
Legend

- Canopy Tree
- Collector road
- Stream
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 101 Samphire Shrubland
- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 823 Lignum Swampy Woodland
- Bare ground and track

N

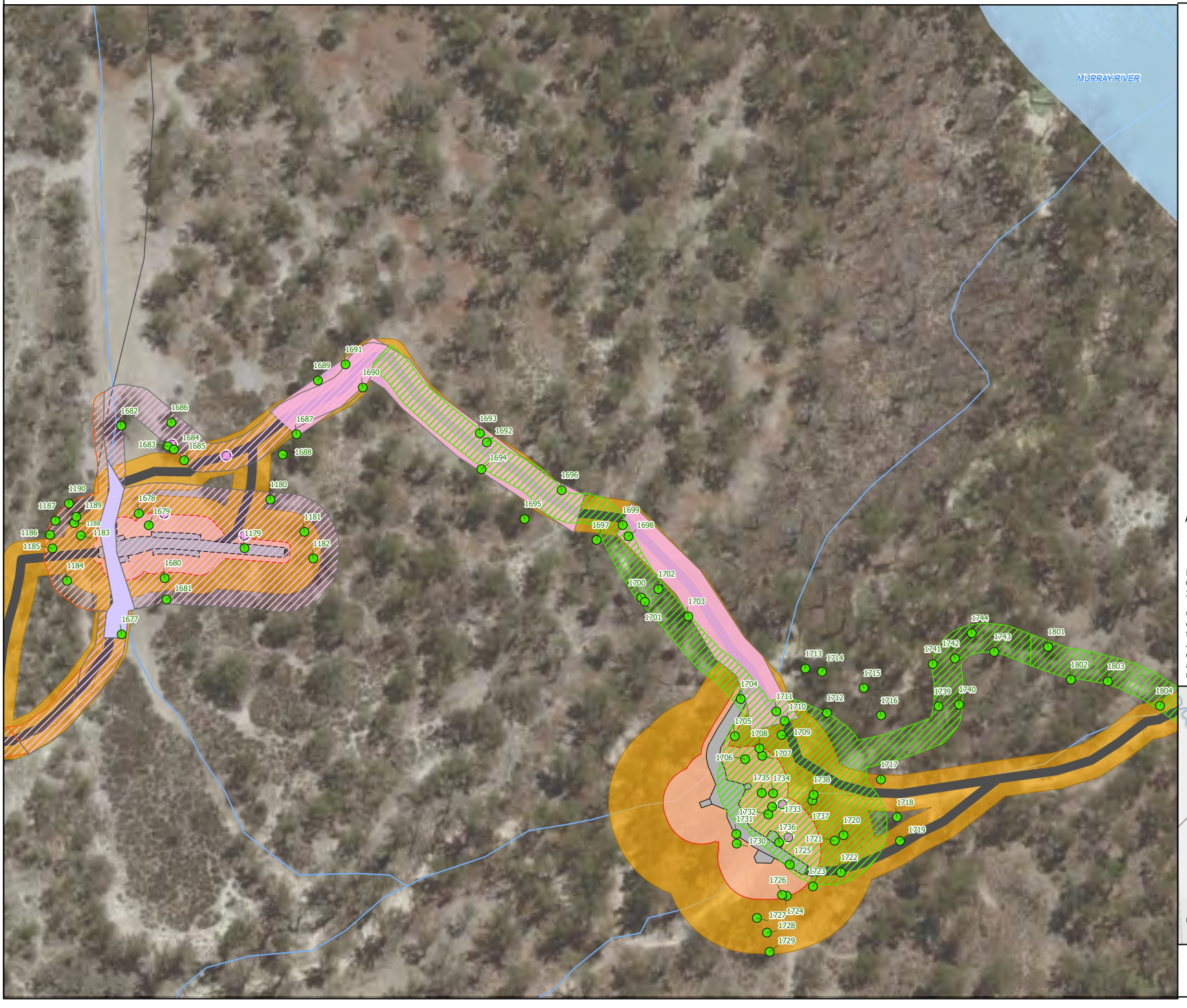
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 103 Riverine Chenopod Woodland
- 106 Grassy Riverine Forest
- 823 Lignum Swampy Woodland
- Bare ground and track

Threatened Flora Species

- Senecio cunninghamii var. cunninghamii

Threatened Flora Species

- Senecio cunninghamii var. cunninghamii

N

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

IS297701

0 25 50
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
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 106 Grassy Riverine Forest
- 813 Intermittent Swampy Woodland
- 818 Shrubby Riverine Woodland

Threatened Flora Species

- Eremophila divaricata subsp. divaricata

N

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

IS297701

0 25 50
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
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 813 Intermittent Swampy Woodland
- 818 Shrubby Riverine Woodland
- 823 Lignum Swampy Woodland
- Bare ground, track, turn around and picnic table

Threatened Flora Species

- Senecio cunninghamii var. cunninghamii

N

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

IS297701

0 25 50
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
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 103 Riverine Chenopod Woodland
- 813 Intermittent Swampy Woodland
- 823 Lignum Swampy Woodland
- Bare ground, car park/turn around area

Threatened Flora Species

- Eremophila divaricata subsp. divaricata

N

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

IS297701

0 25 50
Meters

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




Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx


Legend

- Canopy Tree
- Collector road
- Stream
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 103 Riverine Chenopod Woodland
- 823 Lignum Swampy Woodland

N

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

IS297701

0 25 50
Meters

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




R8


Legend

- Canopy Tree
- Collector road
- Stream
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 106 Grassy Riverine Forest
- 810 Floodway Pond Herbland
- 823 Lignum Swampy Woodland

N

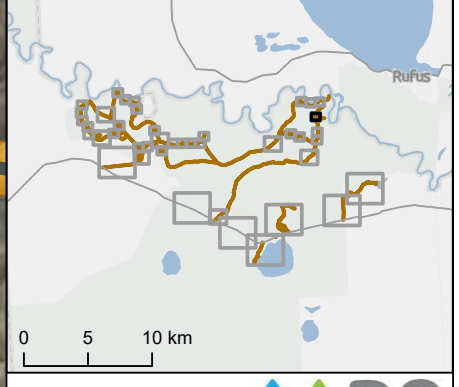
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 25 50
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
- Collector road
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 823 Lignum Swampy Woodland

N

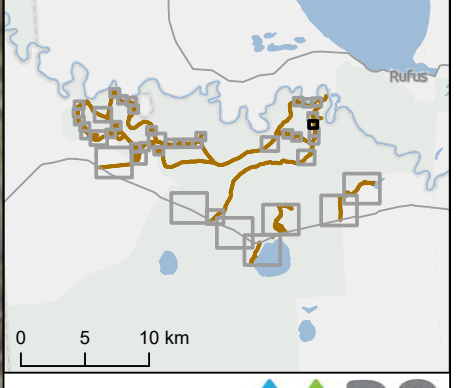
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 25 50
Meters

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





# Figure 5: Ecological Values at Lindsay Island




Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 103 Riverine Chenopod Woodland
- 106 Grassy Riverine Forest
- 813 Intermittent Swampy Woodland
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Senecio cunninghamii var. cunninghamii

N

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

IS297701

0 25 50
Meters

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




Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 5: Ecological Values at Lindsay Island




Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 103 Riverine Chenopod Woodland
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Eremophila divaricata subsp. divaricata
- Eremophila maculata subsp. maculata

N

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

IS297701

0 25 50
Meters

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




R8

Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx


Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 106 Grassy Riverine Forest
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Eremophila divaricata subsp. divaricata

N

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

IS297701

0 25 50
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
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 104 Lignum Swamp
- 106 Grassy Riverine Forest
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Eremophila divaricata subsp. divaricata
- Senecio cunninghamii var. cunninghamii

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
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 104 Lignum Swamp
- 813 Intermittent Swampy Woodland
- 823 Lignum Swampy 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.




Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 104 Lignum Swamp
- 823 Lignum Swampy Woodland

N

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

IS297701

0 25 50
Meters

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




Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx


Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 823 Lignum Swampy Woodland

Threatened Flora Species

- Swainsona greyana

N

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

IS297701

0 25 50
Meters




Legend

- Canopy Tree
- Collector road
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 104 Lignum Swamp
- 823 Lignum Swampy Woodland

N

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

IS297701

0 25 50
Meters

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




Legend

- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 104 Lignum Swamp

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
- Collector road
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 104 Lignum Swamp
- 823 Lignum Swampy 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.




Legend

- Canopy Tree
- Collector road
- Stream
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 104 Lignum Swamp
- 823 Lignum Swampy 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.




Legend

- Canopy Tree
- Collector road
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 104 Lignum Swamp
- 823 Lignum Swampy 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.




R8


Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 104 Lignum Swamp
- 810 Floodway Pond Herbland
- 813 Intermittent Swampy Woodland
- 823 Lignum Swampy Woodland
- Water

Threatened Flora Species

- Tecticornia triandra

N

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

IS297701

0 55 110
Meters




Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland

Threatened Flora Species

- Tecticornia triandra

N

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

IS297701

0 130 260
Meters

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



# Figure 5: Ecological Values at Lindsay Island




Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland

Threatened Flora Species

- Tecticornia triandra

N

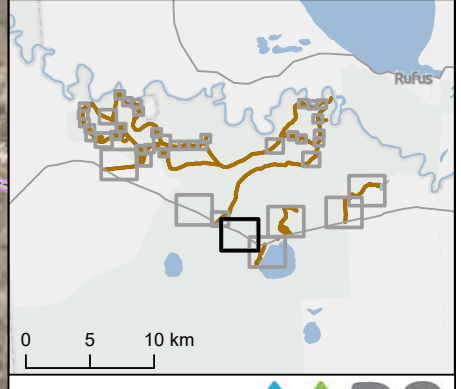
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 130 260
Meters

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






Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 5: Ecological Values at Lindsay Island




Legend

- Canopy Tree
- Collector road
- Stream
- Watercourse
- Lake
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 808 Lignum Shrubland
- 813 Intermittent Swampy Woodland
- Bare ground

Threatened Flora Species

- Acacia oswaldii
- Asperula gemella

N

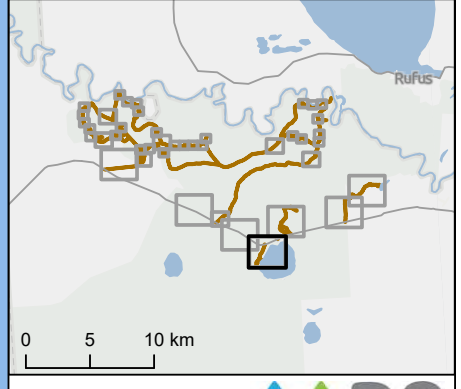
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 130 260
Meters

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






Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx


Legend

- Canopy Tree
- Collector road
- Stream
- Drain/Channel/Other
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 101 Samphire Shrubland
- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 808 Lignum Shrubland
- 813 Intermittent Swampy Woodland
- Bare ground and weeds

Threatened Flora Species

- Acacia oswaldii
- Asperula gemella
- Tecticornia triandra

N

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

IS297701

0 130 260
Meters




Legend

- Canopy Tree
- Collector road
- Stream
- Drain/Channel/Other
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 106 Grassy Riverine Forest
- 818 Shrubby Riverine Woodland
- 823 Lignum Swampy Woodland

Threatened Flora Species

- Asperula gemella
- Atriplex lindleyi subsp. conduplicata
- Tecticornia triandra

N

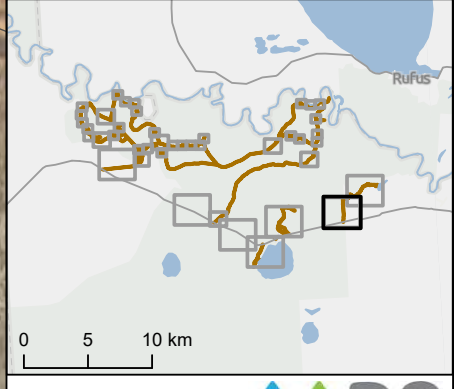
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

IS297701

0 130 260
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
- Collector road
- Stream
- Drain/Channel/Other
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation

EVC

- 102 Low Chenopod Scrubland
- 103 Riverine Chenopod Woodland
- 106 Grassy Riverine Forest
- 810 Floodway Pond Herbland
- 818 Shrubby Riverine Woodland
- 823 Lignum Swampy Woodland
- Bare ground

Threatened Flora Species

- Asperula gemella
- Atriplex lindleyi subsp. conduplicata
- Calotis cuneifolia

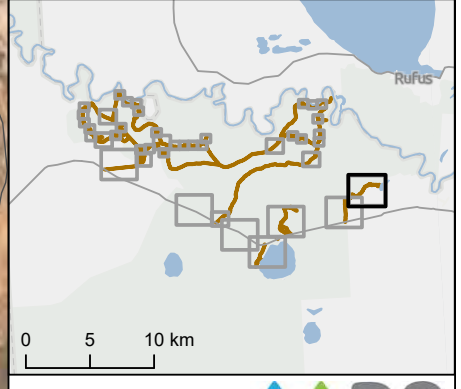
N

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

IS297701

0 130 260
Meters





# 7. Inundation Area vegetation ground-truthing assessment

## 7.1 Context

The project has been designed to facilitate environmental watering of up to 4,845 ha of the Lindsay Island floodplain in Victoria (an additional 263 ha will also be inundated in NSW due to the raising of the Lock 7 weir pool). 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.

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

## 7.2 Desktop assessment

### 7.2.1 Modelled ecological vegetation classes

A summary of the vegetation communities making up the 5,108 ha of vegetation proposed for inundation (along with the full extent of these communities in the broader Lindsay Island Area) is outlined in **Table 8**. Two non-flood dependent EVCs are mapped as receiving environmental water (see **Figure 3**): (Semi-arid Woodland (EVC 97) (2.24 ha) and Semi-arid Chenopod Woodland (EVC 98) (19.14 ha)). The vegetation mapping for the Inundation Areas has been ground-truthed and the on-ground inspection confirmed that these EVCs had been incorrectly mapped, with Semi-arid Woodland communities only observed at higher elevations above the floodplains where environmental water will not penetrate during periods of inundation (see **Figure 7**).

There was no modelled EVC data for 270.22 ha of the Inundation Area. Most of the areas where modelled EVC data was not available (approximately 260 ha) were located in NSW, and found to form part of the Murray River or nearby tributaries and was deemed to constitute areas of waterbody. A desktop review using NSW State Vegetation Type Mapping (SVTM) (Western Region)[16] was undertaken to identify vegetation communities modelled to occur in these areas and the results are described in Section 7.2.2. No ground-truthing field surveys have been undertaken for vegetation in NSW inundation areas.

**Table 8 Area of vegetation communities modelled by DELWP (2005) within the Inundation Area**

| EVCs Modelled within Inundation Area | EVC Conservation Significance | Modelled EVC extent within Inundation Area (ha) |
|---|---|---|
| Semi-arid Woodland (EVC 97) | Vulnerable | 2.24 |
| Semi-arid Chenopod Woodland (EVC 98) | Depleted | 19.14 |
| Low Chenopod Shrubland (EVC 102) | Depleted | 181.83 |
| Riverine Chenopod Woodland (EVC 103) | Depleted | 716.67 |
| Lignum Swamp (EVC 104) | Vulnerable | 163.80 |
| Grassy Riverine Forest (EVC 106) | Depleted | 5.72 |
| Lake Bed Herbland (EVC 107) | Vulnerable | 197.50 |

[16] https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=SEED_Catalog.245.NSW%20Formations,SEED_Catalog.245.NSW%20Classes,SEED_Catalog.245.Labels,SEED_Catalog.245.Plant%20Community%20Type (accessed 7/07/2020)

| EVCs Modelled within Inundation Area | EVC Conservation Significance | Modelled EVC extent within Inundation Area (ha) |
|---|---|---|
| Shallow Freshwater Marsh (EVC 200) | Vulnerable | 19.34 |
| Alluvial Plains Semi-arid Grassland (EVC 806) | Vulnerable | 656.80 |
| Disused Floodway Shrubby Herbland (EVC 807) | Endangered | 7.91 |
| Lignum Shrubland (EVC 808) | Least Concern | 1431.89 |
| Floodway Pond Herbland (EVC 810) | Depleted | 23.80 |
| Grassy Riverine Forest/Floodway Pond Herbland Complex (EVC 811) | Depleted | 10.01 |
| Intermittent Swampy Woodland (EVC 813) | Depleted | 814.72 |
| Shrubby Riverine Woodland (EVC 818) | Least Concern | 237.36 |
| Lignum Swampy Woodland (EVC 823) | Depleted | 127.24 |
| Water Body - Fresh (EVC 992) | | 190.52 |
| Bare Rock/Ground (EVC 993) | | 31.35 |
| Area of unmapped EVC | | 270.22 |
| **Total** | | **5108.07** |

### 7.2.2 NSW Inundation Area – Modelled vegetation communities

A detailed assessment of the Inundation Area where it extends in to NSW has not been undertaken as a part of this assessment. However, of the approximately 260 ha of Inundation Area within NSW for which there is no modelled EVC data, approximately half of this area encompasses the Murray River and its tributaries which are classified as waterbodies. Approximately 129.2 ha of the Inundation Area in NSW is modelled as containing native vegetation based on NSW State Vegetation Type Mapping (SVTM) (Western Region)[17]. Two vegetation communities have been modelled within these areas:

- River Red-gum – Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion), Benson Class 11 (LM143): 128 ha
- Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion), Benson Class 13: 1.2 ha

A small area (0.0002 ha) of 'no native vegetation' (PCTID0) is modelled to occur in the NSW Inundation Area.

Each of these communities consist of floodplain vegetation that are not expected to be adversely affected by inundation provided the frequency, duration and timing of inundation is generally consistent with the water requirements of these communities. Further assessment is required to determine the potential for impacts and would be undertaken based on additional information from the MDBA in relation to how the proposed operation of the Lock 7 weir pool for the project differs from the current operating regime, which is what largely determines the current water regime experienced by these vegetation communities.

[17] https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=SEED_Catalog.245.NSW%20Formations,SEED_Catalog.245.NSW%20Classes,SEED_Catalog.245.Labels,SEED_Catalog.245.Plant%20Community%20Type (accessed 7/07/2020)

## 7.3 Field assessment

### 7.3.1 Ground-truthed ecological vegetation classes

The field assessment focused on ground-truthing areas within the proposed Inundation Area that had been mapped (DELWP 2005) as containing non-flood dependent EVCs, namely Semi-arid Woodland and Semi-arid Chenopod Woodland, and the 8.52 ha where no modelled DELWP EVC mapping was available (DELWP 2005) (**Figure 6**). Fourteen discrete locations within the Inundation Area were assessed as a part of this assessment, and the field assessment confirmed the following:

- The inundation mapping is fine scale and aligns well with topography / soil / vegetation types on the ground.
- The EVC mapping (DELWP 2005 modelled mapping) is coarser than the Inundation Area mapping.
- There was no Semi-arid Woodland or Semi-arid Chenopod Woodland identified within the Inundation Areas surveyed. Each of the discrete locations where these EVCs were mapped (or that were unmapped) by DELWP have now been reclassified, and photographs have been taken of each location.
- The vegetation present in these areas was usually EVC 103 (Riverine Chenopod Woodland), EVC 808 (Lignum Shrubland) and occasionally EVC 806 (Alluvial Plains Semi-arid Grassland). These EVCs are located on alluvial terraces and are prone to flooding and will not likely be adversely affected by the proposed watering regime.

A map was prepared highlighting the full extent of the Inundation Area, outlining the results of the EVC ground truthing exercise within areas that had been modelled as containing non-ground water dependent EVCs or were unmapped (see **Figure 7**). Native vegetation (EVC) mapping is only shown for the areas that were assessed during the ground-truthing field assessment.

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Plate 4 – Patch of vegetation identified by DELWP modelled mapping as containing EVC 97 – Semi-arid Woodland. The vegetation at this location consisted of Riverine Chenopod Woodland (EVC 103) dominated by Eucalyptus largiflorens (Black Box).</td><td>Plate 5 – Patch of vegetation unmapped by DELWP modelled mapping. The vegetation at this location consisted of Lignum Shrubland (EVC 808) dominated by Duma florulenta (Lignum).</td></tr>
</table>

### 7.3.2 Incidental observations of listed flora

Incidental observations of five flora species listed under VROTS were recorded during the ground-truthing surveys undertaken in June 2020:

- *Duma horrida* subsp. *horrida* (Spiny Lignum), rare
- *Eremophila divaricata* subsp. *divaricata* (Spreading Emu-bush), rare
- *Solanum lacunarium* (Lagoon Nightshade), vulnerable
- *Swainsona microphylla** (Small-leaf Swainson-pea), rare
- *Tecticornia triandra* (Desert Glasswort), rare

*This species was found immediately outside of the Inundation Area on higher ground, and is not expected to be impacted by the proposed watering.

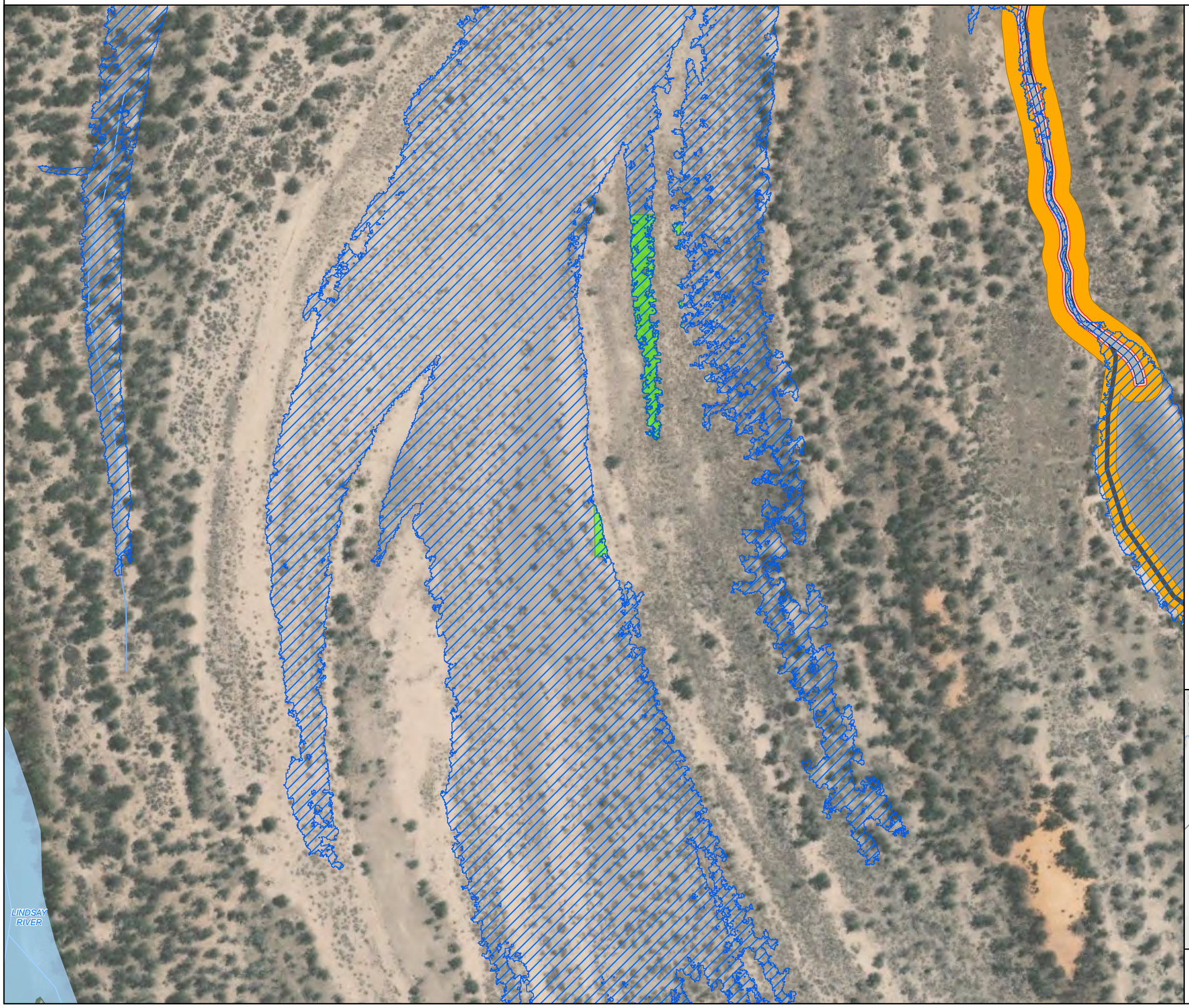
These surveys were rapid in nature, focusing on ground-truthing EVCs and not identifying flora species within the broader Inundation Area. Furthermore the surveys were not undertaken at an appropriate time of year to undertake targeted surveys for many listed flora species. Therefore, it is possible that other flora listed as rare or threatened would be present within the Inundation Area.

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 E).

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island








Legend

- Stream
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation
- Inundation Area
- No modelled mapping available

N

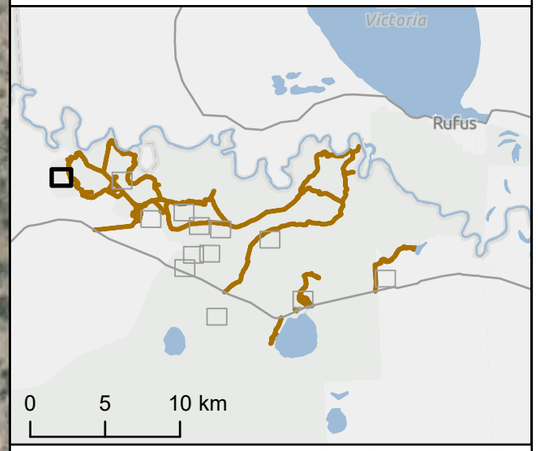
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.






R8

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island





Sandford Trk

Legend

- Collector
- Stream
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation
- Inundation Area
- No modelled mapping available

N

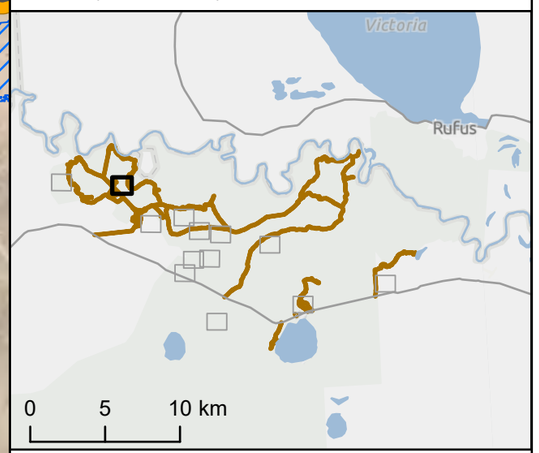
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.



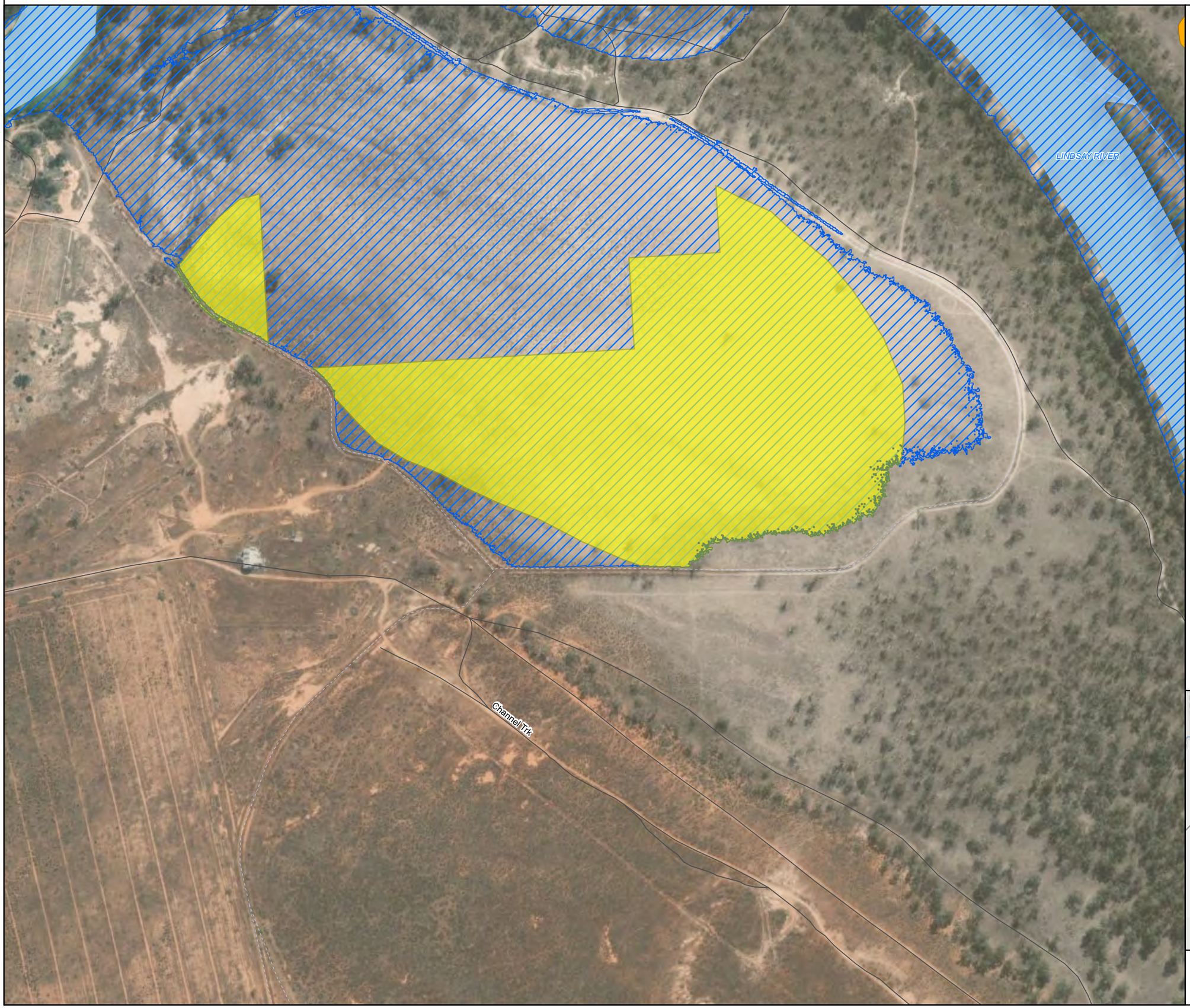



Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island








Legend

- Collector
- Stream
- Drain/Channel/Other
- Watercourse
- Construction Footprint Tracks
- Area of Investigation
- Inundation Area
- 98 Semi-arid Chenopod Woodland

N

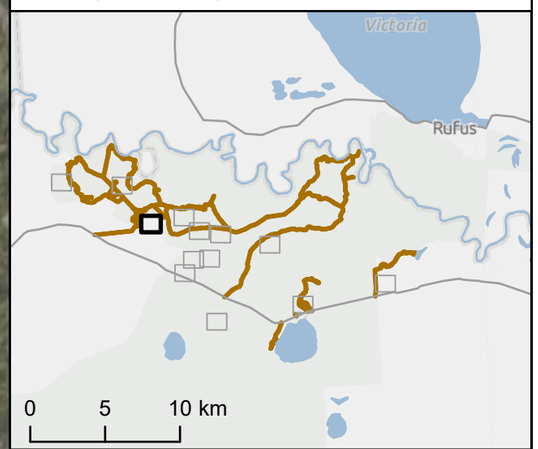
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.






Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island





Legend

Stream

Inundation Area

No modelled mapping available

N

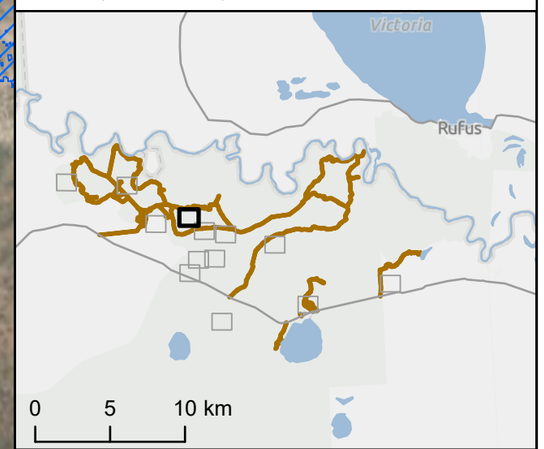
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.

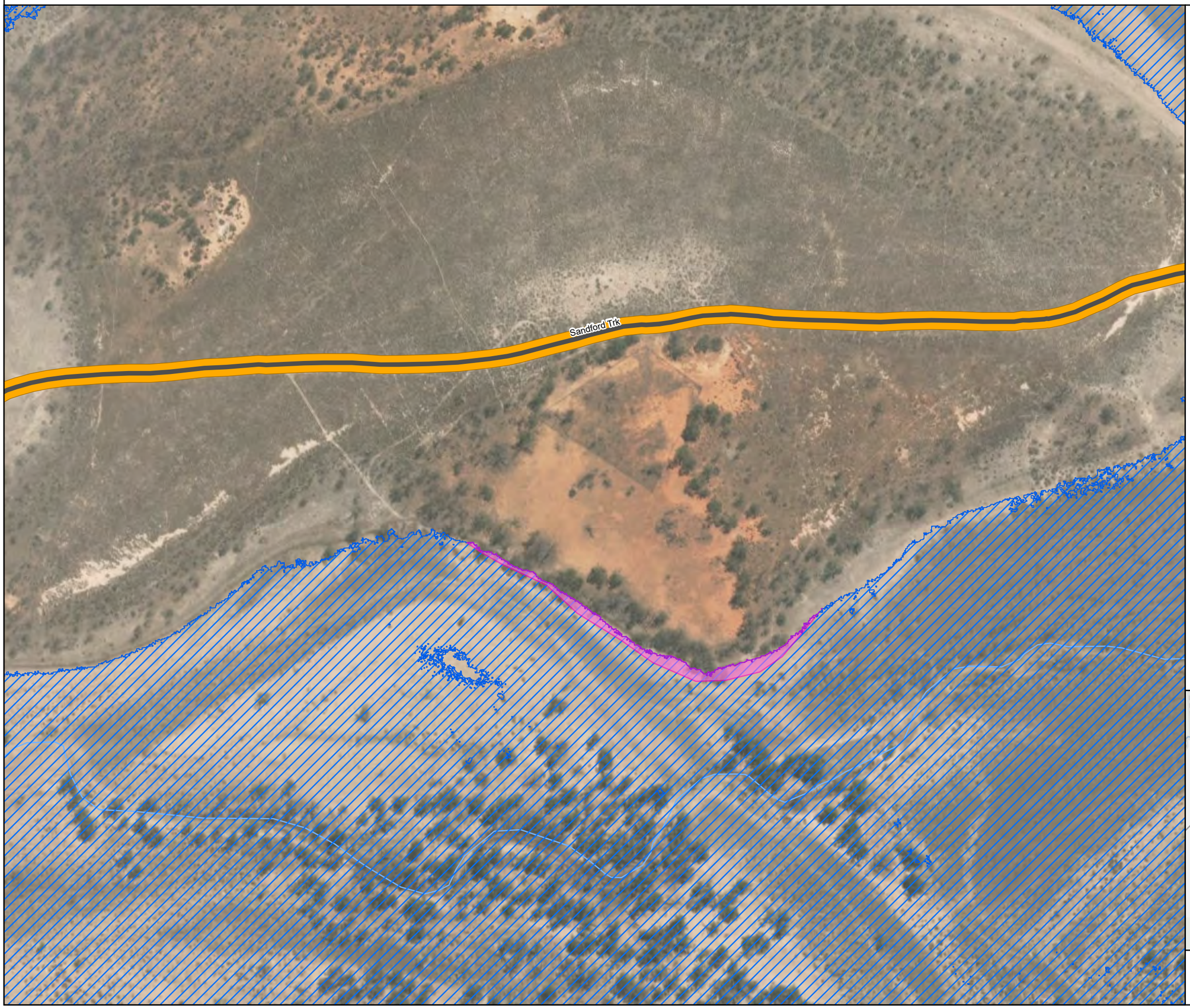





R8

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island






Legend

- Collector
- Stream
- Construction Footprint Tracks
- Area of Investigation
- Inundation Area
- 97 Semi-arid Woodland

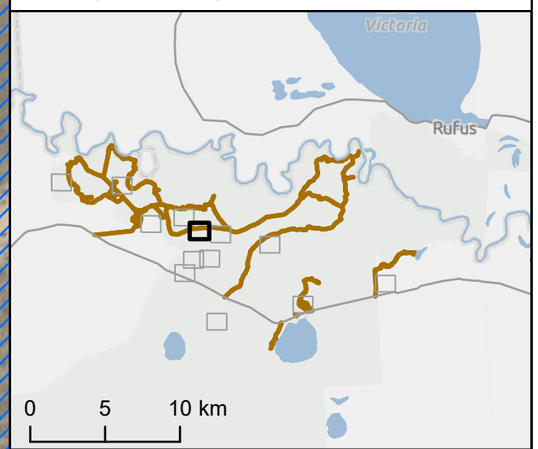
N

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

IS297701

0 55 110
Meters



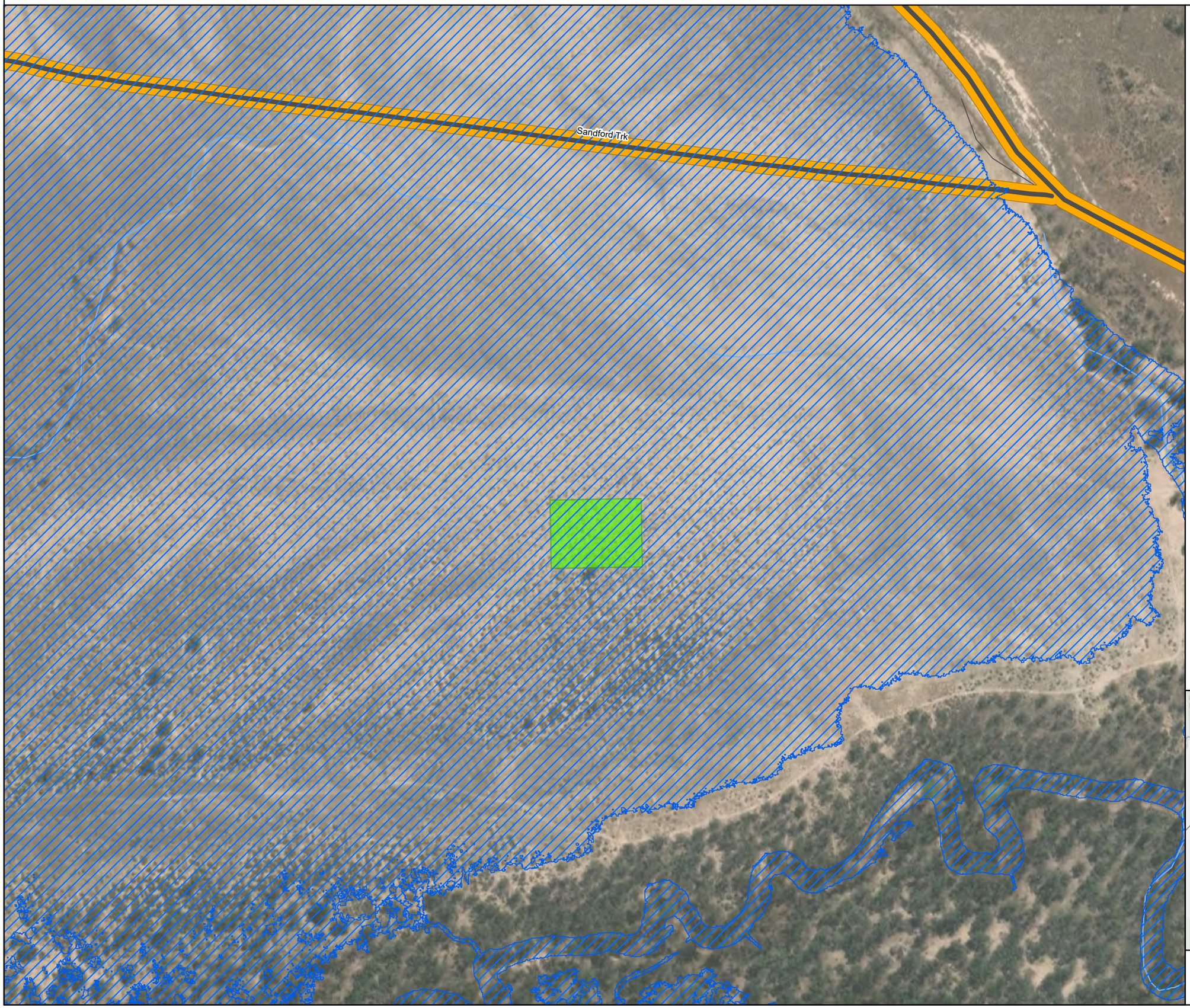



Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island








Legend

- Collector
- Stream
- Construction Footprint Tracks
- Area of Investigation
- Inundation Area
- No modelled mapping available

N

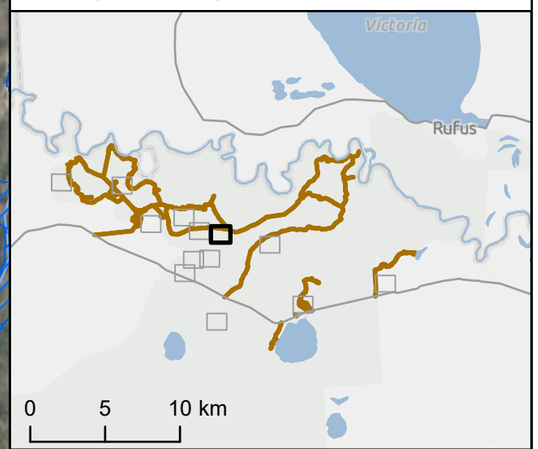
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.



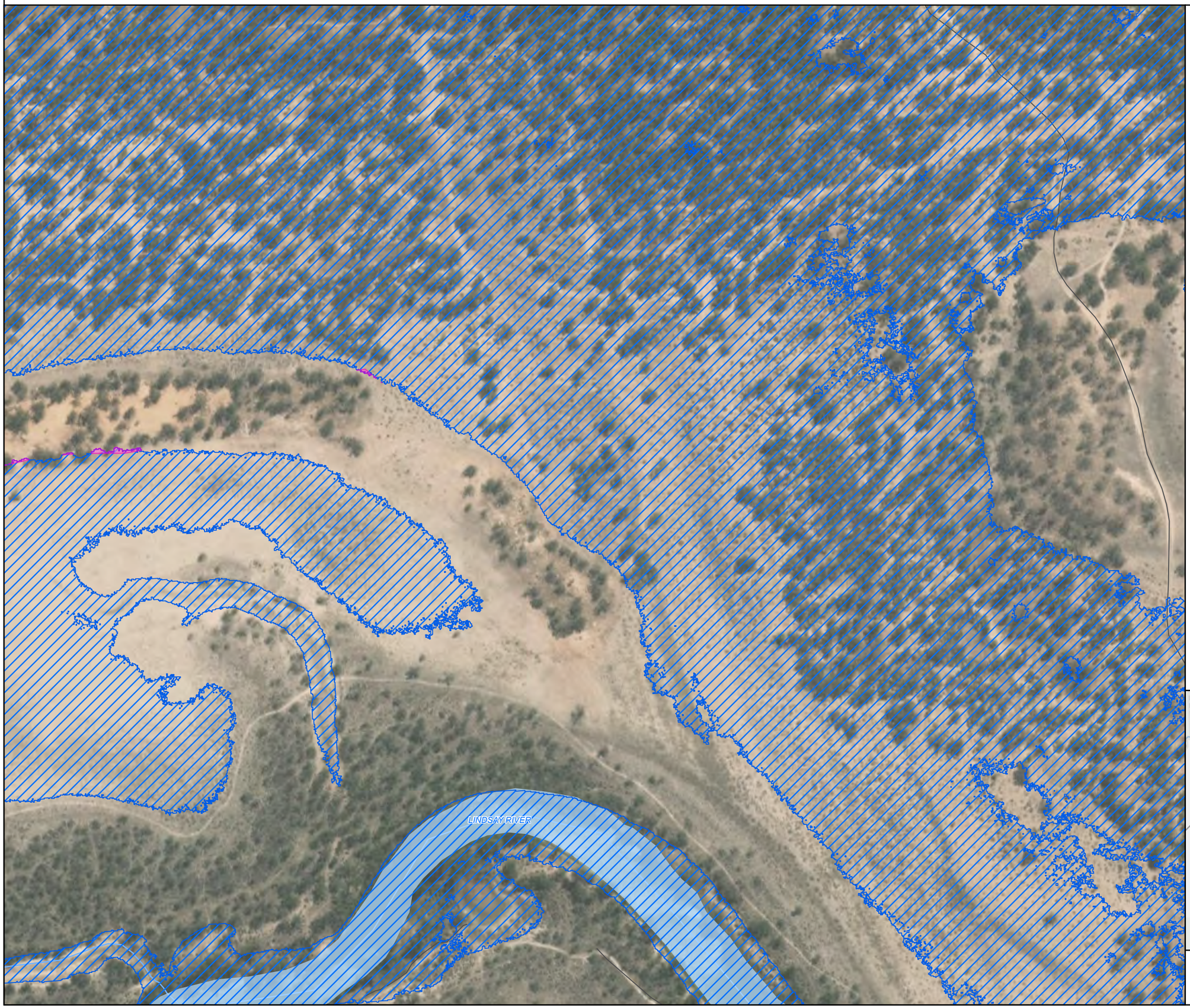



R8

Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island






Legend

- Collector
- Stream
- Watercourse
- Inundation Area
- 97 Semi-arid Woodland

N

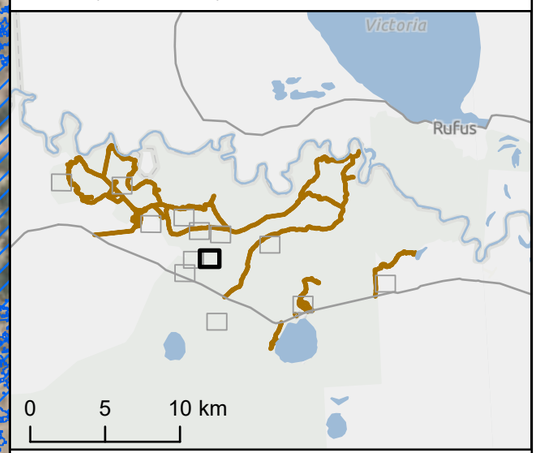
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.






R8

Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island




Legend

- Stream
- Watercourse
- Inundation Area
- 97 Semi-arid Woodland

N

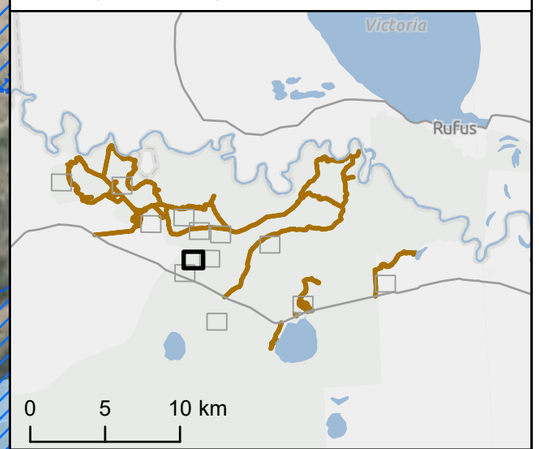
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.






R8

Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island






Legend

- Collector
- Stream
- Watercourse
- Inundation Area
- 98 Semi-arid Chenopod Woodland

N

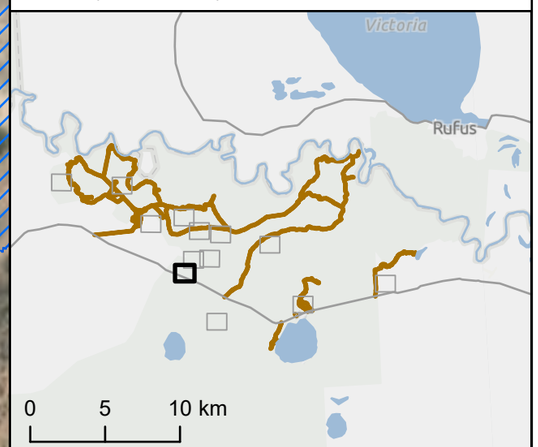
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.






R8

Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island

Legend

- Collector
- Construction Footprint Tracks
- Area of Investigation
- Inundation Area
- No modelled mapping available

N

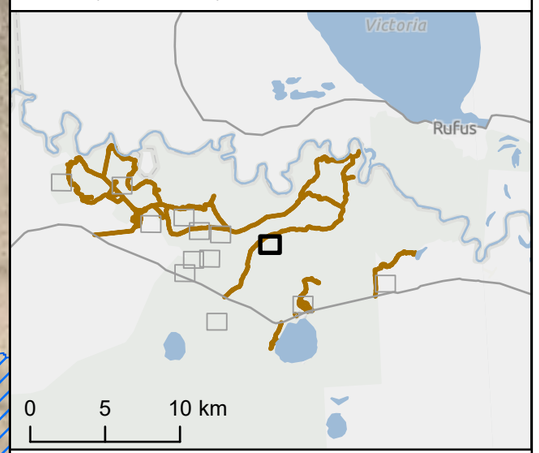
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.






Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island

Legend

Collector

Inundation Area

98 Semi-arid Chenopod Woodland

N

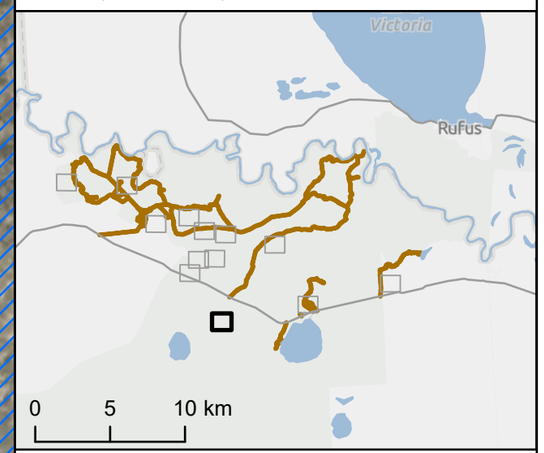
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.

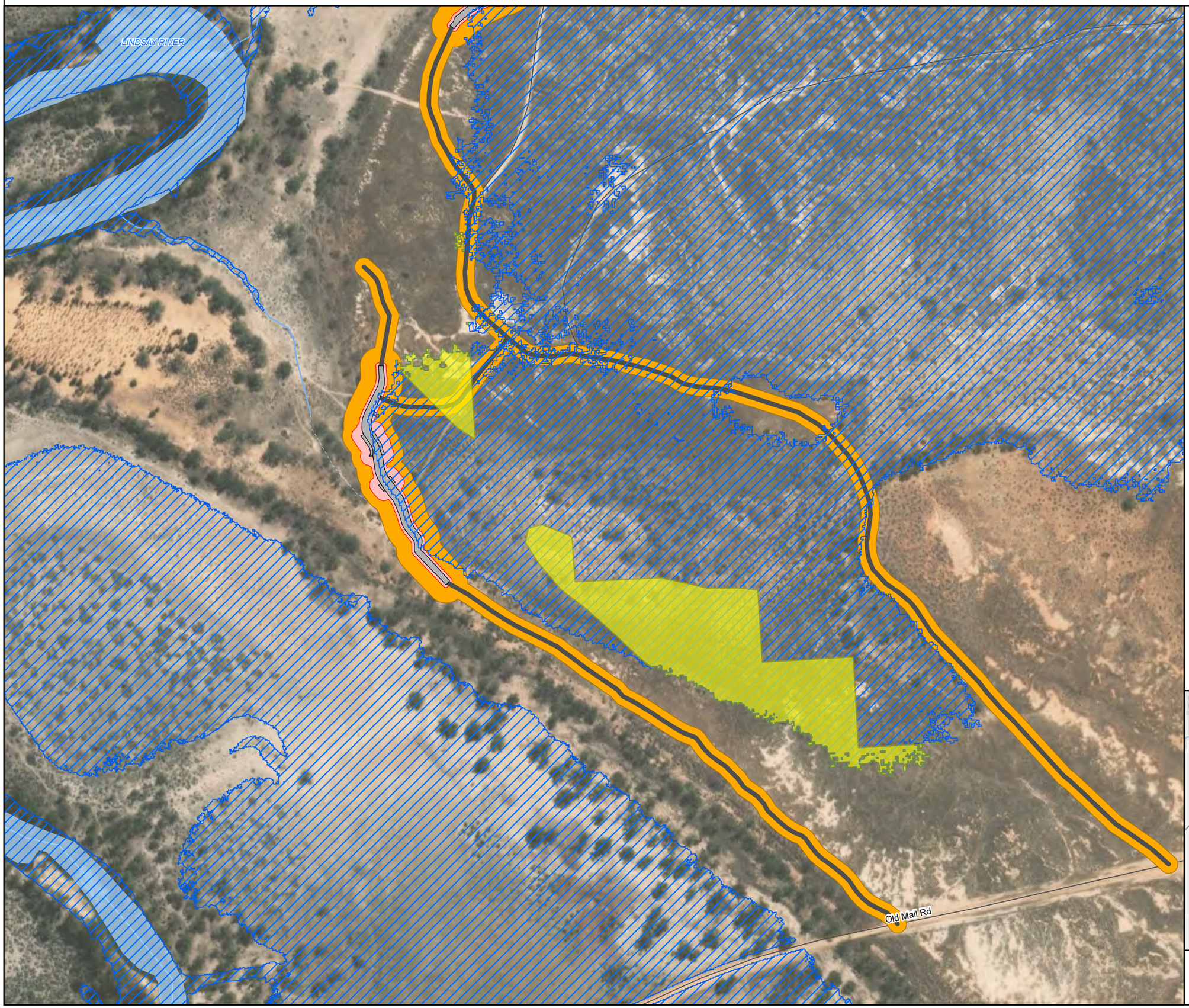





Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island






Legend

- Collector
- Stream
- Drain/Channel/Other
- Watercourse
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation
- Inundation Area
- 98 Semi-arid Chenopod Woodland

N

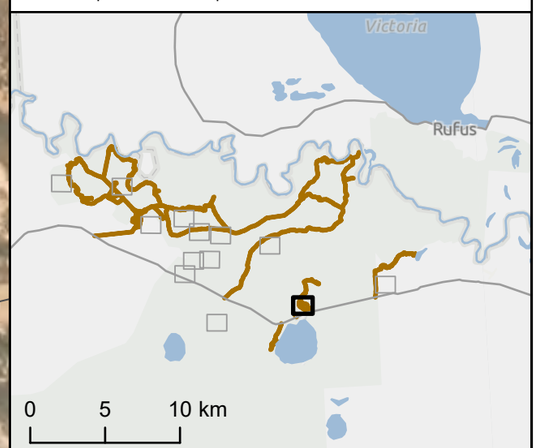
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

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.



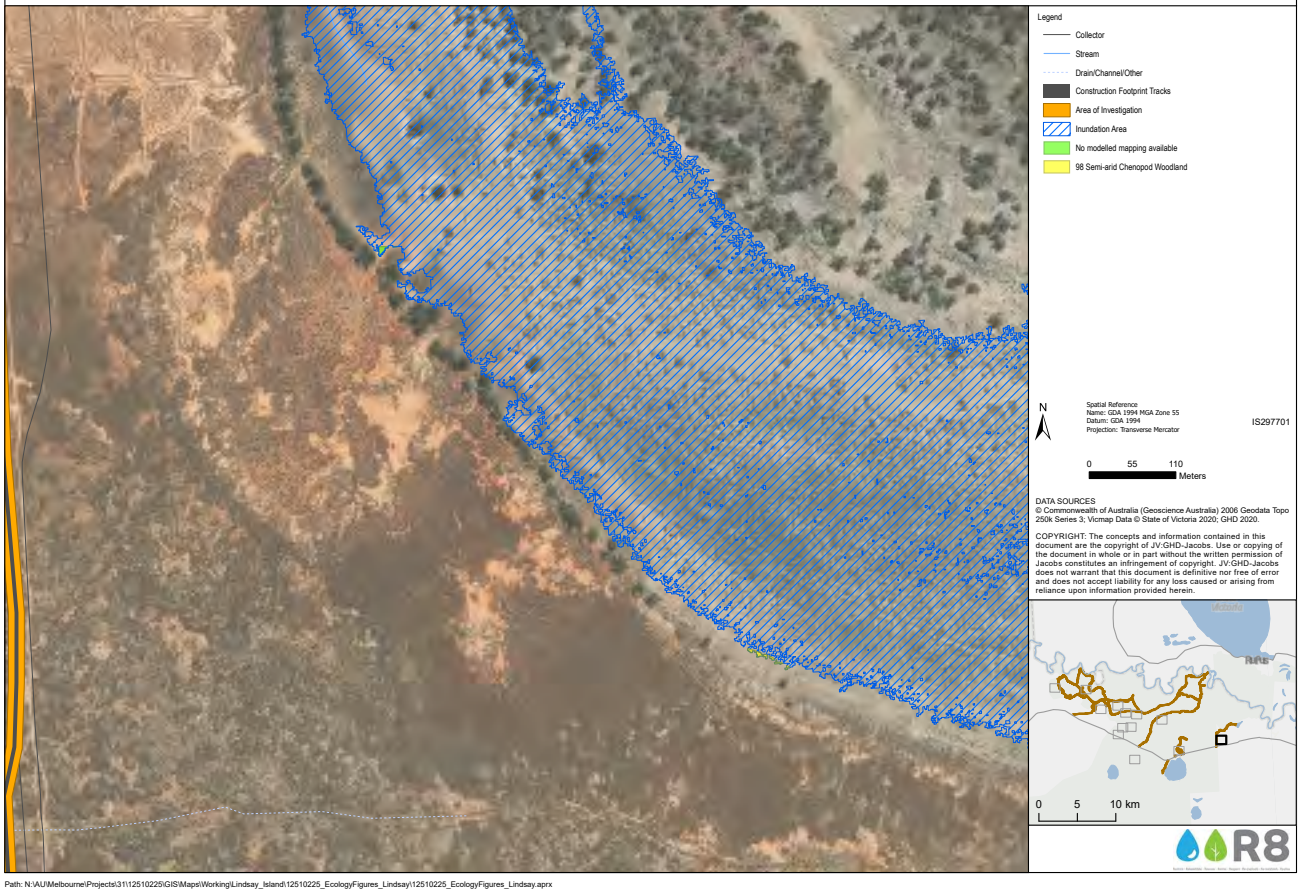



R8

Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 6: Areas targeted during EVC ground-truthing exercise within Inundation Areas at Lindsay Island



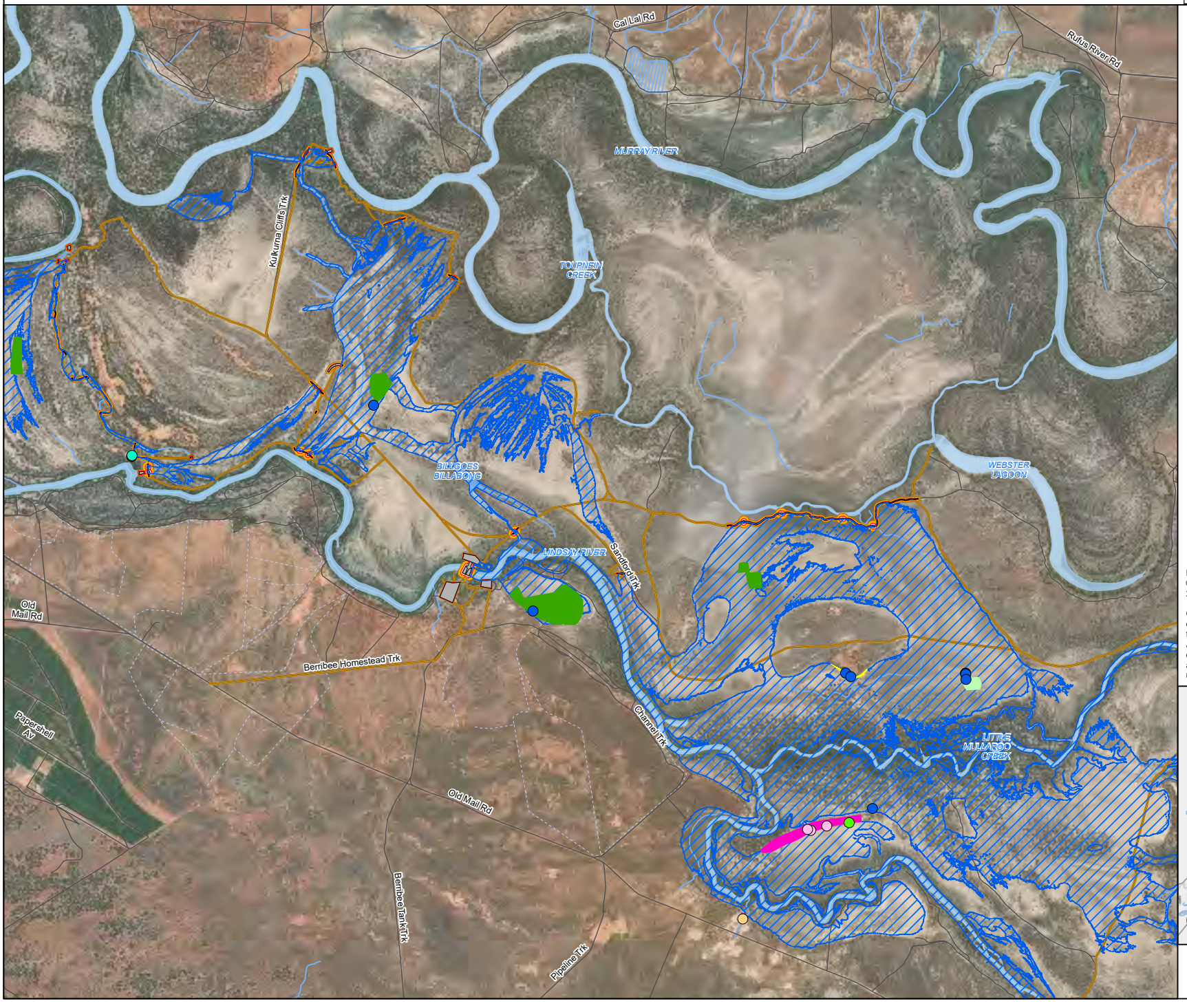



Path: N:\AU\Melbourne\Projects\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 7: Results of the EVC ground-truthing exercise within Inundation Areas at Lindsay Island








Legend

- Arterial
- Collector
- Stream
- Drain/Channel/Other
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation
- Inundation Area

EVC

- 103 Riverine Chenopod Woodland
- 104 Lignum Swamp
- 806 Alluvial Plains Semi-arid Grassland
- 808 Lignum Shrubland
- 813 Intermittent Swampy Woodland

Threatened Flora Species

- Duma horrida subsp. horrida
- Eremophila divaricata subsp. divaricata
- Solanum lacunarium
- Tecticornia triandra
- Crinum flaccidum
- Swainsona microphylla

N

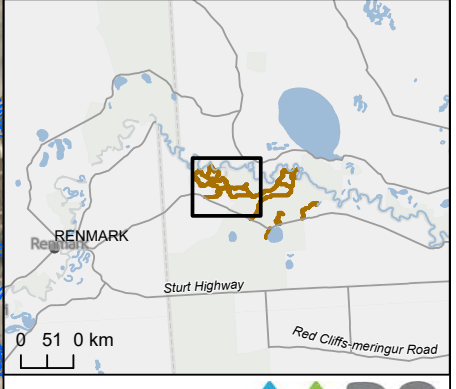
Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

0 500 1000 Meters

IS29770

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





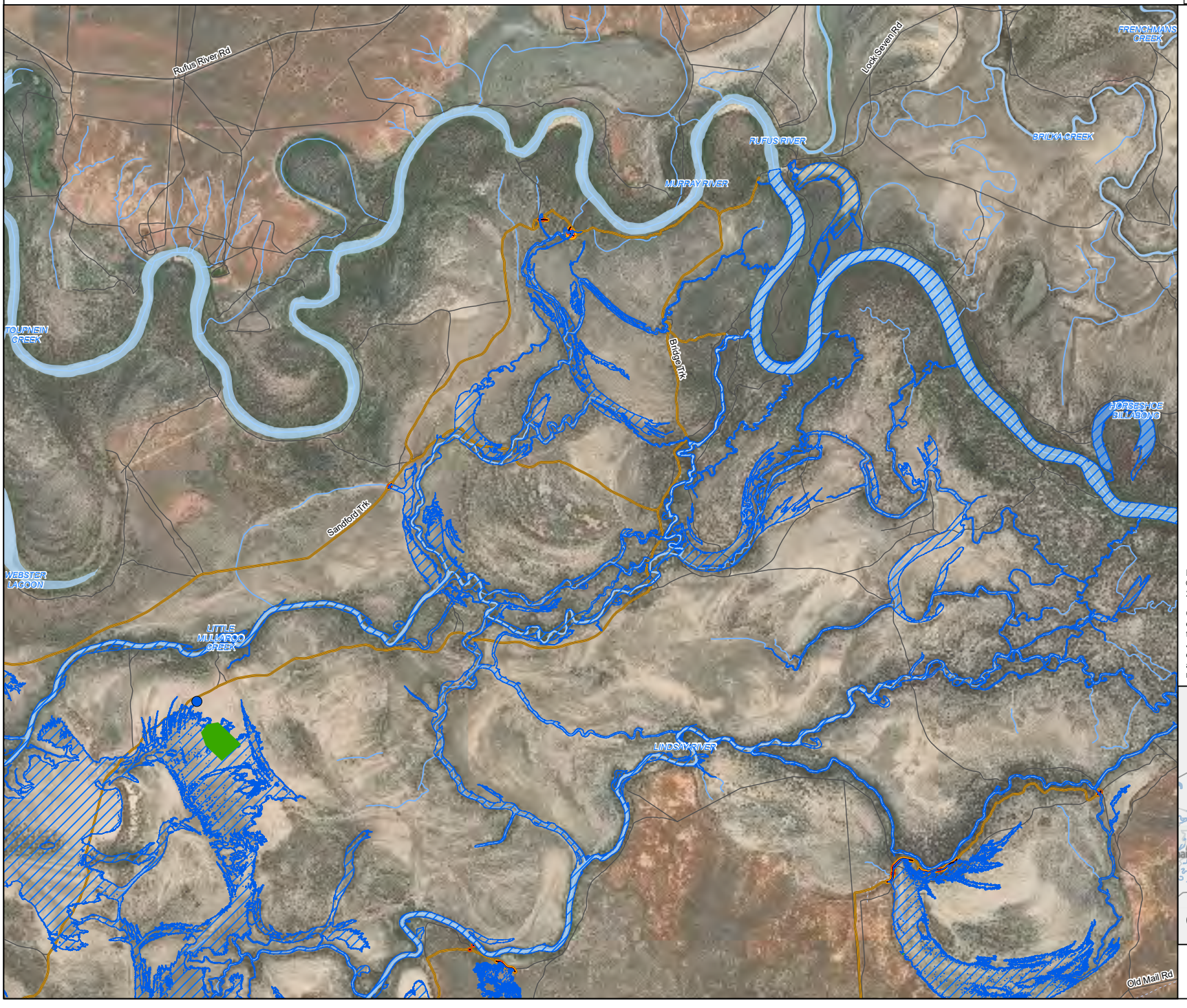

R8

Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# Figure 7: Results of the EVC ground-truthing exercise within Inundation Areas at Lindsay Island








Legend

- Arterial
- Collector
- River
- Stream
- Drain/Channel/Other
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation
- Inundation Area

EVC

- 808 Lignum Shrubland

Threatened Flora Species

- Solanum lacunarium

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator
0 500 1000
Meters

IS29770




R8

# Figure 7: Results of the EVC ground-truthing exercise within Inundation Areas at Lindsay Island






Legend

- Collector
- Stream
- Drain/Channel/Other
- Development Footprint
- Construction Footprint Tracks
- Construction Footprint Structures
- Area of Investigation
- Inundation Area

EVC

- 103 Riverine Chenopod Woodland
- 104 Lignum Swamp
- 808 Lignum Shrubland

Threatened Flora Species

- Solanum lacunarium
- Tecticornia triandra

N

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator
0 500 1000
Meters

IS29770




R8

Path: G:\31\12510225\GIS\Maps\Working\Lindsay_Island\12510225_EcologyFigures_Lindsay\12510225_EcologyFigures_Lindsay.aprx

# 8. Overview of potential impacts

This section provides an overview of the proposed project construction and operational activities and an outline of the potential impacts that may be associated with them. 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 impacts

Construction of the project is anticipated to require 24 months to complete, including approximately 18 months to complete construction of the Berribee Regulator. General construction activities would include:

- Establishment of construction sites, including removal of vegetation, stripping and stockpiling of topsoil, establishing temporary laydown and access routes
- Installation of cofferdams to enable dewatering of construction excavations / work areas in surface waters or below the watertable
- Construction / installation of new structures, including sheet-piling to install seepage cut-offs at the four large regulators (BERR_A) (Berribee Regulator), BERR_F, CR_A and CW_B1)
- Rehabilitation of disturbed areas post-construction.

Construction would involve use of vehicles and machinery such as trucks, excavators, piling rigs, compaction plant, water carts, cranes and access equipment.

A Construction Environmental Management Plan (CEMP) would be prepared for the works and would detail the measures to avoid and minimise impacts during construction as per Section 11. Once construction of regulators, containment banks and associated works are complete, all waste and spoil would be removed from the sites and disposed of as required by the proposed CEMP.

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

***Groundwater***

A desktop groundwater assessment by R8 (2020b) indicates that the Project Area is underlain by shallow groundwater, typically between 3 – 6 m below ground level. The watertable aquifer is predominantly highly saline (>50 mS/cm), with fresher groundwater close to the Murray River and isolated sections of anabranches (<5 mS/cm). Soil salinity is also known to be very high. Groundwater is thought to be in direct connection with the Murray River and sections of the Lindsay River, which generally lose water to groundwater. Large areas of terrestrial vegetation, which are likely to have some reliance on groundwater, are present across the project area.

Potential impacts from the interaction of groundwater with ecological values (terrestrial flora and fauna and aquatic fauna) from construction of the project as described by R8 (2020b) include:

- Potential for temporary, localised drawdown of groundwater levels from dewatering of construction excavations – not expected to significantly reduce groundwater availability to local ecosystems based on implementation of proposed mitigation measures.
- Disposal of saline waste groundwater from dewatering of construction excavations – not expected to significantly impact local ecosystems based on implementation of proposed mitigation measures.

- Potential for localised alteration of groundwater flow paths and levels from installation of permanent below-ground water barriers – not expected to significantly alter groundwater availability to local ecosystems based on implementation of proposed mitigation measures.

Mitigation measures for impacts to groundwater and ecosystems that are likely to have some reliance on groundwater are found in R8 (2020b).

## 8.2 Operational impacts

Operational activities may also result in a range of positive and negative impacts associated with the managed inundation activities. These activities would be undertaken in accordance with the final Environmental Watering 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 and subsequent drawdown of floodwaters from floodplains
- 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 Lindsay River, Murray River and other waterways
- Potential for constructed regulators to restrict passage for fish and other aquatic fauna

***Groundwater***

Potential impacts from the interaction of groundwater with ecological values (terrestrial flora and fauna and aquatic fauna) from operating of the project as described by R8 (2020b) include:

- Potential for increased groundwater levels in inundated areas and some areas outside the managed Inundation Area to result in waterlogging if shallow groundwater persists in areas containing not flood-tolerant vegetation communities and species - further assessment is required to fully understand this potential impact, with monitoring and adaptive management proposed to mitigate this potential impact. Within the managed Inundation Area, EVCs are flood tolerant and therefore unlikely to be affected by waterlogging from shallow groundwater.
- Potential for near-surface salinisation in some areas outside of the managed inundation area in the medium to long term - further assessment is required to fully understand this potential impact, with monitoring and adaptive management proposed to mitigate this potential impact. Within the managed Inundation Area, local ecosystems may benefit from slight reductions in groundwater salinity. NSW Inundation Areas are anticipated to have less of a need for management with respect to near-surface salinisation but will be included in the adaptive management framework.
- Potential increase to nutrient load in soil profile and groundwater from flood waters - not expected to adversely impact local ecosystems.
- Potential for increased salt load in the Lindsay River downstream of the project area from mobilisation of salt from soil and groundwater to surface water (salt wash-off) potentially affecting water dependent ecosystems, and water quality for downstream irrigators - further assessment is required to fully understand this potential impact, with monitoring and adaptive management proposed to partly mitigate this potential impact.

The desktop groundwater assessment (R8, 2020b) identified that environmental watering could result in rising saline groundwater mounds under the Inundation Area and pushing into some areas outside the Inundation Area, which has the potential to cause waterlogging or salinity impacts on native vegetation in these areas.

Further assessment is required to fully understand this potential for rising saline groundwater mounds to impact native vegetation, listed species and communities outside the Inundation Area. Where a potential for impact is identified, monitoring (baseline and long-term vegetation condition data) and adaptive management is proposed to mitigate this potential impact. Mitigation measures for impacts to groundwater and ecosystems that are likely to have some reliance on groundwater are found in R8 (2020b). This includes recommendations for further assessment and establishment of a monitoring program to obtain baseline and long-term groundwater and vegetation condition data for areas potentially affected by waterlogging and near-surface salinisation. This data would inform an adaptive management program to mitigate potential adverse impacts on local ecosystems.

# 9. Impacts to threatened flora and fauna and communities

The following chapter outlines the impacts to threatened flora, fauna and communities resulting from construction and operation of the project.

## 9.1 Impacts to threatened vegetation communities

The PMST identified one EPBC Act listed endangered ecological community with potential to occur within 10 kilometres of the Area of Investigation: *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions*. There are a number of FFG Act-listed communities that may be synonymous with this EPBC listed community: Semi-arid Herbaceous Pine-Buloke Woodland Community, Semi-arid Herbaceous Pine Woodland Community, Semi-arid Northwest Plains Buloke Grassy Woodland Community, and Semi-arid Shrubby Pine-Buloke Woodland Community. These communities have the potential to correspond with one EVC known to occur within the current construction footprint (EVC 98) and two EVCs that had been modelled as occurring within the Inundation area by DELWP (EVC 97 and 98)

A small area of Semi-arid Chenopod Woodland (EVC 98) was identified at Crankhandle West B2 Regulator and Containment Bank (**Figure 4**). This vegetation corresponds with the EPBC Act listed community, *Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions*, and the FFG Act listed Semi-arid Shrubby Pine-Buloke Woodland Community. The patch of Semi-arid Chenopod Woodland (EVC 98) is not within the Construction Footprint of the proposed regulator or containment bank, and is located on the opposite side of an existing access track to the proposed infrastructure, within the current Construction Footprint of the access track. This access track is proposed to be used 'as is' and therefore significant track works are not anticipated to be required at this location. An arborist assessment has been recommended in this area to work with project engineers to identify opportunities to further avoid or minimise impacts to this small patch of Semi-arid Chenopod Woodland (EVC 98).

Ground-truthing assessments were undertaken across the Inundation Area in June 2020 targeting areas where Semi-arid Woodland EVCs had been modelled as occurring by DELWP. The ground-truthing assessment confirmed that there are no non-flood dependent EVCs within the Inundation Area, and that no impacts to the listed flora communities described above are likely to result from the proposed environmental watering.

A desktop review identified no other EVCs modelled to occur in the proposed Inundation Area that corresponds with any listed threatened flora communities. A ground-truthing field assessment will be undertaken in Spring 2020 to confirm the EVC mapping across a broader cross-section of the Inundation Area and to undertake surveys for listed flora species.

## 9.2 Impacts to threatened and protected flora

The following assessment of likelihood of occurrence and impact to threatened flora 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 habitat values observed within the Construction Footprint, or the habitat values either observed or modelled to occur in the Inundation Area.

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 / Inundation Area and species' known range encompasses the Construction Footprint / Inundation Area. Species recorded historically in the Study Area (10 km search radius), and generally within the last 30 years.

**UNLIKELY** – Species' known range encompasses the Construction Footprint / Inundation Area, but suitable habitat does not occur within Construction Footprint / Inundation Area, or occurs within Construction Footprint / Inundation Area but with generally low quality and quantity. Species recorded historically in the Study Area (10 km search radius) 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 (10 km search radius).

**Table 9** summarises the likelihood of occurrence and impact for EPBC Act and FFG Act listed 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 identified as potentially occurring in the Study Area is provided Appendix E.

The likelihood of occurrence and impact for threatened flora in the Inundation Area has been assessed at a desktop level only. It is considered likely that if any of the species considered possible within the Inundation Area were present, that impacts to the species from environmental watering would be positive (see Appendix E and **Table 9**). However it is considered possible that 104 flora species listed under the FFG Act and/or listed as DELWP Advisory List could be present within the Inundation Area (See Appendix E and **Table 4**). It is expected that if these species were present, any impacts resulting from the operational phase of the project would be positive to neutral.

Further discussion of likely construction impacts to flora listed under the EPBC Act and FFG Act / DELWP Advisory List are outlined in Sections 9.2.1 and 9.2.2 respectively, with impacts to FFG Act protected flora summarised in Section 9.2.3.

**Table 9 Summary of likelihood of occurrence / impact assessments for EPBC and FFG listed flora species with the potential to occur**

| Scientific Name | Common Name | EPBC Act | FFG Act | VICADV | Habitat | Likelihood of occurrence / impact | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Construction Footprint** | **Inundation Area** (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 melvillei* | Yarran | | L | vu | Scattered through north-western Victoria, mostly along Murray River and its flood-plain, often in woodland. | **Possible**. Suitable habitat was identified during survey, but not recorded in 2015 or 2019 surveys within the Construction Footprint. Was recorded in local area during AE 2013 surveys.<br><br>**Impact Unlikely.** Not recorded in targeted surveys of the Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Acacia oswaldii* | Umbrella Wattle | | L | vu | Possibility. Widespread but rather uncommon throughout north-western Victoria, mainly on calcareous sands or loam (Walsh & Entwisle 1996) | **Present.** Recorded during 2019 surveys, within Construction Footprint and broader Area of Investigation.<br><br>**Impact possible**. Installation of individual shrub No-Go zones will be needed to avoid impact on this species. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Atriplex acutibractea* subsp. *acutibractea* | Pointed Saltbush | | L | vu | Apparently confined to limestone-rich sandy soils in the far north west (e.g. Benetook, Carwarp, Nowingi etc.) and uncommon to rare. Fruits Mar.-Sep. (Walsh & Entwisle 1996). | **Possible.** Suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely.** Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**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 during survey, but not recorded in 2015 or 2019 surveys. Was recorded in local area during AE 2013 surveys.<br><br>**Impact Unlikely.** Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**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 | Likelihood of occurrence / impact | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Construction Footprint** | **Inundation Area** (Note: Impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present). |
| *Atriplex limbata* | Spreading Saltbush | | L | vu | In Victoria confined to the extreme north west and known from only a few collections from Mildura area and downstream along the Murray River floodplain (Lakes Wallawalla and Cullulleraine. Fruits Sep.-Feb. | **Possible**. Suitable habitat was identified during survey, but not recorded in 2015 or 2019 surveys. Was recorded in local area during AE 2013 surveys.<br><br>**Impact Unlikely.** Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *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) (Walsh & Entwisle 1996). | **Possible**. Suitable habitat was identified during survey, but not recorded in 2015 or 2019 surveys. Was recorded in local area during AE 2013 surveys.<br><br>**Impact Unlikely.** Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Craspedia haplorrhiza* | Plains Billy-buttons | | L | k | Usually on heavy soils or loamy sands, particularly on floodplains and seasonally wet depressions. Flowers spring and early summer. | **Possible.** Suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely.** Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Crinum flaccidum* | Darling Lily | | L | vu | Occurring on alluvial soils and beds of ephemeral streams. Rare in Victoria, confined to the extreme north-west along the Murray River floodplain west of its junction with the Darling River. | **Present.** Recorded several times during 2019 surveys as well as previous surveys, within Area of Investigation.<br><br>**Impact Possible:** Recorded in Area of Investigation immediately adjacent to the Construction Footprint. No-Go fencing needed to avoid impacts. | **Possible.** Could occur in Inundation Area.<br><br>**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 | Likelihood of occurrence / impact | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Construction Footprint** | **Inundation Area** (Note: Impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present). |
| *Cullen cinereum* | Hoary Scurf-pea | | L | en | Endangered in Victoria, known only from a few localities in the far north west of the state where it grows in moist depressions and on floodplains (Walsh & Entwisle 1996). | **Possible.** Suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely.** Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Cyperus nervulosus* | Annual Flat-sedge | | L | en | Apparently confined in Victoria to the far north-west (Mildura, Hattah Lakes, Robinvale) where occasional on damp sandy soil fringing receding water in lakes and watercourses (Walsh & Entwisle 1996). | **Possible.** Suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely.** Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Eleocharis obicis* | | VU | | vu | Rare, occurring in grasslands, associated with ephemeral wetlands and gilgai hollows | **Possible** This species was recorded in 2013 to the south of the Project Area, along the eastern banks of Lake Wallawalla. Some suitable habitat was identified during field assessments for the project, but the species was not recorded within the Construction Footprint in 2013, 2015 or 2019.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**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 | Likelihood of occurrence / impact | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Construction Footprint** | **Inundation Area** (Note: Impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present). |
| *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) | **Present** Identified during the 2019 targeted surveys within the Construction Footprint and within the Area of Investigation.<br><br>**Impact likely**. Recorded in targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**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** Identified during the 2019 targeted surveys within the Construction Footprint.<br><br>**Impact Possible**. Recorded in targeted surveys of Construction Footprint on edge of existing track, if track is widened, the individual could be impacted however No-go zones are proposed to be implemented to avoid impacts to this species | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Eremophila sturtii* | Narrow-leaf Emu-bush | | L | en | Confined in Victoria to the far north-west where a component of Belah (*Casuarina pauper*) and Sugarwood (*Myoporum platycarpum*) woodland on slightly higher ground of the Murray River floodplain. Formerly known from Merbein near Mildura, but apparently not collected from there since 1935. An outlier from Swan Hill (1950) is of uncertain source (possibly cultivated). Two pre-1900 collections labelled 'Wimmera' and 'Sandhurst' are of doubtful provenance. | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**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 | Likelihood of occurrence / impact | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Construction Footprint** | **Inundation Area** (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** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Isolepis congrua* | Slender Club-sedge | | L | vu | Apparently rare in Victoria, but possibly overlooked, recorded from cracking clay along the Murray River near Colignan and other seasonally wet areas at Mt Arapiles, near Donald, St Arnaud, Dadswell Bridge and Puckapunyal (Walsh & Entwisle 1996) | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Leiocarpa leptolepis* | Pale Plover-daisy | | L | en | In Victoria confined to Lindsay Is where found on heavy soils in riverine woodland (Walsh & Entwisle 1996). | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Lepidium monoplocoides* | Winged Peppercress | EN | L | en | Uncommon in north western quarter of state, mostly on heavy soils near lakes and watercourses. Flowers mostly spring-summer (Walsh & Entwisle 1996). | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys. This species hasn't been recorded within the Study Area for over 70 years.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area, however this species hasn't been recorded within the Study Area for over 70 years.<br><br>**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 | Likelihood of occurrence / impact | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Construction Footprint** | **Inundation Area** (Note: Impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present). |
| *Rhodanthe stricta* | Slender Sunray | | L | en | Known in Victoria from recent collections in the north-west where recorded from chenopod-dominated shrublands on the Murray River floodplain at Neds Corner Station, and a disjunct 1978 specimen purportedly from the Barmah Forest. It can be locally common following flooding of the river, but is otherwise very rare. | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Swainsona greyana* | Hairy Darling-pea | | L | en | Very rare and apparently confined in Victoria to the far north-west corner (Lindsay Is.) where found on heavy soils in riverine woodland. | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Swainsona phacoides* | Dwarf Swainsona-pea | | L | en | Apparently rare in Victoria, scattered in seasonally inundated habitats along the Murray Valley downstream from about Echuca (Walsh and Entwisle 1999). | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |
| *Swainsona purpurea* | Purple Swainson-pea | | L | en | In Victoria very rare and known only from the far north-west on the Raak Plains and near Lake Hattah. Grows in low-lying areas or on dunes, usually around lake margins in saline or gypseous soils. | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**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 | Likelihood of occurrence / impact | |
|---|---|---|---|---|---|---|---|
| | | | | | | **Construction Footprint** | **Inundation Area** (Note: Impact in this column pertains to the hypothetical scenario in which the species is actually present. However, many may not actually be present). |
| *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. | **Possible** when conditions are less dry. Some suitable habitat was identified during survey, but not recorded in 2013, 2015 or 2019 surveys.<br><br>**Impact Unlikely**. Not recorded in any targeted surveys of Construction Footprint. | **Possible.** Could occur in Inundation Area.<br><br>**Impact:** positive to neutral impact expected as the result of the operation of the project. |

### 9.2.1 EPBC Act listed threatened flora

Three species listed as threatened under the EPBC Act were identified by the PMST and VBA as potentially occurring within the Study Area, and the likelihood of occurrence and the potential for the project to significantly impact these species has been outlined below and in Appendix E and Appendix G. One additional species listed under the EPBC Act has also been considered during this assessment, *Eleocharis obicis* (Striate Spike-sedge). This species has no local records on the VBA (the nearest registered record of this species is over 90 km away near Managatang). However, a flora census of the Project Area (AE 2013) identified this species along the eastern banks of Lake Wallawalla. Targeted surveys were undertaken for this species within the Construction Footprint in 2015 and 2019, but this species has not been identified within the proposed Construction Footprint.

***Construction Footprint***

No EPBC Act listed flora species were recorded during current and previous surveys within the Construction Footprint and adjacent areas (2013, 2015 and 2019). However, of the four EPBC Act listed flora species identified by the desktop review, two are considered unlikely to occur, and it is considered possible that two species could be present:

- One species is considered **unlikely** to occur as it is only known to occur in NSW: *Atriplex infrequens* (Saltbush).
- One species is considered **unlikely** to occur due to the absence of suitable habitat within the Construction Footprint and/or Inundation Area (mallee scrub), and the lack of any records within 50 km of Lindsay Island: *Swainsona pyrophila* (Yellow Swainson-pea).
- Two species are considered **possible** to occur, due to the potential presence of suitable habitat within the Construction Footprint and/or Inundation Area, however no individuals of these species were recorded within the Construction Footprint during the 2013, 2015 or 2019 survey: *Eleocharis obicis* (Striate Spike-sedge) and *Lepidium monoplocoides* (Winged Peppercress).

***Inundation Area***

The likelihood of occurrence and impact for threatened flora in the Inundation Area has been assessed at a desktop level only. It is considered likely that if any of the species considered possible within the Inundation Area were present, that any impacts to the species from environmental watering would be positive (See Appendix E and **Table 9**).

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, 2020b). However areas of native vegetation fringing the Inundation Area have the potential to be negatively impacted by changes to groundwater level, flow and quality, to various extents, however it is currently unknown whether any potential impacts would be considered significant. Mitigation measures for groundwater is addressed in R8, 2020b, with key knowledge gaps identified to be investigated that would reduce uncertainty around potential risks. It is planned that a monitoring program will be established to obtain baseline and long-term vegetation condition data to allow for the determination of impacts from saline groundwater.

***Significance of impact assessments***

Potential impacts on the two EPBC Act listed flora species considered as having Construction Footprint / Inundation Area have been considered in relation to the EPBC Act Significant Impact Guidelines (see Appendix G), and it was determined that:

- The construction and operation of the project is not likely to have a significant adverse impact on the EPBC Act-listed *Eleocharis obicis* (Striate Spike-sedge) – This species was recorded in 2013 along the eastern banks of Lake Wallawalla, outside the proposed Construction Footprint and Area of Investigation. Although some suitable habitat is present, this species was not recorded within the construction footprint during targeted flora surveys in 2013, 2015 or 2019. It is anticipated that the proposed environmental watering will have a positive benefit for the species and its habitat, and will likely result in Lake Wallawalla becoming more reliably ephemeral, which would help the species persist in the area.

- The construction and operation of the project is not likely to have a significant adverse impact on the EPBC Act and FFG Act-listed *Lepidium monoplocoides* (Winged Peppercress) – Although there is a historic record of this species to the west of the national park from 1948, this species has not been recorded within 70 km of the project area since this time. Although some suitable habitat is present, this species was not recorded within the construction footprint during targeted flora surveys in 2013, 2015 or 2019. Although this species has not been recorded in the area for over 50 years, if it were present in the Inundation Area, the reinstatement of a more natural wetting / drying regime would likely be beneficial to this species persisting in the area.

### 9.2.2 FFG Act and DELWP Advisory listed threatened flora

Four species listed as threatened under the FFG Act were identified within or adjacent to the Construction Footprint during the targeted surveys in Spring 2019 (see **Table 5** and **Figure 4**). Steps to avoid and minimise impacts to these species during the refinement of Construction Footprints are outlined in Section 11.1. A summary of these species and potential impacts follows:

- *Acacia oswaldii* (Umbrella Wattle): Two individuals were recorded in the 'CR_D' Construction Footprint and another six individuals were found to be impacted in Construction Footprints associated with tracks during the 2019 surveys. (Note: Neither of the two individuals located at CR_D are located within the part of the construction footprint that that extends into NSW).
- *Crinum flaccidum* (Darling Lily): This species was not recorded in the Construction Footprints themselves, but several were recorded on higher terraces in the Area of Investigation surrounding the 'CW_A2' Construction Footprint and also in the Area of Investigation immediately adjacent to the 'WE_A' Construction Footprint during the 2019 surveys.
- *Eremophila bignoniiflora* (Bignonia Emu-bush): This species was uncommon but scattered, with two recorded in the Construction Footprint for 'BERR_D', including one in the large laydown area at Berribee. A third individual was recorded within the 'LS_A2' Construction Footprint and a fourth in the 'BERR_A1' Construction Footprint. There is also a group of 14 individuals of this species that are located on both sides of a small stretch of the Sandford track, which are proposed to be impacted by the Construction Footprint associated with the track in that location.
- *Eremophila maculata* subsp. *maculata* (Spotted Emu-bush): One individual was recorded in the Construction Footprint associated with tracks near the intersection of Bridge Track and Sandford Track.

The number of individual plants impacted of the FFG Act listed threatened species identified will not have a substantial impact on populations of these species in the local area, with evidence on site suggesting species like *Acacia oswaldii* (Umbrella Wattle) and *Eremophila bignoniiflora* (Bignonia Emu-bush) are relatively common in the Study Area, and after appropriate rainfall *Crinum flaccidum* (Darling Lily) can also be locally common.

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.

Eleven flora species listed under the DELWP Advisory List for threatened flora, including the four FFG Act listed species described above, were identified within and adjacent to the Construction Footprint during the 2019 surveys (see **Table 5** and **Figure 4**) and have the potential to be impacted by the proposed works.

### 9.2.3 FFG Act protected flora

During comprehensive surveys in 2015, 27 different flora species listed as protected under the FFG Act were recorded within the construction footprint current at that time and/or within a substantial buffer that generally covers most of the current Area of Investigation. Two additional protected flora species were recorded incidentally during the 2019 surveys. A summary of FFG Act protected flora, including the four FFG Act listed threatened species and DELWP Advisory List species, recorded within or adjacent to the construction footprint is provided in **Table 10.**

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

**Table 10 FFG Act protected flora recorded generally in the Area of Investigation during 2015 and 2019 flora surveys**

| Scientific name | Common Name | Possible Impacts within the Construction Footprint (estimated no. of individuals) |
|---|---|---|
| *Acacia oswaldii* | Umbrella Wattle | 8 |
| *Acacia rigens* | Nealie | 0 |
| *Acacia stenophylla* | Eumong | 100-200 |
| *Asteraceae* sp. | Asteraceae | <10 |
| *Boronia* sp. | Boronia | <10 |
| *Brachyscome ciliaris* | Variable Daisy | 400-500 |
| *Brachyscome lineariloba* | Hard-head Daisy | 50-100 |
| *Brachyscome* sp. | Daisy | <10 |
| *Calotis cuneifolia* | Blue Burr-daisy | 50-100 |
| *Calotis hispidula* | Hairy Burr-daisy | 50-100 |
| *Centipeda cunninghamii* | Old Man Weed | 200-300 |
| *Crinum flaccidum* | Darling Lily | 0 |
| *Eremophila bignoniiflora* | Bignonia Emu-bush | 4 |
| *Eremophila divaricata* subsp. *divaricata* | Spreading Emu-bush | 50-100 |
| *Eremophila glabra* | Common Emu-bush | 50-100 |
| *Eremophila maculata* subsp. *maculata* | Spotted Emu-bush | 1 |
| *Minuria cunninghamii* | Bush Minuria | 10-20 |
| *Olearia pimeleoides* | Pimelea Daisy-bush | 10-20 |
| *Polycalymma stuartii* | Poached-eggs Daisy | 20-50 |
| *Pycnosorus chrysanthes* | Golden Billy-buttons | 10-20 |
| *Senecio* sp. | Groundsel | <10 |
| *Senecio cunninghamii* var. *cunninghamii* | Branching Groundsel | 50-100 |
| *Senecio glossanthus* | Slender Groundsel | 20-50 |
| *Senecio quadridentatus* | Cotton Fireweed | 50-100 |
| *Senecio runcinifolius* | Tall Fireweed | 50-100 |
| *Swainsona greyana* | Hairy Darling-pea | <5 |
| *Vittadinia cuneata* | Fuzzy New Holland Daisy | 50-100 |
| *Xerochrysum bracteatum* | Golden Everlasting | <5 |

## 9.3 Impacts to listed fauna

**Table 11** summarises the likelihood of occurrence and impact for EPBC Act and FFG Act listed threatened and migratory fauna species considered possible or present within the Construction Footprint and/or Inundation Area. An assessment of likelihood of occurrence and impact to all listed threatened and migratory fauna identified as potentially occurring in the Study Area is provided Appendix D. Further discussion of likely construction and operational impacts to fauna listed under the EPBC Act and FFG Act / DELWP Advisory List are outlined in Section 9.3.1-9.3.5.

Not all of the 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:

**Likelihood of occurrence:**

**PRESENT** – Species known to occur within the Construction Footprint and/or Inundation Area, or detected during the site visit and targeted surveys associated with the VMFRP project.

**POSSIBLE** – Potentially suitable habitat occurs within the Construction Footprint and/or Inundation Area and species' known range encompasses the area. Species recorded historically in the Study 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 occur within these, or occurs within these 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.

**Table 11 Summary of likelihood of occurrence / impact assessments for EPBC and FFG listed threatened and migratory fauna species with potential to occur**

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

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| **MAMMALS** | | | | | | | | | |
| *Planigale gilesi* | Giles' Planigale | | L | | 12 | 2013 | VBA, GHD 2014 | **Possible.** Suitable habitat of soil cracks at all Construction Footprint sites.<br><br>**Impact Unlikely.** Species reasonably mobile and suitable surrounding habitat widespread. | **Present.** Recorded during 2013 surveys within Inundation Area. Suitable habitat of soil cracks common across Inundation Area, species recorded within Inundation Areas.<br>**Impact Unlikely.** Species is mobile and adapted to living on floodplains. Species likely to benefit from improved habitat condition following environmental water. |
| **BIRDS** | | | | | | | | | |
| *Struthidea cinerea* | Apostlebird | | L | | 41 | 2017 | VBA<br><br>GHD 2013 | **Possible.** Suitable habitat at all sites.<br><br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. | **Present.** Recorded during 2013 surveys within Inundation Area. Species likely to utilise habitats across the Inundation Area.<br>**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 | 0 | | PMST | **Unlikely.** No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** No previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Spatula rhynchotis* | Australasian Shoveler | | | vu | 8 | 2001 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Gelochelidon macrotarsa* | Australian Gull-billed Tern | | L | en | 2 | 1977 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Rostratula australis* | Australian Painted-snipe | EN | L | cr | | | PMST | **Unlikely.** No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Porzana pusilla* | Baillon's Crake | | L | vu | 1 | 2006 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Ninox connivens* | Barking Owl | | L | en | 2 | 1991 | VBA | **Possible.** Potentially suitable habitat present within Construction Footprints with larger trees.<br>**Impact Unlikely.** Species highly mobile and infrequently encountered in north-west Victoria and unlikely to breed at Lindsay Island. | **Possible.** Potentially suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species highly mobile and likely to benefit from improved habitat condition following environmental water. |
| *Falco subniger* | Black Falcon | | L | vu | 2 | 1988 | VBA | **Possible.** Potentially suitable foraging habitat present within Construction Footprints of open woodland.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. | **Possible.** Species may utilise habitats within Inundation Area.<br>**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 | 2 | 1987 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within inundation extent.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Burhinus grallarius* | Bush Stone-curlew | | L | en | 8 | 2013 | VBA,<br>GHD 2013 | **Possible.** Species may utilise habitats for foraging.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread | **Present.** Recorded during 2013 surveys within Inundation Area. Suitable habitat present within inundation extent.<br>**Impact Unlikely.** Species highly mobile and likely to benefit from environmental water when present. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Hydroprogne caspia* | Caspian Tern | | L | | 25 | 2013 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within inundation extent.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Tringa nebularia* | Common Greenshank | Mi | | vu | 3 | 2001 | VBA<br>PMST | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Three previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Actitis hypoleucus* | Common Sandpiper | Mi | | vu | | | PMST | **Unlikely.** No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** No previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Calidris ferruginea* | Curlew Sandpiper | CR<br>Mi | | en | | | PMST | **Unlikely.** No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** No previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Geopelia cuneata* | Diamond Dove | | L | | 3 | 1988 | VBA | **Possible**. Species may utilise habitats for foraging<br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread | **Possible.** Species may utilise habitats within Inundation Area.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Numenius madagascariensis* | Eastern Curlew | Mi | L | vu | | | PMST | **Unlikely.** No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** No previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Ardea modesta* | Eastern Great Egret | | L | vu | 48 | 2019 | VBA, GHD 2013 R8 2019 | **Present.** Recorded during 2013 and 2019 surveys at Berribee Regulator Construction Site. Species will utilise open water and wetland habitats for foraging<br><br>**Impact Unlikely**. Species highly mobile and wide ranging, suitable surrounding habitat widespread | **Present.** Recorded during 2013 and 2019 surveys within Inundation Area. Suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present and improvement in habitat afterwards. |
| *Stictonetta naevosa* | Freckled Duck | | L | en | 5 | 2012 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Apus pacificus* | Fork-tailed Swift | Mi | | | | | PMST | **Possible**. Species may fly over Construction Footprint while feeding.<br><br>**Impact Highly Unlikely**. Species extremely mobile and wide ranging, suitable surrounding habitat widespread. Species may benefit from insect proliferation following environmental water. | **Possible.** Species may fly over Inundation Area while feeding.<br>**Impact Unlikely.** Species extremely mobile and wide ranging, suitable surrounding habitat widespread. Species may benefit from insect proliferation following environmental water. |
| *Falco hypoleucus* | Grey Falcon | | L | en | 3 | 1988 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Species may utilise habitats within Inundation Area.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Motacilla cinerea* | Grey Wagtail | Mi | | | | | PMST | **Highly Unlikely.** No previous records, suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within Inundation Areas, and will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Pomatostomus temporalis* | Grey-crowned Babbler | | L | en | 3 | 1988 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Species may utilise habitats for foraging<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Coracina maxima* | Ground Cuckoo-shrike | | L | vu | 3 | 2019 | VBA.<br><br>Loyn *et al*. 2019 | **Possible**. Species may utilise habitats for foraging.<br><br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread. | **Present.** Species recorded within Inundation Areain 2019, may utilise habitats for foraging.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. |
| *Aythya australis* | Hardhead | | | vu | 13 | 2014 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within inundation extent.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Melanodryas cucullata* | Hooded Robin | | L | | 12 | 2005 | VBA<br><br>GHD 2013<br><br>GHD 2014 | **Possible**. Species may utilise habitats for foraging<br><br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread | **Present.** Recorded within Inundation Area. Suitable habitat across Inundation Area.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Charadrius australis* | Inland Dotterel | | | vu | 3 | 2004 | VBA<br><br>GHD 2013 | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Present.** Recorded during 2013 surveys within Inundation Area. Suitable habitat across Inundation Area.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Gallinago hardwickii* | Latham's Snipe/Japanese Snipe | Mi | | nt | | | PMST | **Unlikely**. No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** No previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species mobile and wide ranging. Species likely to benefit from improved habitat condition following environmental water. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Egretta garzetta* | Little Egret | | L | en | 7 | 2010 | VBA | **Possible**. Species may utilise open water and wetland habitats for foraging.<br><br>**Impact Unlikely**. Species highly mobile and wide ranging, suitable surrounding habitat widespread. | **Possible.** Suitable habitat across Inundation Area.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Lophochroa leadbeateri* | Major Mitchell's Cockatoo | | L | vu | 19 | 2001 | VBA | **Possible**. Species may utilise habitats for foraging.<br><br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread. | **Possible.** Suitable habitat across Inundation Area.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Biziura lobata* | Musk Duck | | | vu | 6 | 2014 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Pandion haliaetus* | Osprey | Mi | | | | | PMST | **Possible**. Species not recorded previously but may occasionally utilise habitats for foraging.<br><br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread. | **Possible.** Species not recorded previously but may occasionally utilise habitats for foraging.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. |
| *Grantiella picta* | Painted Honeyeater | VU | L | vu | | | PMST | **Possible**. Species not recorded previously but may occasionally utilise habitats for foraging.<br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread. | **Possible.** Species not recorded previously but may occasionally utilise habitats for foraging.<br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Species likely to benefit from improved habitat condition following environmental water. |
| *Calidris melanotos* | Pectoral Sandpiper | Mi | | nt | | | PMST | **Highly Unlikely**. No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** No previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint:<br>Likelihood of Occurrence / Impact | Inundation Area:<br>Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Ardea intermedia* | Plumed Egret | | L | en | en | 6 | 2003 | **Possible**. Species may utilise open water and wetland habitats for foraging<br>**Impact Unlikely**. Species highly mobile and wide ranging, suitable surrounding habitat widespread | **Possible.** Suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Turnix pyrrhothorax* | Red-chested Button-quail | | L | vu | 2 | 1991 | VBA | **Possible**. Species may occasionally utilise habitats for foraging<br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread | **Possible.** Suitable habitat present within Inundation Area.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| *Polytelis anthopeplus monarchoides* | Regent Parrot | VU | L | vu | 34 | 2009 | VBA<br>PMST<br>GHD 2013<br>GHD 2014<br>GHD 2016<br>R8 2019 | **Present**. Recorded across the Project Area and at a number of Construction Footprints (Berribee Regulator. (Berr_A), Toupnein Creek containment bank. (Berr_D), Little Mullaroo West regulator. (Berr_E) and Little Mullaroo regulator. (Berr_F)), with suitable foraging and potential nesting habitat within these Construction Footprints.<br>**Impact Unlikely**. Targeted surveys for nesting birds during breeding season at Construction Footprints containing potential nest trees did not record any breeding activity (only two old breeding records from 1984/85, likely to be the same birds and tree at the mouth of the Mullaroo Creek). Losses to relatively small area of foraging habitat proposed, however the species is highly mobile and wide ranging, suitable surrounding habitat widespread. | **Present.** Many recent previous records within the Project Area, with suitable foraging habitat across the Inundation Area.<br>**Impact Unlikely.** Species is highly mobile and wide ranging, suitable surrounding habitat widespread. Potentially important breeding habitat present within the Inundation Area, this breeding habitat (large old River Red-gums) likely to have condition improved, and future breeding habitat sustained by environmental watering. Species likely to benefit from broadly improved habitat condition following environmental water. Environmental water is essential to sustain the River Red-gums this species requires for breeding habitat. |
| *Calidris acuminata* | Sharp-tailed Sandpiper | Mi | | | 3 | 6/05/2001 | VBA, PMST | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat present within inundation extent.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Ptilonorhynchus maculatus* | Spotted Bowerbird | | L | cr | 1 | 1988 | VBA | **Possible**. Although not recorded in 30 years, suitable habitat present within Construction Footprint at Toupnein Creek containment bank. (Berr_D).<br><br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread. If present likely to benefit from improved ecological condition of Inundation Area | **Possible.** Although not recorded in 30 years, suitable habitat present across Inundation Area.<br>**Impact Unlikely.** Species mobile and wide ranging, potentially suitable surrounding habitat widespread. If present likely to benefit from improved ecological condition of Inundation Area |
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle | | L | vu | 18 | 2014 | VBA | **Possible**. Suitable habitat at Construction Footprints on Lindsay River (Berribee Regulator (Berr_A)) and Toupnein Creek containment bank (Berr_D).<br><br>**Impact Unlikely**. Species mobile and wide ranging, suitable surrounding habitat widespread | **Possible.** Suitable habitat across Inundation Area.<br><br>**Impact Unlikely.** Species mobile and wide ranging, suitable surrounding habitat widespread. Will likely benefit from environmental water when present and indirectly from improved habitat condition following environmental water. |
| *Motacilla flava* | Yellow Wagtail | Mi | | | | | PMST | **Highly Unlikely**. No previous records. Suitable habitat not present within Construction Footprints. | **Possible.** No previous records. Suitable habitat not present within Inundation Areas currently, but will be created by environmental watering and species likely to benefit from environmental water when present.<br>**Impact Unlikely.** Species likely to benefit from environmental water when present. |
| **AMPHIBIANS** | | | | | | | | | |
| *Litoria raniformis* | Growling Grass Frog | VU | L | en | 25 | 2016 | VBA,<br><br>PMST,<br><br>GHD 2013 | **Present**. Recorded in 2012 at the Toupnein Creek containment bank (Berr_D) Construction Footprint while minor flooding was occurring. Has potential to occur at any construction sites when water is present. Potential aquatic habitat within the Murray and Lindsay Rivers, Mullaroo and Little Mullaroo Creeks.<br><br>**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. | **Present.** Recorded in 2012 at the Toupnein Creek containment bank (Berr_D) Construction Footprint while minor flooding was occurring. Has potential to occur across the Inundation Area when water is present. Potential aquatic habitat within the Murray and Lindsay Rivers, Mullaroo and Little Mullaroo Creeks and all of floodplain when wet from localised rain or river flows.<br>**Impact Unlikely.** Species almost certain to benefit directly from greatly expanded habitat when environmental water is present, and indirectly from improved habitat condition following environmental water. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| **REPTILES** | | | | | | | | | |
| *Chelodina expansa* | Broad-shelled Turtle | | L | en | | | Seran *et al* 2018 | **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.<br><br>**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 (see section 11) | **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. Suitable habitat expected to increase during environmental watering.<br><br>**Impact Possible.** Species may benefit from greatly expanded temporary habitat when environmental water is present and flowing habitat and connectivity is improved through the Mullaroo Creek and Lindsay River. |
| *Morelia spilota metcalfei* | Carpet Python | | L | en | 6 | 2008 | VBA | **Possible**. Suitable habitat at all sites<br><br>**Impact Possible**. Localised impacts possible, consideration of finalised footprint required to avoid hollow-bearing trees and large woody debris. Suitable habitat surrounding and widespread | **Possible.** Suitable habitat across inundation extent.<br><br>**Impact Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water. |
| *Denisonia devisi* | De Vis' Banded Snake | | | cr | 7 | 2010 | VBA | **Possible**. Suitable habitat at all sites<br><br>**Impact Possible**. Localised impacts possible, consideration of finalised footprint required. Suitable habitat surrounding and widespread | **Possible.** Suitable habitat across inundation extent.<br><br>**Impact Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water. |
| *Varanus varius* | Lace Monitor | | L | en | 8 | 1998 | VBA,<br><br>GHD 2013,<br><br>GHD 2014 | **Possible**. Suitable habitat at all sites<br><br>**Impact Possible**. Localised impacts possible, consideration of finalised footprint required to avoid hollow-bearing trees and large woody debris. Suitable habitat surrounding and widespread | **Present.** Recorded during 2013 and 2014 surveys within Inundation Area. Suitable habitat across inundation extent.<br><br>**Impact Unlikely.** Species likely to benefit from environmental water when present, and indirectly from improved habitat condition following environmental water. |

| Species Name | Common Name | EPBC Act | FFG Act | VICADV | Number of Records | Most Recent Record | Source | Construction Footprint: Likelihood of Occurrence / Impact | Inundation Area: Likelihood of Occurrence / Impact |
|---|---|---|---|---|---|---|---|---|---|
| *Furina diadema* | Red-naped Snake | | L | vu | 6 | 2010 | VBA | **Possible**. Suitable habitat at all sites<br>**Impact Possible**. Localised impacts possible. Suitable habitat surrounding and widespread. | **Possible.** Suitable habitat across inundation extent.<br>**Impact Unlikely.** Species likely to benefit indirectly from improved habitat condition following environmental water. |
| *Morethia adelaidensis* | Samphire Skink | | L | en | 6 | 1999 | VBA | **Unlikely.** Suitable habitat not present within Construction Footprints. | **Possible.** Suitable habitat across inundation extent.<br>**Impact Unlikely.** Species likely to benefit indirectly from improved habitat condition following environmental water. |
| **FISH** | | | | | | | | | |
| *Maccullochella peelii* | Murray Cod | VU | L | vu | 10 | 2017 | VBA, PMST MDFRC 2016 | **Present**. Mullaroo Creek and Lindsay River are recognised as nationally important self-sustaining populations of Murray Cod.<br>**Impact Possible**. Refer to Section 9.3.1. | **Present.** Mullaroo Creek and Lindsay River are recognised as nationally important self-sustaining populations of Murray Cod.<br>**Impact Likely.** Refer to Section 9.3.1. |
| *Bidyanus bidyanus* | Silver Perch | CR | L | vu | 14 | 2017 | VBA, PMST MDFRC 2016 | **Present.** Species is known from area and suitable habitat present.<br>**Impact Possible**. Refer to Section 9.3.1. | **Present.** Species is known from area and suitable habitat present.<br>**Impact Likely.** Refer to Section 9.3.1. |
| *Melanotaenia fluviatilis* | Murray-Darling Rainbowfish | | L | vu | | | DELWP (2018) | **Present.** Species is known from area and suitable habitat present in wetlands and waterways within the complex.<br>**Impact Possible.** Refer to Section 9.3.3. | **Present.** Species is known from area and suitable habitat present in wetlands and waterways within the complex.<br>**Impact Possible.** Refer to Section 9.3.3. |
| *Craterocephalus stercusmuscarum fulvus* | Unspecked Hardyhead | | L | | | | DELWP (2018) | **Present.** Species is known from area and suitable habitat present in wetlands and waterways within the complex.<br>**Impact Possible.** Refer to Section 9.3.3. | **Present.** Species is known from area and suitable habitat present in wetlands and waterways within the complex.<br>**Impact Possible.** Refer to Section 9.3.3. |
| *Tandanus tandanus* | Freshwater Catfish | | L | en | | | DELWP (2018) | **Present.** Species is known from area and suitable habitat present in wetlands and waterways within the complex.<br>**Impact Possible.** Refer to Section 9.3.3. | **Present.** Species is known from area and suitable habitat present in wetlands and waterways within the complex.<br>**Impact Possible**. Refer to Section 9.3.3. |

### 9.3.1 Impacts to EPBC Act listed threatened fauna species

Five EPBC Act listed threatened fauna species were identified as either present or as possibly occurring within the Construction Footprint: Regent Parrot (*Polytelis anthopeplus monarchoides*), Growling Grass Frog (*Litoria raniformis*), Painted Honeyeater (*Grantiella picta*), Murray Cod (*Maccullochella peelii*) and Silver Perch (*Bidyanus bidyanus*). Potential impacts on these species from the proposed construction and operation of the project have been considered below. An assessment against the relevant significant impact criteria contained in the EPBC Act Significant Impact Guidelines 1.1: Matters of National Environmental Significance (DOTE, 2013) for the five species identified here as present or possibly occurring has been made in Appendix H.

An additional four EPBC Act listed threatened fauna species were identified as possibly occurring within the Inundation Areas Australasian Bittern (*Botaurus poiciloptilus*), Australian Painted Snipe (*Rostratula australis*), Curlew Sandpiper (*Calidris ferruginea*) and Eastern Curlew (*Numenius madagascariensis*).

Although unlikely to occur in either the construction footprint or inundation area, the South-eastern Long-eared Bat is discussed here and in Appendix H and I for completeness as it was identified as potentially impacted in the EPBC Act referral decision notice for the Vinifera Floodplain Restoration Project.

***Terrestrial Fauna***

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

The eastern Regent Parrot was observed numerous times across the Project Area during surveys in 2012 (GHD 2013), 2013 (GHD 2014) and 2019 (this study), and at a number of the Construction Footprints, with potential breeding habitat (nest trees) identified within four of the proposed Construction Footprints (Berribee regulator (Berr_A), Toupnein Creek containment bank (Berr_D), Little Mullaroo West regulator (Berr_E) and Little Mullaroo regulator (Berr_F)). Breeding activity by this species has only been confirmed within the broader Lindsay Island area on two previous occasions; in 1984 and 1985 (VBA), both close to Lock 7 (potentially the same birds in the same tree in consecutive years). It is not clear if these breeding attempts were successful.

Experience from the previous, similar Hattah Lakes The Living Murray (TLM) project made identifying potential Regent Parrot nest trees at proposed infrastructure and Construction Footprints a priority. Detection and avoidance of potential Regent Parrot nest trees and colonies has been a key consideration of the Lindsay Island project from its inception, and prompted the initial targeted surveys using the THPS method for this species in 2012. Well studied Regent Parrot nesting colonies at Hattah, Yungera Island and Peacock Creek in NSW (Webster 2002, Webster 2004, Webster & Belcher 2005, Webster & Belcher 2008, GHD 2009, GHD 2013, GHD 2014) have often shown these colonies to be located at the particularly large River Red-gums which frequently grow at the confluences of major creeks and tributaries of the Murray River, the locations where large, key water management infrastructure is required to direct or retain water into and from the floodplain. Planning throughout the Lindsay Island project has made allowance for and prioritised survey for this species.

The four Construction Footprints containing potential Regent Parrot breeding habitat were all subsequently targeted for further investigation. A total of 22 targeted surveys for Regent Parrot nest trees were completed in 2012 and 32 targeted surveys in 2019 (**Table 7**), using the THPS method during the breeding period October and November. Low levels of Regent Parrot activity were observed in each of these areas, no breeding activity was observed, and it is considered very unlikely that nesting was occurring at these sites. The results of these surveys are provided in Section 6.3.3.

Impacts to Regent Parrots from the construction of infrastructure are expected to be marginal at most, and likely nil. From a landscape perspective the proposed Construction Footprints represent a relatively small area of around 105.89 ha (0.706%) of potential foraging habitat, within a total area of approximately 15,000 ha of Lindsay Island, centred largely on existing tracks and degraded areas, within a broader, very large intact area of tens of thousands of high quality native vegetation along the Murray River corridor.