandy soil (Walsh & Entwisle 1994).	**Highly Unlikely.** No suitable habitat recorded in the Construction Footprint, and no records within 100 km of the site.	**Highly Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated, and no records within 100 km of the site.
Calandrinia volubilis	Twining Purslane			r	6	1988	VBA	Largely restricted in Victoria to the far north west in samphire and saltbush communities on saline flats and around salt lakes, but with a remarkably disjunct occurrence on a basalt escarpment of the Moorabool River near Lethbridge.	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Calostemma luteum	Yellow Garland-lily			vu	1	1994	VBA	Localised in the far north-west, known only from a single population on the Murray River floodplain west of Merbein, common in drainage systems of the Darling River in New South Wales and Queensland, and the Murray River floodplain in South Australia.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys, existence of a population within Construction Footprints unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Calotis cuneifolia	Blue Burr-daisy			r	15	2016	VBA	Scattered along the Murray River and its floodplain downstream from near Barmah, with occurrences away from the river at Kamarooka and Chiltern. Occurs chiefly on alluvial loam or clay soils, often associated with Eucalyptus camaldulensis. Flowers Aug.-Feb. (Walsh & Entwisle 1996).	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact Likely.** Recorded in Construction Footprint in most recent surveys and in previous surveys	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Calotis lappulacea	Yellow Burr-daisy			r	1	2003	VBA	Scattered in dry rocky country in the east (e.g. Deddick, Suggan, Buggan, Tabberabbera, Glenaladale), rare in open woodland near Melbourne (e.g. Toolern Vale) and on fertile, loam or clay soils in the north and north-west (e.g. Picola, Chinkapook districts). Flowers mostly Sep.-Jan. (Walsh & Entwisle 1996).	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Cardamine moirensis	Riverina Bitter-cress			r	3	2013	VBA	In Victoria, occurring in the north and west in seasonally wet areas.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys, existence of a population within Construction Footprints unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Crinum flaccidum	Darling Lily		L	vu	9	2018	VBA	Rare in Victoria, confined to the extreme north-west along the Murray River floodplain west of its junction with the Darling River.	**Present**. Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact possible.** Recorded in Construction Footprint in 2019, mitigation measures will need to be implemented to avoid impact on this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Cullen discolor	Grey Scurf-pea		L	en	1	1887	VBA	Endangered in Victoria where found in the far north west of the state in sandy soils. Flowers mainly Sep.-Jan.	**Unlikely.** Some suitable habitat present. Only 1 previous record in area over 100 years old.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Cyperus flaccidus	Lax Flat-sedge			vu	1	2010	VBA	Rare in Victoria, occurring in seasonally wet sites (e.g. lake and river margins), recorded only from Mildura, Dimboola, Goroke and Cobram areas. Flowers spring-summer (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely**. Not recorded in previous surveys, existence of a population within Construction Footprints unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Cyperus pygmaeus	Dwarf Flat-sedge			vu	3	2017	VBA	On banks and seasonally wet floodways of the Murray River between Mildura and Swan hill, with a distant occurrence upstream near Yarrawonga; on clayey soils in open positions (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified during survey, but the species was not recorded in 2015 or 2019 surveys. The species Was recorded in local area during Ogyris 2013 census surveys outside the Area of Investigation. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprints unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Dianella porracea	Leek Flax-lily			vu	N/A	N/A	Recorded	Largely confined to the north-west, mostly near the Murray River and rather rare, inhabiting sandy soils and silty alluvium (e.g. Lake Arawak near Hattah, Lake Powell near Robinvale, Wood on the Murray River), with outlying, scattered occurrences in the Quambatook area.	**Present.** Recorded during 2019 targeted surveys in the Construction Footprints/buffers. **Impact possible.** A few specimens recorded in Construction Footprint and buffers in most recent survey, at least some will possibly be impacted by proposed works.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Diplachne fusca subsp. *fusca*	Brown Beetle-grass			r	1	2013	VBA	Confined to far eastern Victoria (Orbost, Suggan Buggan, Cann River, Genoa, Mallacoota areas) and rather rare; occurs in mainly dry sclerophyll forest and woodland, often in rocky areas (Walsh & Entwistle 1999).	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Dissocarpus biflorus var. *biflorus*	Twin-flower Saltbush			r	5	2011	VBA	Occasional in far north western Victoria (e.g. Lake Wallawalla, Mildura, Underbool, Sea Lake areas), on saline, seasonally wet, cracking clay soils, usually in low shrubland formations. Fruits mostly Sep.-Nov.	**Possible.** Suitable habitat present in Study Areas. The species was recorded in 2015 surveys, but not re-recorded in 2019 surveys, possibly due to extremely dry conditions. **Impact possible.** Even though not re-located in 2019 surveys, could still appear in Construction Footprint in future if conditions are suitable. The level of impact would depend on how extensively the species appeared locally under the right conditions, and the proportion of any population that cropped up that was proposed to be impacted at the time of construction.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Dodonaea viscosa subsp. *angustifolia*	Giant Hop-bush			r	1	2003	VBA	Confined to far eastern Victoria (Orbost, Suggan Buggan, Cann River, Genoa, Mallacoota areas) and rather rare; occurs in mainly dry sclerophyll forest and woodland, often in rocky areas.	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Duma horrida subsp. *horrida*	Spiny Lignum			r	8	2014	VBA	Infrequent on silty soils and clays fringing shallow swamps and lakes in the northwest, and near the Murray River downstream from about Swan Hill.	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact Likely.** Recorded within Construction Footprint. Impact likely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Eleocharis plana	Flat Spike-sedge			vu	1	2006	VBA	Only recorded near Tallengatta, where it occurs in moist situations (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprints unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Eragrostis australasica	Cane Grass			vu	5	2013	VBA	Apparently confined to a few clay pans and shallow lakes in the north west, mostly between Mildura and environs and the SA border, but also at Chirrup (between Donald and Wycheproof) (Walsh & Entwisle 1996).	**Present.** Recorded in 2013, 2015 and 2019 surveys of the area. Along the edge of the old mail road. **Impact Possible.** Recorded in the road reserve along sections of the Old Mail Road. It is possible works along this road could impact the species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Eragrostis setifolia	Bristly Love-grass			vu	4	2001	VBA	Uncommon in Victoria, occurs on clayey soils of seasonally flooded areas, confined to the far north-west. Plants at a young-flowering stage have a very different appearance from the mature plant, with a contracted inflorescence and very short, apparently few-flowered spikelets. The spikelets elongate rapidly towards maturity and the short panicle branches diverge, giving the plant its typical mature form (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprints unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Eremophila bignoniiflora	Bignonia Emu-bush		L	vu	4	2017	VBA	In Victoria confined to the far north-west and considered endangered in this State. Found along river flats and in depressions in woodlands on heavy clay soils. (Walsh and Entwisle 1999)	**Possible.** Suitable habitat was identified during survey, and species was recorded in 2015 surveys, but not recorded during 2019 targeted surveys. **Impact possible.** Even though not re-located in 2019 surveys, could still appear in Construction Footprint in future if conditions are suitable. The level of impact would depend on how extensively the species appeared locally under the right conditions, given the nature of the species it is unlikely it would reappear in large numbers in a localised area and any impacts would not be considered significant within the broader Wallpolla area.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Eremophila divaricata subsp. *divaricata*	Spreading Emu-bush			r	11	2017	VBA	In Victoria confined to woodland communities along the floodplain of the Murray River system north-west from Kerang (Walsh & Entwisle 1996)	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact Possible.** Recorded in low numbers in areas close to the river, could possibly be impacted by proposed works.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Eremophila maculata subsp. *maculata*	Spotted Emu-bush		L	r	4	2013	VBA	In Victoria confined to the north-west, mainly in Eucalyptus largiflorens forests or woodlands on heavy clay soils.	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact Possible.** One specimen recorded in Construction Footprint and another three in buffer areas. A large shrub, easily identifiable. Mitigation measures available to avoid impact on this species.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Eremophila polyclada	Twiggy Emu-bush			vu	10	2011	VBA	In Victoria confined to the far north-west between Mildura and the South Australian border and considered vulnerable in this State. Occurs along river flats and in depressions, mainly in Eucalyptus largiflorens forests and woodlands on heavy clay soils.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Euphorbia planitiicola	Plains Spurge		L	en	1	2009	VBA	Known in Victoria only from near Boort, Inglewood, Kerang and Lake Wallawalla, where found on seasonally wet, cracking clay soils.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Gratiola pumilo	Dwarf Brooklime			r	1	2011	VBA	Mainly confined in Victoria to the north and west of state, on damp and drying mud besides lakes and watercourses and seasonally inundated depressions, but also with a few isolated records to the south. Nearest known occurrence < 5 km east of site, 2003.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Hydrilla verticillata	Hydrilla			r	1	1970	VBA	Recorded from scattered localities along the Murray River between Yarrawonga and Mildura, and possibly occurring further downstream. In still too slow-flowing freshwater of lakes and streams, to a depth of at least 3.5m. Male flowers recorded in May.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Lepidium monoplocoides	Winged Peppercress	EN	L	en			PMST	Uncommon in north western quarter of state, mostly on heavy soils near lakes and watercourses. Flowers mostly spring-summer (Walsh & Entwisle 1996).	**Unlikely.** Suitable habitat, but not in known distribution area, and no records within 70 km of site.	**Unlikely.** Suitable habitat could be present within the Inundation Area, but not in known distribution area (the nearest records are over 70 km south east at Hattah Kulkyne National Park.
Maireana sedifolia	Pearl Bluebush			r	12	2010	VBA	In Victoria confined to a few sites with loamy, often limestone rich soils in the far north west (Red Cliffs, Merbein, South Australian border region but sometimes locally common. Fruits mostly Aug.-Oct. (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Malacocera tricornis	Goat Head			r	30	2013	VBA	Grows in clay pans and heavy alluvial flats along the Murray River floodplain from Boundary Bend downstream to the South Australian border (Walsh & Entwisle 1996).	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact Possible.** Recorded in reasonably high numbers along road sides, it is possible this species will be impacted by the proposed works.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Minuria cunninghamii	Bush Minuria			r	5	2011	VBA	Confined in Victoria to the north west, and rare (e.g. Raak plain near Benetook, Hattah Lakes, Lake Tyrell), usually occurring on slightly too strongly saline ground in sand, clay or gypseous soils (Walsh & Entwistle 1999).	**Possible.** Some suitable habitat recorded in Study Areas. The species was recorded in 2015 surveys, but not re-recorded in 2019, possibly due to dry conditions. **Impact possible.** Even though not re-located in 2019 surveys, could still appear in Construction Footprint in future if conditions are suitable.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Minuria integerrima	Smooth Minuria			r	2	2013	VBA	In Victoria confined to heavy clay and alluvial silt on floodplains of Murray River, from Barmah districts to the South Australian border (Walsh & Entwistle 1999).	**Possible.** Some suitable habitat recorded in Study Areas. The species was recorded in 2013 and 2015 surveys, but not re-recorded in 2019, possibly due to dry conditions. **Impact Possible.** Even though not re-located in 2019 surveys, could still appear in Construction Footprint in future if conditions are suitable.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Myoporum montanum	Waterbush			r	1	2010	VBA	Scattered across northern Victoria where uncommon to rather rare; mostly in Mallee and riparian woodland communities but also in rocky gorges (Walsh & Entwisle 1999). Flowers mainly Jun-Nov.	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Neobassia proceriflora	Soda Bush			en	8	2013	VBA	Apparently restricted in Victoria to chenopod shrublands and Eucalyptus largiflorens woodlands, often slightly saline, on the Murray River floodplain in the far north-west (e.g. Wallpolla and Lindsay Islands). A rather cryptic species and seemingly abundant only following summer rains.	**Possible.** Suitable habitat was identified during survey, but not recorded in 2015 or 2019 surveys. The species was recorded in local area during Ogyris 2013 census surveys, outside the Area of Investigation. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Nicotiana goodspeedii	Small-flower Tobacco			r	1	1986	VBA	In Victoria, confined to the north west where rare and found mostly in alkaline soils, often in sand overlying limestone. Flowers mainly spring and summer.	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Phlegmatospermum eremaeum	Spreading Cress			vu	1	1887	VBA	Rare plant of open Mallee on calcareous clay or loam in north west of state. Flowers winter-spring	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Phyllanthus lacunarius	Lagoon Spurge			vu	16	2017	VBA	Rare plant of open Mallee on calcareous clay or loam in north west of state. Flowers winter-spring	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Phyllanthus lacunellus	Sandhill Spurge			r	3	2011	VBA	Typically occurs on sandy rises, will flower most of year depending on rains (Walsh & Entwisle 1999).	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Picris squarrosa	Squat Picris			r	7	2013	VBA	Widespread in Victoria but of disjunct distribution. Usually found on coastal sand dunes or in alluvial soils on river banks or floodplains, mainly at low altitudes. Flowers mostly Oct.-Apr. (W& E) Occurs in woodland to open forest of less flood-prone (riverine) watercourse fringes, principally on levees and higher sections of point-bar deposits (DSE 2004).	**Possible.** Suitable habitat was identified during survey, but species was not recorded in 2015 or 2019 surveys. Species was recorded in local area during Ogyris 2013 census surveys, outside the Area of Investigation. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Pterostylis cheraphila	Floodplain Rustyhood	VU	L	vu			PMST	Endemic to Victoria where localised and known only from the Little Desert area and near Murtoa in riverine Eucalyptus largiflorens woodland, growing amongst ephemerals on sandy loam or cracking silty soils (Walsh & Entwisle 1994).	**Unlikely.** No suitable habitat recorded in the Construction Footprint, and no records within 100 km of the site.	**Unlikely.** Suitable habitat could be present within the floodplain areas proposed to be inundated, but no records within 100 km of the site.
Radyera farragei	Desert Rose Mallow			vu	1	1966	VBA	Very rare in Victoria, known from a few records from small populations in the far north-west (Bolton, Annuello, Merbein, Hattah, Millewa, Nowingi areas), some of which have almost certainly been destroyed in clearing for cereal cropping since the first collection in 1922. Plants occur on low-lying, calcareous loams. Establishment from seed appears to require some disturbance (e.g. fire) followed by good rains.	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Roepera similis	White Twin-leaf			r	3	2013	VBA	In Victoria, confined mainly to the far north-west where found in Mallee scrub and riverine woodland on sand or heavier clay soils, but with an outlying occurrence near Kerang	**Unlikely.** This species is not cryptic and it is expected would have been recorded during recent or previous surveys if it was present.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Rorippa eustylis	Dwarf Bitter-cress			r	3	2013	VBA	Habitat restricted to scattered swamps and floodplains along Murray (Walsh & Entwistle 1996).	**Possible.** Suitable habitat was identified during survey, but species was not recorded in 2015 or 2019 surveys. Species was recorded in local area during Ogyris 2013 census surveys, outside the Area of Investigation. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Sarcozona praecox	Sarcozona			r	8	2013	VBA	Occasional in Mallee and Callitris-Casuarina woodlands of the north west, usually on loamier soils (Walsh & Entwistle 1996)	**Unlikely.** No suitable habitat recorded in the Construction Footprint. Was recorded in local area during Ogyris 2013 census surveys.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Sclerolaena decurrens	Green Copperburr			vu	6	2010	VBA	Found growing on low rises within Murray River floodplains Fruits Jan (Walsh & Entwistle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

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Sclerolaena intricata	Poverty Bush			vu	7	2010	VBA	Only recorded from Wallpolla Island and areas immediately north of Lake Wallawalla. Fruits Oct (Walsh & Entwistle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Sclerolaena lanicuspis	Woolly Copperburr			en	3	2013	VBA	Known in Victoria from a 1980 collection from the edge of a dried lagoon of the Murray River near Red Cliffs. Fruits Jul., Oct. (2 records)	**Unlikely.** This species is not cryptic and it is expected in will have been recorded during recent or previous surveys if it was present.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Sclerolaena patenticuspis	Spear-fruit Copperburr			vu	3	2010	VBA	In Victoria confined to the far north west near the Murray River downstream from Robinvale, apparently rare and not collected since 1972 (near mouth of Chalka Creek, Hattah-Kulkyne national Park) (Walsh & Entwisle 1996)	**Unlikely.** This species is not cryptic and it is expected in will have been recorded during recent or previous surveys if it was present.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Sclerolaena ventricosa	Salt Copperburr		L	en	4	2010	VBA	Known in Victoria from a few small populations on treeless, saline, alluvial flats at Neds Corner in the far north-west and in black box-chenopod woodland near Kerang.	**Unlikely.** This species is not cryptic and it is expected would have been recorded during recent or previous surveys if it was present.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Senecio cunninghamii var. *cunninghamii*	Branching Groundsel			r	8	2016	VBA	Occurs on heavy-sometimes winter wet soils as well as dry rocky soils. Common on embankments or escarpments and woodland to open forest to 15 m tall of less flood-prone (riverine) watercourse fringes, principally on levees and higher sections of point-bar deposits (Walsh & Entwisle 1996).	**Possible.** Suitable habitat present in Study Areas. Species was recorded in 2013 and 2015 surveys, but not re-recorded in 2019 surveys, possibly due to extremely dry conditions. **Impact Possible.** Even though not re-located in 2019 surveys, could still appear in Construction Footprint in future if conditions are suitable.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Senecio productus subsp. *productus*	Riverina Groundsel			vu	1	2010	VBA	Rare along the edges of watercourses in clay soils and in chenopod shrubland, often with *Senecio glossanthus*, in areas near the Murray River upstream to near Kerang	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Sida ammophila	Sand Sida			vu	2	2013	VBA	Occurs on red sand and loam soils in the Hattah-Mildura area, mostly in non-eucalypt open shrublands on dunes and roadsides, depleted by grazing and clearing (Walsh and Entwisle 1996).	**Possible.** Suitable habitat was identified during survey, but species not recorded in 2015 or 2019 surveys. Species was recorded in local area during Ogyris 2013 census surveys, outside the Area of Investigation. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Sida intricata	Twiggy Sida			vu	3	2010	VBA	All mainland states. Moderately common in open areas of the far north and north-west, usually on heavier loam and clay loam soils not far from the Murray River.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Solanum karsense	Menindee Nightshade	VU					PMST	Grows in flooded depressions, extending up the Darling R. to Menindee district.	**Highly Unlikely**. NSW species only. Suitable habitat was identified during survey, but no records in Victoria.	**Highly Unlikely.** NSW species only. Suitable habitat could be present within the Inundation Area, but not in known distribution area.
Solanum lacunarium	Lagoon Nightshade			vu	13	2003	VBA	Very rare in Victoria where apparently confined to heavy clay soils of the Murray River floodplain downstream from Mildura.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

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Swainsona murrayana	Slender Darling-pea	VU	L	en			PMST	Rare species, apparently restricted to a few sites in north-central Victoria (mostly between Bendigo and the Murray River) where it grows in grassland on heavy red soils and is now almost confined to roadside remnants (Walsh and Entwisle 1999).	**Highly Unlikely.** No suitable habitat recorded in study sites. Nearest record over 100 km away	**Highly Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated. Nearest record over 100 km away.
Swainsona pyrophila	Yellow Swainson-pea	VU		vu			PMST	Rare in Victoria, known only from the far north west where rare. Grows in Mallee scrub on sandy or loamy soil and usually found only after fire (Walsh and Entwisle 1996).	**Highly Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Highly Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Swainsona reticulata	Kneed Swainson-pea		L	vu	2	2011	VBA	Rare in Victoria, mainly in north west, usually growing on alluvial flats in grassland and grassy woodland. Flowers Aug.-Oct.	**Unlikely.** No suitable habitat recorded in the Construction Footprint.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Tecticornia triandra	Desert Glasswort			r	54	2014	VBA	In Victoria localized in the far north-west (e.g. Rocket Lake west of Nowingi, Merbein area, Lake Culluleraine, Lake Wallawalla environs), occurring in samphire or Mallee communities.	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints. **Impact Highly Likely.** Recorded in abundance in and adjacent to the Construction Footprint. Will be impacted to some degree.	**Possible**. Recorded in the Construction Footprint. Extremely widespread species in the area. **Impact.** Positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Templetonia egena	Round Templetonia			vu	4	2013	VBA	In Victoria confined to the north west. Favours deep sandy soils in Mallee and woodland communities (Walsh and Entwisle 1996).	**Present.** Recorded in 2013 surveys of the area and in the 2015 and 2019 surveys of the Construction Footprints **Impact possible.** Confirmed in buffer area, impact possible.	**Unlikely.** Suitable habitat is unlikely to be present within the floodplain areas proposed to be inundated.
Trianthema clavatum	Red Spinach			en	1	2007	VBA	Apparently restricted to the Murray River floodplain north west of Mildura on light clay.	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys.. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.
Trigonella suavissima	Sweet Fenugreek			r	1	2010	VBA	Apparently confined to the drier north-west of the State where it grows along seasonal watercourses, floodplains and depressions (Walsh & Entwisle 1996).	**Possible.** Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely.** Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Scientific name	Common name	EPBC Act	FFG Act	VICADV	Count	Last Recorded	Source	Description of Habitat	Construction Footprint: Likelihood of Occurrence / Impact	Inundation Area: Likelihood of Occurrence / Impact
Vittadinia pterochaeta	Winged New Holland Daisy			vu	1	1986	VBA	Very rare in Victoria, known by only a few collections in the Quambatook-Leaghur region, near Warracknabeal and Wallpolla Island west of Mildura. Apparently confined to relatively fertile clay-loam soils.	**Possible**. Suitable habitat was identified within the Construction Footprint, but the species was not recorded in 2013, 2015 or 2019 surveys. **Impact Unlikely**. Not recorded in previous surveys of the Construction Footprint, existence of a population within Construction Footprint unlikely.	**Possible.** Could occur in Inundation Area. **Impact:** positive to neutral impact expected as the result of the operation of the project.

Appendix C Likelihood of occurrence / impact - threatened fauna - Construction Footprint

Likelihood of occurrence:

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

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

POSSIBLE – Potentially suitable habitat occurs within Construction Footprints and species' known range encompasses the Construction Footprints. Species recorded historically in the 10-km search area (Study Area), and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the Construction Footprints, but suitable habitat does not occur within Construction Footprints, or occurs within Construction Footprints but with generally low quality and quantity. Species recorded historically in the 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 Study Area.

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

Species that are considered as near threatened or data deficient on the DELWP Advisory Lists only and not also listed as threatened on one of either the FFG Act or EPBC Act threatened species lists, were not considered.

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.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Mammals								
Macrotis lagotis	Bilby	VU			3	1857	VBA	**Highly Unlikely.** Not recorded from area for over 100 years.
Sminthopsis murina	Common Dunnart			vu	1	1999	VBA	**Possible**. Species is known from area. May occur primarily in chenopod woodland areas. **Impact Possible.** Impacts from vegetation removal and habitat loss should be managed through a Fauna Management Plan, however direct impacts/mortality as a result of impacts from vegetation removal are still possible
Pseudomys desertor	Desert Mouse			rx	5	1857	VBA	**Highly Unlikely.** Not recorded from area for over 100 years.
Planigale gilesi	Giles' Planigale		L		11	2013	VBA, Biosis 2013	**Present.** Recorded during 2013 survey. **Impact Possible.** Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.
Myrmecobius fasciatus	Numbat	VU			1	1857	VBA	**Highly Unlikely.** Not recorded from area for over 100 years.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Nyctophilus corbeni	South-eastern Long-eared Bat	VU	L	en	2	1999	VBA	**Possible**. Species is known from area. May occur in dry woodland and shrubland communities. **Impact Possible:** Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix I).
Birds								
Struthidea cinerea	Apostlebird		L		34	2010	VBA	**Possible.** Suitable habitat in area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Botaurus poiciloptilus	Australasian Bittern	EN	L	en	3	2017	VBA, PMST	**Unlikely.** Suitable habitat not present.
Anas rhynchotis	Australasian Shoveler			vu	12	2009	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Gelochelidon macrotarsa	Australian Gull-billed Tern	Mi	L	en	1	1977	VBA	**Unlikely.** Not recorded from area for over 40 years.
Rostratula australis (=benghalensis)	Australian Painted Snipe	EN	L	cr			PMST	**Highly Unlikely.** Never recorded from area and no suitable habitat present.
Porzana pusilla	Baillon's Crake		L	vu	17	2007	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Ninox connivens	Barking Owl		L	en	2	2006	VBA	**Possible.** Suitable habitat in area. **Impact Possible.** Localised impacts possible, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex
Falco subniger	Black Falcon		L	vu	2	1985	VBA	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Manorina melanotis	Black-eared Miner	EN	L	cr			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Oxyura australis	Blue-billed Duck		L	en	9	2006	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Burhinus grallarius	Bush Stone-curlew		L	en	2	2000	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species rare and highly mobile suitable surrounding habitat widespread.
Sterna caspia	Caspian Tern		L		19	2010	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Tringa nebularia	Common Greenshank	Mi		vu	2	1958	VBA	**Unlikely.** Not recorded from area for over 60 years.
Oreoica gutturalis	Crested Bellbird		L		2	2010	VBA	**Unlikely**. No preferred habitat in area.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Calidris ferruginea	Curlew Sandpiper	CR, Mi	L	en			PMST	**Highly Unlikely.** Never recorded from area and no suitable habitat present.
Numenius madagascariensis	Eastern Curlew	CR, Mi	L	vu			PMST	**Highly Unlikely.** Never recorded from area and no suitable habitat present.
Ardea modesta (=alba)	Eastern Great Egret		L	vu	44	2019	VBA, Biosis 2013, GHD 2016, R8 2019 (This Survey, see Appendix G)	**Present.** Recorded during 2013, 2016 and this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Neophema elegans	Elegant Parrot			vu	1	1999	VBA	**Unlikely.** Suitable habitat not present.
Stictonetta naevosa	Freckled Duck		L	en	1	2006	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Falco hypoleucos	Grey Falcon		L	en	1	2000	VBA	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Coracina maxima	Ground Cuckoo-shrike		L	vu	1	2007	VBA	**Possible**. Species is known from area, though rare. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Aythya australis	Hardhead			vu	20	2019	VBA, R8 2019 (This Survey, see Appendix G)	**Present.** Recorded during this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Melanodryas cucullata	Hooded Robin		L		6	2019	VBA, Biosis 2013, GHD 2016, R8 2019 (This Survey, see Appendix G)	**Present.** Recorded during 2013, 2016 and this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Ardea intermedia	Intermediate Egret		L	en	8	2019	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Egretta garzetta	Little Egret		L	en	1	1977	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Lophochroa leadbeateri	Major Mitchell's Cockatoo		L	vu	16	2001	VBA	**Possible.** Suitable habitat, likely an occasional visitor to the area. **Impact Possible.** Species wide ranging and suitable surrounding habitat widespread. However, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.
Leipoa ocellata	Malleefowl	VU	L	en			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Tringa stagnatilis	Marsh Sandpiper	Mi		vu	1	2009	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Biziura lobata	Musk Duck			vu	1	1981	VBA	**Unlikely.** Potential habitat in area but species not recorded for almost 40 years.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Pezoporus occidentalis	Night Parrot	EN, Mi		rx			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Grantiella picta	Painted Honeyeater	VU	L	vu			PMST	**Possible.** Species not recorded previously but has potential to utilise woodland habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.
Pedionomus torquatus	Plains-wanderer	CR	L	cr			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Turnix pyrrhothorax	Red-chested Button-quail		L	vu	1	2000	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Pachycephala rufogularis	Red-lored Whistler	VU	L	en	1	1881	VBA	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Pyrrholaemus brunneus	Redthroat		L	en	1	1999	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Polytelis anthopeplus monarchoides	Regent Parrot	VU	L	vu	3	1998	VBA, PMST	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Chlamydera maculata	Spotted Bowerbird		L	cr	1	1877	VBA	**Highly Unlikely.** Not recorded from area for over 100 years.
Lathamus discolor	Swift Parrot	CR	L	en	1	1958	VBA	**Unlikely.** Not recorded from area for over 60 years.
Haliaeetus leucogaster	White-bellied Sea-Eagle		L	vu	22	2013	VBA, Biosis 2013	**Present.** Recorded during 2013 survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Climacteris affinis	White-browed Treecreeper		L	vu	3	1999	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread.
Reptiles								
Rhynchoedura ornata	Beaked Gecko		L	cr	6	2020	VBA, This Survey (see Appendix G)	**Present.** Recorded in this survey. Species has potential to utilise habitats within Construction Footprint. **Impact Possible.** Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.
Morelia spilota metcalfei	Carpet Python		L	en	7	2005	VBA	**Possible.** Suitable habitat in area. **Impact Possible.** Localised impacts possible, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Denisonia devisi	De Vis' Banded Snake			cr	5	2020	VBA, Biosis 2013, GHD 2016, This Survey (see Appendix G)	**Present.** Recorded in 2013, 2016 and this survey. **Impact Possible**. Potential impacts could occur through vegetation removal, including direct impacts/mortality during clearing and habitat loss. These would be managed through a Flora and Fauna Management Plan. The construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.
Pygopus schraderi	Eastern Hooded Scaly-foot		L	cr	4	2010	VBA	**Possible**. Species is known from area. May occur in red clay and clay-loam soil areas with chenopod shrubland and native grassland vegetation. **Impact Possible.** Localised impacts possible as a result of vegetation removal and potential habitat loss.
Varanus varius	Lace Monitor			en	8	2016	VBA, GHD 2016	**Present**. Recorded in 2016 surveys. **Impact Possible.** Localised impacts possible, removal of hollow-bearing trees would contribute to incremental loss of habitat. Vegetation removal, including hollow bearing trees would be minimised and managed through a Flora and Fauna Management Plan. Overall the construction footprint is comparatively small in the context of the 9,000 hectare Wallpolla Island floodplain complex.
Furina diadema	Red-naped Snake		L	vu	6	2013	VBA, Biosis 2013	**Present**. Recorded in 2013 surveys. **Impact Possible.** Impacts from vegetation removal and habitat loss should be managed through a Fauna Management Plan, however direct impacts/mortality as a result of vegetation removal are still possible

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Morethia adelaidensis	Samphire Skink		L	en	1	2000	VBA	**Possible**. Species is known from area. May occur in chenopod-dominated shrublands, often associated with woodlands. **Impact Possible.** Localised impacts possible as a result of vegetation removal and potential habitat loss.
Chelodina expansa	Broad-shelled Turtle		L	en	1	1994	VBA	**Possible.** Species is known from the area. May occur in waterways and waterholes especially those that are permanent and have aquatic vegetation, including the Murray River and Wallpolla Creek. **Impact Possible.** Localised impacts possible, associated with coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from the construction footprint. A construction specific aquatic fauna management plan would be developed for all works around waterways.
Emydura macquarii	Murray River Turtle			vu	9	2015	VBA, Biosis 2013	**Possible.** Species is known from the area. Preference for large rivers and permanent lakes of the Murray-Darling Basin including the Murray River. **Impact Possible.** Localised impacts possible, consideration of coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints must consider aquatic fauna. A construction specific aquatic fauna management plan should be developed for all works around waterways.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Frog								
Litoria raniformis	Growling Grass Frog	VU	L	en	9	2004	VBA, PMST, This Survey (see Appendix G)	**Present.** Recorded close to Construction Footprint Site 9. Previous records within Wallpolla Island within the VBA it is known to have been recorded on Wallpolla Island by Biosis in 2013 (Seran BL&A 2018). **Impact Possible.** Localised impacts possible as a result of habitat clearance, including direct impacts/mortality. Impacts from vegetation removal and habitat loss would be minimised and managed through a Fauna Management Plan. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix I).
Fish								
Galaxias rostratus	Flat-headed Galaxias	CR		vu			PMST	**Unlikely.** No previous records. Suitable habitat of still or gently flowing water on the margins of lakes, billabongs and streams not present. Also unlikely in the Murray River. Numerous surveys of riverine habitat completed as part of the Sustainable Rivers Audit between 2004 and 2010 failed to collect a single specimen (TSSC 2015). Likewise, fish surveys of riverine and floodplain wetland habitat completed between the Murrumbidgee River confluence and the South Australian border also failed to collect the species (Gilligan 2005).
Macquaria australasica	Macquarie Perch	EN	L	en			PMST	**Highly Unlikely.** No previous records. Suitable habitat of clear water, deep, rocky holes and cover not present.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Maccullochella peelii peelii	Murray Cod	VU	L	vu	6	2017	VBA, PMST	**Possible.** Species has not been recorded during TLM monitoring of Wallpolla Creek between 2008 and 2018 but has been recorded from Dedmans Creek during this period. Favours permanent flowing river reaches and creeks with hydraulic complexity/diversity. Habitat present in the Murray River, Dedmans Creek and potentially Wallpolla Creek. **Impact Possible** Wallpolla Creek is unlikely to support a significant population of Murray Cod under current conditions. The use of coffer dams to allow for construction of Regulator MS2 has the potential to restrict fish passage and negatively impact water quality in Wallpolla Creek which may impact any fish present. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Adoption of these measures would minimise the likelihood of impact to Murray Cod, if present during the construction period. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints. A construction specific aquatic fauna management plan would be developed for all works around waterways. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix I).

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Craterocephalus fluviatilis	Murray Hardyhead	EN	L	cr			PMST	**Highly Unlikely.** Suitable habitat not present - mostly recorded in isolated moderately saline lakes (Backhouse et al. 2008). Stoessel et al. (2020) state that they are predominantly found in permanent brackish wetlands, likely displaced to these locations due to the negative impacts of non-native species in wetlands with fresher water and the Murray Hardyhead's ability to tolerate high salinities. These conditions are not likely to be found in Murray River or existing aquatic habitat on Wallpolla island.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Bidyanus bidyanus	Silver Perch	CR	L	vu	7	2017	VBA, PMST	**Present.** Species has been consistently recorded in low numbers during TLM monitoring of Wallpolla Creek and Dedmans Creek between 2008 and 2018. Inhabits rivers, lakes and reservoirs, preferring areas of rapid flow. Habitat present in the Murray River, Dedmans and Wallpolla Creeks. **Impact Possible.** The use of coffer dams to allow for construction of Regulator MS2 has the potential to restrict fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Although Wallpolla Creek is not likely to provide optimal habitat for the species, any fish present would be unable to pass through Wallpolla Creek when the coffer dams are in place during stage 2 of the construction phase. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas from construction footprints. A construction specific aquatic fauna management plan would be developed for all works around waterways. Potential impacts have been assessed against the EPBC Act Significant Impact criteria and are not considered significant (see Appendix H).

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Melanotaenia fluviatilis	Murray-Darling Rainbowfish		L	vu	17	2017	VBA	**Present.** Species has been regularly recorded during TLM monitoring between 2015 and 2018. Prefers streams, backwaters of larger rivers, drainage ditches, overflow ponds and reservoirs, especially near grassy banks. Habitat present in the Murray River, Dedmans Creek and Wallpolla Creek. **Impact Possible.** The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction will allow for fish passage and flows to pass. Stage 2 of the construction will require closure of the waterway (and hence no fish passage) for up to three months. Section 11.3 will minimise the likelihood of impact to Murray-Darling Rainbowfish during the construction period. Localised impacts are also possible. Consideration of dewatering works, and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints must consider aquatic fauna. For mitigation measures see Section 11.3.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Craterocephalus stercusmuscarum fulvus	Unspecked Hardyhead		L		28	2017	VBA	**Present**. Species has been regularly recorded during TLM monitoring between 2008 and 2018. Prefers margins of large, slow-flowing, lowland rivers, and in lakes, backwaters and billabongs. Habitat present in the Murray River, Dedmans Creek and Wallpolla Creek. **Impact Possible**. The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas. A construction specific aquatic fauna management plan would be developed for all works around waterways. For mitigation measures see Section 11.3.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Tandanus tandanus	Freshwater Catfish		L	en	4	2017	VBA	**Present**. Low numbers of this species have been recorded in Dedmans and Wallpolla Creeks. Prefers slow-moving streams, lakes and ponds with fringing vegetation. Habitat present in the Murray River, Wallpolla Creek and Dedmans Creek. **Impact Possible.** The use of coffer dams to allow for construction of Regulator MS2 has the potential to limit fish passage and negatively impact water quality in Wallpolla Creek. Stage 1 of construction would allow for fish passage and flows to pass. Stage 2 of the construction would require closure of the waterway (and hence no fish passage) for up to three months. Measures to reduce the likelihood of impacts to this species include avoiding fish passage barriers during breading season, monitoring of water quality and depths, and flow-through pumping. Localised impacts are also possible associated with dewatering works, and any potential for sediment/ contaminant run-off into wet areas. A construction specific aquatic fauna management plan would be developed for all works around waterways. For mitigation measures see Section 11.3.

Appendix D Likelihood of occurrence / impact - threatened fauna – Inundation Area

Likelihood of occurrence:

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

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

POSSIBLE – Potentially suitable habitat occurs within Inundation Area and species' known range encompasses the Inundation Area. Species recorded historically in the 10-km search area (Study Area), and generally within the last 30 years.

UNLIKELY – Species' known range encompasses the Inundation Area, but suitable habitat does not occur within the Inundation Area, or occurs within the Inundation Area but with generally low quality and quantity. Species recorded historically in the 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 Study Area.

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

Species that are considered as near threatened or data deficient on the DELWP Advisory Lists only and not also listed as threatened on one of either the FFG Act or EPBC Act threatened species lists, were not considered.

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 footprint

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Mammals								
Macrotis lagotis	Bilby	VU			3	1857	VBA	Highly **Unlikely.** Not recorded from area for over 100 years.
Sminthopsis murina	Common Dunnart			vu	1	1999	VBA	**Possible**. Species is known from area. May occur primarily in chenopod woodland areas. **Impact Unlikely.** Species likely to benefit from improved habitat condition following environmental watering.
Pseudomys desertor	Desert Mouse			rx	5	1857	VBA	**Highly Unlikely.** Not recorded from area for over 100 years.
Planigale gilesi	Giles' Planigale		L		11	2013	VBA, Biosis 2013	**Present.** Recorded during 2013 survey. **Impact Unlikely.** Species likely to benefit from improved habitat condition following environmental watering.
Myrmecobius fasciatus	Numbat	VU			1	1857	VBA	**Highly Unlikely.** Not recorded from area for over 100 years.
Nyctophilus corbeni	South-eastern Long-eared Bat	VU	L	en	2	1999	VBA	**Possible**. Species is known from area. May occur in dry woodland and shrubland communities. **Impact Unlikely.** Species mobile and suitable surrounding habitat widespread. Species may benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Birds								
Struthidea cinerea	Apostlebird		L		34	2010	VBA	**Possible.** Suitable habitat in area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Botaurus poiciloptilus	Australasian Bittern	EN	L	en	3	2017	VBA, PMST	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Anas rhynchotis	Australasian Shoveler			vu	12	2009	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Gelochelidon macrotarsa	Australian Gull-billed Tern	Mi	L	en	1	1977	VBA	**Unlikely.** Not recorded from area for over 40 years.
Rostratula australis (=benghalensis)	Australian Painted Snipe	EN	L	cr			PMST	**Highly Unlikely.** No previous records. Suitable habitat not present within inundation extent currently, but species likely to benefit from environmental water when present.
Porzana pusilla	Baillon's Crake		L	vu	17	2007	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Ninox connivens	Barking Owl		L	en	2	2006	VBA	**Possible.** Suitable habitat in area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Falco subniger	Black Falcon		L	vu	2	1985	VBA	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Manorina melanotis	Black-eared Miner	EN	L	cr			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Oxyura australis	Blue-billed Duck		L	en	9	2006	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Burhinus grallarius	Bush Stone-curlew		L	en	2	2000	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species rare and highly mobile suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Sterna caspia	Caspian Tern	Mi	L		19	2010	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Tringa nebularia	Common Greenshank	Mi		vu	2	1958	VBA	**Unlikely.** Not recorded from area for over 60 years.
Oreoica gutturalis	Crested Bellbird		L		2	2010	VBA	**Unlikely**. No preferred habitat in area.
Calidris ferruginea	Curlew Sandpiper	CR, Mi	L	en			PMST	**Highly Unlikely.** Never recorded from area and no suitable habitat present.
Numenius madagascariensis	Eastern Curlew	CR, Mi	L	vu			PMST	**Highly Unlikely.** Never recorded from area and no suitable habitat present.
Ardea modesta (=alba)	Eastern Great Egret		L	vu	44	2019	VBA, Biosis 2013, GHD 2016 R8 2019 (this study) (see Appendix G)	**Present.** Recorded during 2013, 2016 and this survey. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Neophema elegans	Elegant Parrot			vu	1	1999	VBA	**Unlikely.** Suitable habitat not present.
Stictonetta naevosa	Freckled Duck		L	en	1	2006	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Falco hypoleucos	Grey Falcon		L	en	1	2000	VBA	**Possible**. Species is known from area, though rare and highly mobile. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Coracina maxima	Ground Cuckoo-shrike		L	vu	1	2007	VBA	**Possible**. Species is known from area, though rare. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Aythya australis	Hardhead			vu	20	2019	VBA, R8 2019 (This Survey see Appendix G)	**Present.** Recorded during this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Melanodryas cucullata	Hooded Robin		L		6	2019	VBA, Biosis 2013, GHD 2016 R8 2019 (this study) (see Appendix G)	**Present.** Recorded during 2013, 2016 and this survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Ardea intermedia	Intermediate Egret		L	en	8	2019	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Egretta garzetta	Little Egret		L	en	1	1977	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Lophochroa leadbeateri	Major Mitchell's Cockatoo		L	vu	16	2001	VBA	**Possible.** Suitable habitat, likely an occasional visitor to the area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Leipoa ocellata	Malleefowl	VU	L	en			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Tringa stagnatilis	Marsh Sandpiper			vu	1	2009	VBA	**Possible**. Species is known from area. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Biziura lobata	Musk Duck			vu	1	1981	VBA	**Unlikely.** Potential habitat in area but species not recorded for almost 40 years. Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.
Pezoporus occidentalis	Night Parrot	EN, Mi		rx			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Grantiella picta	Painted Honeyeater	VU	L	vu			PMST	**Possible.** Species not recorded previously but has potential to utilise woodland habitats for foraging. **Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread.
Pedionomus torquatus	Plains-wanderer	CR	L	cr			PMST	**Highly Unlikely**. Never recorded from area and no suitable habitat.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Turnix pyrrhothorax	Red-chested Button-quail		L	vu	1	2000	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Pachycephala rufogularis	Red-lored Whistler	VU	L	en	1	1881	VBA	**Highly Unlikely**. Never recorded from area and no suitable habitat.
Pyrrholaemus brunneus	Redthroat		L	en	1	1999	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Polytelis anthopeplus	Regent Parrot	VU	L	vu	3	1998	VBA, PMST	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Chlamydera maculata	Spotted Bowerbird		L	cr	1	1877	VBA	**Highly Unlikely.** Not recorded from area for over 100 years.
Lathamus discolor	Swift Parrot	CR	L	en	1	1958	VBA	**Unlikely.** Not recorded from area for over 60 years.
Haliaeetus leucogaster	White-bellied Sea-Eagle		L	vu	22	2013	VBA, Biosis 2013	**Present.** Recorded during 2013 survey. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Climacteris affinis	White-browed Treecreeper		L	vu	3	1999	VBA	**Possible**. Species is known from area though limited potential habitat. **Impact Unlikely.** Species wide ranging and suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Reptiles								
Rhynchoedura ornata	Beaked Gecko		L	cr	6	2020	VBA, R8 2020 (This Survey see Appendix G)	**Present.** Recorded in this survey. Species likely to utilise habitats within Inundation Area. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Morelia spilota metcalfei	Carpet Python		L	en	7	2005	VBA	**Possible.** Suitable habitat in area. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Denisonia devisi	De Vis' Banded Snake			cr	5	2019	VBA, Biosis 2013, GHD 2016, R8 2019 (This Survey see Appendix G)	**Present.** Recorded in 2013, 2016 and this survey. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Pygopus schraderi	Eastern Hooded Scaly-foot		L	cr	4	2010	VBA	**Possible**. Species is known from area. May occur in red clay and clay-loam soil areas with chenopod shrubland and native grassland vegetation. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Varanus varius	Lace Monitor			en	8	2016	VBA, GHD 2016	**Present**. Recorded in 2016 surveys. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Furina diadema	Red-naped Snake		L	vu	6	2013	VBA, Biosis 2013	**Present**. Recorded in 2013 surveys. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Morethia adelaidensis	Samphire Skink		L	en	1	2000	VBA	**Possible**. Species is known from area. May occur in chenopod-dominated shrublands, often associated with woodlands. **Impact Unlikely.** Suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water.
Chelodina expansa	Broad-shelled Turtle		L	en	1	1994	VBA	**Possible.** Species is known from the area. May occur in waterways and waterholes especially those that are permanent and have aquatic vegetation, including the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Possible.** Species has the potential to benefit directly from enhanced habitat availability when environmental water is present and flowing habitat and connectivity is improved through the Wallpolla Creek, and indirectly from improved habitat condition following environmental watering. The remains some potential that adverse impacts could occur as a result of improperly planned designs that don't take into account turtle momement, dispersal and habitat use. This will need to be considered during the detailed design phase. An aquatic management plan would also address turtle requirements.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Emydura macquarii	Murray River Turtle			vu	9	2015	VBA, Biosis 2013	**Possible.** Species is known from the area. Preference for large rivers and permanent lakes of the Murray-Darling Basin including the Murray River. Suitable habitat expected to increase during environmental watering. **Impact Possible.** Localised impacts possible, consideration of any in-stream works such as coffer dam construction, dewatering works, and any potential for sediment/ contaminant run-off into wet areas from Construction Footprints must consider aquatic fauna. A construction specific aquatic fauna management plan should be developed for all works around waterways. Species likely to benefit from improved habitat condition following environmental water.
Frog								
Litoria raniformis	Growling Grass Frog	VU	L	en	9	2019	VBA, PMST, R8 2019 (This Survey See Appendix G)	**Present.** Recorded close to Construction Footprint Site 9. Previous records within Wallpolla Island within the VBA it is known to have been recorded on Wallpolla Island by Biosis in 2013 (Seran BL&A 2018). **Impact Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Fish								
Galaxias rostratus	Flat-headed Galaxias	CR		vu			PMST	**Unlikely.** No previous records. Suitable habitat of still or gently flowing water on the margins of lakes, billabongs will be created during inundation events. However due to the rarity of the species in the region it is unlikely that the Murray River would support a source population that would lead to the natural development of a population on the Wallpolla floodplain. Numerous surveys of riverine habitat completed as part of the Sustainable Rivers Audit between 2004 and 2010 failed to collect a single specimen (TSSC, 2015). Likewise, fish surveys of riverine and floodplain wetland habitat completed between the Murrumbidgee River confluence and the South Australian border also failed to collect the species (Gilligan, 2005).
Macquaria australasica	Macquarie Perch	EN	L	en			PMST	**Highly Unlikely.** No previous records. Predominantly an upland species. Suitable habitat of clear water, deep, rocky holes and cover not present.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Maccullochella peelii peelii	Murray Cod	VU	L	vu	6	2017	VBA, PMST	**Possible.** Species is known from area and suitable habitat present. Favours permanent flowing river reaches and creeks with hydraulic complexity/diversity. Habitat present in the Murray River, Dedmans Creek and potentially Wallpolla Creek. **Impact Possible.** Increased flows in Wallpolla Island creeks likely to benefit species during smaller inundation scenarios. Larger inundation scenarios are likely to reduce flows (thus reducing their preferred habitat) and allow for proliferation of carp in floodplain habitat, which may impact existing populations. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).
Craterocephalus fluviatilis	Murray Hardyhead	EN	L	cr			PMST	**Highly Unlikely.** No previous records. Suitable habitat not present - mostly recorded in isolated moderately saline lakes (Backhouse et al. 2008). Stoessel *et al.* (2020) state that they are predominantly found in permanent brackish wetlands, likely displaced to these locations due to the negative impacts of non-native species in wetlands with fresher water and the Murray Hardyhead's ability to tolerate high salinities. These conditions are not likely to be found in the areas that will be inundated by the project.

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Bidyanus bidyanus	Silver Perch	CR	L	vu	7	2017	VBA, PMST	**Present.** Species is known from area and suitable habitat present. Prefers rivers, lakes and reservoirs, preferring areas of rapid flow. Habitat present in the Murray River, Dedmans Creek and Wallpolla Creek. **Impact Possible.** Increased flows in Wallpolla Island creeks likely to benefit species during smaller inundation scenarios. Larger inundation scenarios are likely to reduce flows (thus reducing their preferred habitat) and allow for proliferation of carp in floodplain habitat, which may impact existing population. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).
Melanotaenia fluviatilis	Murray-Darling Rainbowfish		L	vu	17	2017	VBA	**Present.** Species is known from area and suitable habitat present. Prefers Streams, backwaters of larger rivers, drainage ditches, overflow ponds and reservoirs, especially near grassy banks. Possible habitat present in the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Unlikely.** Suitable habitat expected to increase during environmental watering. An increased risk of carp during inundation events (which may negatively impact the species) will remain during inundation events. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).

Scientific name	Common name	EPBC Act	FFG Act	DELWP Advisory	Number of Records	Most Recent Record	Source	Likelihood of Occurrence and Impact (only assessed if species present or possible)
Craterocephalus stercusmuscarum fulvus	Unspecked Hardyhead		L		28	2017	VBA	**Possible**. Species is known from area and suitable habitat present. Prefers margins of large, slow-flowing, lowland rivers, and in lakes, backwaters and billabongs. Possible habitat present in the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Unlikely.** Suitable habitat expected to increase during environmental watering. An increased risk of carp during inundation events (which may negatively impact the species) will remain during inundation events. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).
Tandanus tandanus	Freshwater Catfish		L	en	4	2017	VBA	**Possible**. Species is known from area and suitable habitat present. Prefers slow-moving streams, lakes and ponds with fringing vegetation. Possible habitat present in the Murray River and Wallpolla Creek. Suitable habitat expected to increase during environmental watering. **Impact Unlikely.** Suitable habitat expected to increase during environmental watering. An increased risk of carp during inundation events (which may negatively impact the species) will remain during inundation events. Mitigation measures to reduce carp should be implemented during the operation phase of the project to reduce this risk (Section 11.4).

Appendix E Flora recorded during previous surveys

Key to table:

en Endangered (Advisory List of Rare or Threatened Plants in Victoria – 2014 (DEPI 2014)

vu Vulnerable (Advisory List of Rare or Threatened Plants in Victoria – 2014 (DEPI 2014)

r Critically endangered (Advisory List of Rare or Threatened Plants in Victoria – 2014 (DEPI 2014)

k Poorly known (Advisory List of Rare or Threatened Plants in Victoria – 2014 (DEPI 2014)

L Listed as threatened (FFG Act)

P Protected (FFG Act)

R Restricted (CaLP Act)

C Regionally Controlled (CaLP Act)

Y Species identified during the field survey

WONS Weed of National Significance

Scientific name	Common name	Status	Ogyris 2013	GHD 2016	GHD 2019
Native					
Acacia oswaldii	Umbrella wattle	L, P, vu		Y	Y
Acacia stenophylla	Eumong	P		Y	
Actinobole uliginosum	Flannel Cudweed	P		Y	
Alternanthera denticulata s.l.	Lesser Joyweed		Y	Y	
Ammannia multiflora	Jerry-jerry	vu	Y		
Amyema miquelii	Box Mistletoe		Y		
Amyema miraculosa subsp. *boormanii*	Fleshy Mistletoe		Y		
Amyema sp.	Mistletoe			Y	
Asperula gemella	Twin-leaf Bedstraw	r		Y	
Atriplex eardleyae	Small Saltbush			Y	
Atriplex leptocarpa	Slender-fruit Saltbush			Y	
Atriplex lindleyi	Flat-top Saltbush			Y	
Atriplex lindleyi subsp. *inflata*	Corky Saltbush		Y		
Atriplex lindleyi subsp. *conduplicata*	Baldoo	r			Y
Atriplex nummularia	Old-man Saltbush			Y	
Atriplex nummularia subsp. *omissa*	Dwarf Old-man Saltbush	r			Y
Atriplex pseudocampanulata	Mealy Saltbush	r		Y	
Atriplex pumilio	Mat Saltbush		Y		
Atriplex rhagodioides	Silver Saltbush	L, P, vu		Y	
Atriplex semibaccata	Berry Saltbush			Y	
Atriplex sp.	Saltbush		Y	Y	
Atriplex suberecta	Sprawling Saltbush		Y		
Atriplex vesicaria	Bladder Saltbush			Y	
Austrobryonia micrantha	Mallee Cucumber	r	Y		
Austrostipa elegantissima	Feather Spear-grass			Y	

Scientific name	Common name	Status	Ogyris 2013	GHD 2016	GHD 2019
Austrostipa nitida	Balcarra Spear-Grass		Y		
Austrostipa scabra subsp. *falcata*	Rough Spear-grass			Y	
Austrostipa sp.	Spear Grass			Y	
Azolla rubra	Pacific Azolla		Y		
Brachyscome ciliaris	Variable Daisy	P		Y	
Brachyscome dentata	Lobe-seed Daisy	P	Y		
Brachyscome lineariloba	Hard-head Daisy	P		Y	
Bulbine semibarbata	Leek Lily		Y		
Calandrinia eremaea	Small Purslane		Y		
Callitris gracilis	Slender Cypress-pine		Y		
Calocephalus sonderi	Pale Beauty Heads	P	Y	Y	
Calotis cuneifolia	Blue Burr-daisy	P, r	Y	Y	Y
Calotis hispidula	Hairy Burr-daisy	P	Y	Y	
Calotis scapigera	Tufted Burr-daisy	P	Y		
Calotis sp.	Burr Daisy	P		Y	
Centipeda cunninghamii	Common Sneezeweed	P	Y	Y	
Centipeda minima s.l.	Spreading Sneezeweed	P		Y	
Centipeda minima subsp. *minima* s.s.	Spreading Sneezeweed	P	Y		
Chenopodium curvispicatum	Cottony Saltbush			Y	
Chenopodium nitrariaceum	Nitre Goosefoot		Y	Y	
Chthonocephalus pseudevax	Groundheads	P	Y		
Convolvulus sp.	Bindweed			Y	
Crassula colorata	Dense Crassula		Y	Y	
Crassula sieberiana s.l.	Sieber Crassula		Y	Y	
Cressa australis	Rosinweed		Y		
Crinum flaccidum	Darling Lily	L, P, vu	Y	Y	Y
Cynodon dactylon	Couch			Y	
Cynodon dactylon var. *pulchellus*	Native Couch	k	Y		
Cyperus difformis	Variable Flat-sedge		Y		
Cyperus gymnocaulos	Spiny Sedge		Y	Y	
Cyperus pygmaeus	Dwarf Flat-sedge	vu	Y		
Cyperus sp.	Flat Sedge			Y	
Daucus glochidiatus	Australian Carrot		Y	Y	
Dianella revoluta s.l.	Black-anther Flax-lily			Y	
Dianella porracea	Leek Flax-lily	vu			Y
Diplachne fusca subsp. *fusca*	Brown Beetle-grass	r	Y		
Disphyma crassifolium subsp. *clavellatum*	Rounded Noon-flower		Y	Y	

Scientific name	Common name	Status	Ogyris 2013	GHD 2016	GHD 2019
Dissocarpus biflorus var. *biflorus*	Twin-flower Saltbush	r		Y	
Dodonaea viscosa subsp. *angustissima*	Slender Hop-bush		Y	Y	
Duma florulenta	Tangled Lignum		Y	Y	
Duma horrida subsp. *horrida*	Spiny Lignum	r	Y	Y	Y
Dysphania cristata	Crested Goosefoot		Y	Y	
Dysphania glomulifera subsp. *glomulifera*	Globular Pigweed		Y		
Dysphania melanocarpa	Black Crumbweed			Y	
Eclipta platyglossa subsp. *platyglossa*	Yellow Twin-heads	P	Y		
Einadia nutans	Nodding Saltbush		Y	Y	
Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush		Y	Y	
Enneapogon avenaceus	Common Bottle-washers		Y		
Eragrostis australasica	Cane Grass	vu	Y	Y	Y
Eragrostis dielsii	Mallee Love-grass		Y	Y	
Eragrostis setifolia	Bristly Love-Grass	vu		Y	
Eragrostis sp.	Love Grass			Y	
Eremophila bignoniiflora	Bignonia Emu-bush	L, P, vu		Y	
Eremophila divaricata subsp. *divaricata*	Spreading Emu-bush	P, r	Y	Y	Y
Eremophila maculata subsp. *maculata*	Spotted Emu-bush	L, P, r	Y	Y	Y
Eremophila sp.	Emu Bush	P		Y	
Erodium crinitum	Blue Heron's-bill		Y		
Eucalyptus camaldulensis	River Red-gum		Y	Y	
Eucalyptus largiflorens	Black Box		Y	Y	
Euchiton sphaericus	Annual Cudweed	P	Y	Y	
Euphorbia dallachyana	Flat Spurge		Y	Y	
Euphorbia sp.	Spurge			Y	
Exocarpos aphyllus	Leafless Ballart			Y	
Frankenia pauciflora var. *gunnii*	Southern Sea-heath			Y	
Frankenia serpyllifolia	Bristly Sea-Heath	r		Y	
Glinus lotoides	Hairy Carpet-weed		Y		
Glycyrrhiza acanthocarpa	Southern Liquorice		Y	Y	
Goodenia glauca	Pale Goodenia		Y		
Goodenia pinnatifida	Cut-leaf Goodenia		Y		
Haloragis aspera	Rough Raspwort		Y		

Scientific name	Common name	Status	Ogyris 2013	GHD 2016	GHD 2019
Heliotropium curassavicum	Smooth Heliotrope		Y		
Isoetopsis graminifolia	Grass Cushion	P		Y	
Juncus sp.	Rush			Y	
Juncus usitatus	Billabong Rush		Y		
Lachnagrostis filiformis s.l.	Common Blown-grass			Y	
Lachnagrostis filiformis s.s.	Common Blown-grass		Y		
Laphangium luteoalbum	Jersey Cudweed		Y		
Lepidium fasciculatum	Bundled Peppercress	k	Y		
Lepidium papillosum	Warty Peppercress	k	Y	Y	
Limosella australis	Austral Mudwort		Y		
Ludwigia peploides subsp. *montevidensis*	Clove-strip		Y	Y	
Maireana aphylla	Leafless Bluebush	k		Y	
Maireana appressa	Grey Bluebush		Y	Y	
Maireana brevifolia	Short-leaf Bluebush			Y	
Maireana decalvans s.s.	Black Cotton-bush		Y		
Maireana pentagona	Hairy Bluebush		Y		
Maireana pentatropis	Erect Bluebush		Y	Y	
Maireana pyramidata	Sago Bush		Y	Y	
Maireana turbinata	Satiny Bluebush		Y	Y	
Malacocera tricornis	Goat Head	r	Y	Y	Y
Marsdenia australis	Doubah	vu		Y	
Marsilea drummondii	Common Nardoo		Y	Y	
Melaleuca lanceolata	Moonah		Y	Y	
Mentha australis	River Mint		Y		
Minuria cunninghamii	Bush Minuria	P, r		Y	
Minuria integerrima	Smooth Minuria	P, r	Y	Y	
Myoporum parvifolium	Creeping Myoporum		Y	Y	
Myosurus australis	Mousetail		Y	Y	
Myosurus sp.	Mouse-tail			Y	
Myriocephalus rhizocephalus	Woolly-heads	P	Y		
Neobassia proceriflora	Soda Bush	en	Y		
Nicotiana goodspeedii	Small-flower Tobacco	r		Y	
Nitraria billardierei	Nitre-bush			Y	
Olearia pimeleoides	Pimelea Daisy-bush	P	Y	Y	
Osteocarpum acropterum var. *deminutum*	Babbagia		Y	Y	
Oxalis perennans	Grassland Wood-sorrel		Y	Y	
Paspalidium jubiflorum	Warrego Summer-grass		Y	Y	
Persicaria lapathifolia	Pale Knotweed		Y		
Phragmites australis	Common Reed		Y	Y	

Scientific name	Common name	Status	Ogyris 2013	GHD 2016	GHD 2019
Picris squarrosa	Squat Picris	P, r	Y		
Pimelea microcephala subsp. *microcephala*	Mallee Rice-flower		Y	Y	
Pittosporum angustifolium	Weeping Pittosporum		Y	Y	
Plantago cunninghamii	Clay Plantain		Y		
Plantago turrifera	Crowned Plantain		Y	Y	
Poa fordeana	Forde Poa		Y		
Podolepis muelleri	Small Podolepis	L, P, en		Y	
Pogonolepis muelleriana	Stiff Cup-flower	P	Y	Y	
Polycalymma stuartii	Poached-eggs Daisy	P	Y		
Polygonum plebeium	Small Knotweed		Y		
Pseudoraphis spinescens	Spiny Mud-grass		Y	Y	
Pycnosorus pleiocephalus	Soft Billy-buttons	P	Y		
Rhagodia spinescens	Hedge Saltbush		Y	Y	
Rhodanthe corymbiflora	Paper Sunray	P		Y	
Rhodanthe pygmaea	Pygmy Sunray	P		Y	
Rhodanthe stuartiana	Clay Sunray	P	Y	Y	
Roepera angustifolia	Scrambling Twin-leaf	r		Y	
Roepera apiculata	Pointed Twin-leaf		Y	Y	
Roepera glauca	Pale Twin-leaf		Y		
Roepera iodocarpa	Violet Twin-leaf		Y	Y	
Roepera similis	White Twin-leaf	r	Y		
Roepera sp.	Twin-leaf			Y	
Rorippa eustylis	Dwarf Bitter-cress	r	Y		
Rumex brownii	Slender Dock		Y		
Rumex tenax	Narrow-leaf Dock		Y	Y	
Rytidosperma caespitosum	Common Wallaby-grass		Y	Y	
Rytidosperma sp.	Wallaby Grass			Y	
Salsola tragus subsp. *tragus*	Prickly Saltwort		Y	Y	
Sarcozona praecox	Sarcozona	r	Y		
Schenkia australis	Spiked Centaury		Y		
Scleroblitum atriplicinum	Starry Goosefoot		Y		
Sclerochlamys brachyptera	Short-wing Saltbush		Y	Y	
Sclerolaena diacantha	Grey Copperburr		Y	Y	
Sclerolaena lanicuspis	Woolly Copperburr	en	Y		
Sclerolaena muricata	Black Roly-poly		Y	Y	
Sclerolaena obliquicuspis	Limestone Copperburr		Y	Y	
Sclerolaena tricuspis	Streaked Copperburr		Y	Y	

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Senecio cunninghamii var. *cunninghamii*	Branching Groundsel	P, r	Y	Y	
Senecio glossanthus	Slender Groundsel			Y	
Senecio glossanthus s.s.	Slender Groundsel		Y		
Senecio quadridentatus	Cotton Fireweed	P	Y	Y	
Senecio runcinifolius	Tall Fireweed	P	Y	Y	
Senecio sp.	Groundsel	P		Y	
Senna artemisioides subsp. *petiolaris*	Woody Cassia			Y	
Sida ammophila	Sand Sida	vu	Y		
Sida fibulifera	Pin Sida	vu		Y	
Sida trichopoda	Narrow-leaf Sida		Y		
Spergularia brevifolia	Salt Sea-spurrey		Y		
Spergularia sp.	Sand Spurrey		Y	Y	
Sphaeromorphaea littoralis	Spreading Nut-heads	P	Y	Y	
Sporobolus mitchellii	Rat-tail Couch		Y	Y	
Stelligera endecaspinis	Star Bluebush		Y		
Stemodia florulenta	Blue Rod		Y	Y	
Tecticornia pergranulata	Blackseed Glasswort			Y	
Tecticornia triandra	Desert Glasswort	r	Y	Y	Y
Templetonia egena	Round Templetonia	vu	Y	Y	Y
Tetragonia moorei	Annual Spinach	k	Y	Y	
Teucrium racemosum s.s.	Grey Germander		Y	Y	
Verbena officinalis var. *gaudichaudii*	Native Verbena	k	Y		
Vittadinia cervicularis	Annual New Holland Daisy	P	Y		
Vittadinia dissecta var. *hirta*	Dissected New Holland Daisy	P	Y	Y	
Vittadinia sp.	New Holland Daisy	P		Y	
Wahlenbergia fluminalis	River Bluebell		Y	Y	
Wahlenbergia gracilenta s.s.	Hairy Annual-bluebell		Y		
Walwhalleya proluta	Rigid Panic		Y		
Wurmbea dioica	Common Early Nancy		Y		
Xerochrysum bracteatum	Golden Everlasting	P	Y	Y	
Introduced					
Asparagus asparagoides	Bridal Creeper	R, WONS			
Asphodelus fistulosus	Onion Weed			Y	
Avena fatua	Wild Oat		Y		
Brassica rapa	White Turnip			Y	
Brassica tournefortii	Mediterranean Turnip		Y	Y	
Bromus catharticus	Prairie Grass			Y	
Bromus rubens	Red Brome		Y	Y	

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Carrichtera annua	Ward's Weed		Y	Y	
Centaurea melitensis	Malta Thistle		Y	Y	
Chondrilla juncea	Skeleton Weed	R	Y		
Cirsium vulgare	Spear Thistle	R	Y	Y	
Cotula bipinnata	Ferny Cotula		Y		
Cuscuta campestris	Field Dodder	R	Y		
Dittrichia graveolens	Stinkwort	R	Y	Y	
Erigeron sumatrensis	Guernsey Fleabane		Y	Y	
Erodium cicutarium	Common Heron's-bill		Y		
Fumaria bastardii	Bastard's Fumitory		Y		
Galium aparine	Cleavers		Y		
Heliotropium europaeum	Common Heliotrope			Y	
Heliotropium supinum	Creeping Heliotrope		Y		
Hordeum leporinum	Barley-grass		Y		
Hordeum sp.	Barley Grass			Y	
Hypochaeris glabra	Smooth Cat's-ear			Y	
Lactuca saligna	Willow-leaf Lettuce		Y		
Lactuca serriola	Prickly lettuce		Y	Y	
Lepidium africanum	Common Peppercress		Y	Y	
Limonium lobatum	Winged Sea-lavender		Y	Y	
Lolium rigidum	Wimmera Rye-grass			Y	
Lycium ferocissimum	African Box-thorn	C, WONS		Y	
Lysimachia arvensis	Pimpernel			Y	
Lysimachia arvensis (Blue-flowered variant)	Blue Pimpernel		Y		
Marrubium vulgare	Horehound	R		Y	
Medicago laciniata var. *laciniata*	Cut-leaf Medic			Y	
Medicago minima	Little medic		Y	Y	
Mesembryanthemum crystallinum s.s.	Common Ice-plant		Y	Y	
Mesembryanthemum nodiflorum	Small Ice-plant		Y	Y	
Opuntia stricta	Common Prickly-pear	C, WONS		Y	
Parapholis incurva	Coast Barb-grass		Y		
Pentameris airoides subsp. *airoides*	False Hair-grass		Y		
Phyla canescens	Fog-fruit		Y		
Polygonum arenastrum	Wireweed			Y	

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Psilocaulon granulicaule	Wiry Noon-flower		Y	Y	
Reichardia tingitana	False Sow-thistle		Y		
Schismus barbatus	Arabian Grass		Y	Y	
Silene apetala	Mallee Catchfly			Y	
Silene nocturna	Mediterranean Catchfly		Y		
Silene sp.	Catchfly			Y	
Sisymbrium erysimoides	Smooth Mustard		Y	Y	
Solanum nigrum s.s.	Black Nightshade		Y		
Soliva anthemifolia	Dwarf Jo-jo		Y		
Sonchus oleraceus	Common Sow-thistle		Y	Y	
Spergularia diandra	Lesser Sand-spurrey		Y		
Symphyotrichum subulatum	Aster-weed		Y	Y	
Verbena officinalis s.s.	Common Verbena			Y	
Verbena sp.	Verbena			Y	
Veronica peregrina	Wandering Speedwell		Y	Y	
Vulpia myuros	Rat's-tail Fescue		Y		
Vulpia sp.	Fescue			Y	
Xanthium occidentale	Noogoora Burr		Y	Y	
Xanthium spinosum	Bathurst Burr	C		Y	