

**MEMO**

# LAKE THROSSELL TEN CLEARING PRINCIPLES

PREPARED FOR: TRIGG MINING PTY LTD



**Spectrum**  
ECOLOGY & SPATIAL



© Spectrum Ecology Pty Ltd

ABN 68 615 115 243

PO Box 314 Leederville

Western Australia 6902

Ph: (08) 9317 8233

Email: [info@spectrumecology.com.au](mailto:info@spectrumecology.com.au)



| Project ID: 2226 |  | Lake Throssell Ten Clearing Principles   |  |
|------------------|--|--|--|
| Prepared for:    |  | Trigg Mining                             |  |
| Date of issue:   |  | 28/06/22                                 |  |
| Prepared by:     |  | Emily Crowther                           |  |
| Spectrum Review: |  | Chris Shaw, Melissa Hay, Astrid Heidrich |  |

This document has been prepared to the requirements of the client identified on the cover page and no representation is made to any third party. It may be cited for the purposes of scientific research or other fair use, but it may not be reproduced or distributed to any third party by any physical or electronic means without the express permission of the client for whom it was prepared or Spectrum Ecology Pty Ltd.

## TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>1. INTRODUCTION</b> .....                                   | <b>2</b>  |
| 1.1. LAKE THROSSSELL .....                                     | 2         |
| 1.2. BIOLOGICAL SURVEYS.....                                   | 4         |
| 1.3. ASSESSMENT OBJECTIVES .....                               | 4         |
| 1.4. BIOREGION.....  | 4         |
| 1.5. BEARD VEGETATION.....                                     | 5         |
| <b>2. FLORA</b> .....  | <b>10</b> |
| 2.1. LITERATURE REVIEW.....                                    | 10        |
| 2.1.1. Detailed Flora & Vegetation Assessment.....             | 11        |
| 2.1.2. Significant Flora .....                                 | 11        |
| 2.1.3. Significant Lands.....                                  | 11        |
| <b>3. VEGETATION</b> .....                                     | <b>15</b> |
| 3.1. VEGETATION TYPES.....                                     | 15        |
| 3.2. VEGETATION CONDITION .....                                | 17        |
| <b>4. VERTEBRATE FAUNA</b> .....                               | <b>17</b> |
| 4.1. LITERATURE REVIEW.....                                    | 17        |
| 4.1.1. Fauna Assemblage .....                                  | 17        |
| 4.1.2. Conservation Significant Fauna.....                     | 18        |
| 4.2. FAUNA HABITATS .....                                      | 20        |
| <b>5. ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES</b> ..... | <b>21</b> |
| <b>6. CONCLUSIONS</b> .....                                    | <b>25</b> |
| <b>7. REFERENCES</b> .....                                     | <b>26</b> |

## MAPS

|   |    |
|---|----|
| Map 1.1: Lake Throssell Project Area & Proposed Exploration Footprint ..... | 3  |
| Map 1.2: Beard Vegetation Mapping.....                                      | 9  |
| Map 2.1: Locations of Significant Flora & Fauna .....                       | 13 |
| Map 2.2: Significant Lands .....  | 14 |

## TABLES

|  |    |
|--|----|
| Table 1.1: Beard Vegetation Sub-Associations.....  | 6  |
| Table 2.1: Previously Conducted Flora Assessments .....  | 10 |
| Table 2.2: Significant Lands .....   | 12 |
| Table 3.1: Vegetation Types .....  | 15 |
| Table 4.1: Previously Conducted Fauna Assessments .....  | 17 |
| Table 4.2: Conservation Significant Fauna Recorded or Potentially Occurring in the Project Area..... | 19 |
| Table 4.3: Fauna Habitats within the Project Area .....  | 20 |
| Table 5.1: Ten Native Vegetation Clearing Principles.....  | 21 |

## 1. INTRODUCTION

Trigg Mining Pty Ltd (Trigg) plan to conduct ongoing exploration activities within their Lake Throssell project, located 200 km north-east of Laverton in the Great Victoria Desert IBRA region (Central subregion) of Western Australia. A draft, proposed disturbance footprint for an exploration program is displayed on Map 1.1. This disturbance footprint is in draft format as they may be moved if required during the exploration process, therefore a Native Vegetation Clearing Permit (NVCP) is being sought to cover a larger area (the Project Area) at Lake Throssell.

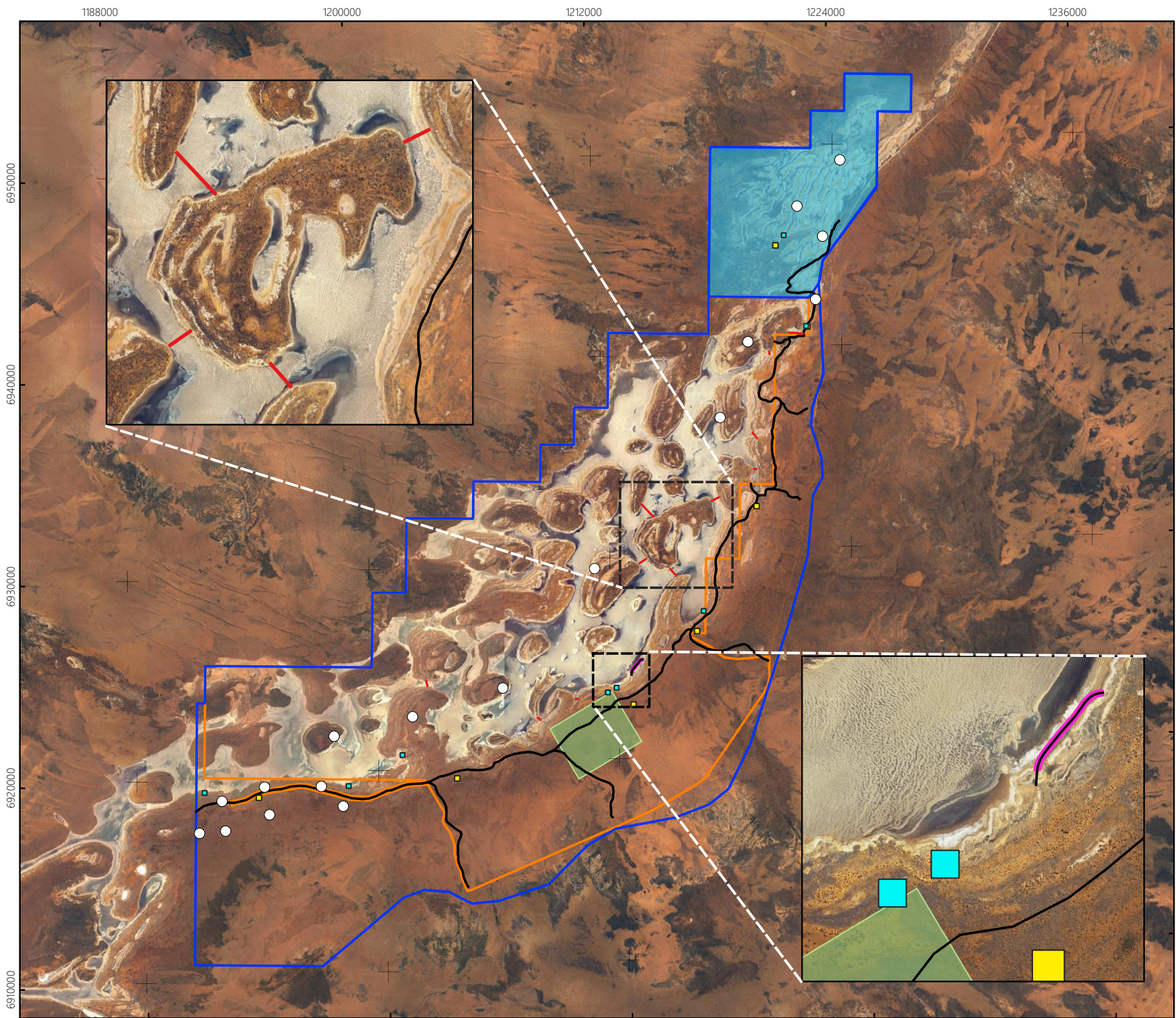
Previous biological survey extents do not cover the entire Project Area, however, through aerial analysis the assessment on the ten clearing principles includes the unsurveyed southern section of the Project Area due to very close similarities in aerial patterning. However, the unsurveyed northern section of the Project Area will require further survey effort and has not been included in the analysis of the ten clearing principles, as the aerial imagery is different to the areas surveyed and could potentially support additional flora, vegetation, and fauna not recorded during in the current survey (Map 1.1).

### 1.1. Lake Throssell

The Project Area is located 180 km east of Laverton and covers approximately 64,000 ha (Map 1.1). The Project Area encompasses Lake Throssell, an ephemeral saline lake extending up to 75 km in length and 10 km in width. The lake is seasonally inundated by rainfall events and localised drainages, the largest of which occurs in the west of the lake. The Project Area varied in vegetation density, with broad flat plains in the lake centre supporting low species richness, and Mulga woodlands along the eastern border of the Project Area supporting higher species richness and vegetation density. Eight vegetation types and seven fauna habitats occur within the Project Area.

The proposed exploration footprint totals 129.9 ha (0.2% of the Project Area) and the infrastructure is distributed throughout (Map 1.1). The proposed exploration footprint includes areas designated for the access tracks, causeway, excavations, camps, laydowns, groundwater bores, and geotechnical test pits.





**Legend**

- Previous Survey Area
- Project Area
- Not included in assessment
- Exploration Footprint**
- Conceptual Water Bores
- Causeway Excavations
- Access Tracks
- Burrow Pit
- Camps
- Laydowns
- Test pits (Geotech) polygon



0 1 2 3 4 5 km  
 Scale 1:259,000 @ A4  
Coordinate System: GDA 1994 MGA Zone 51  
 Projection: Transverse Mercator  
 Units: Meter

Author: EC Date: 30-06-2022

**Lake Throssell Project Area & Proposed Exploration Footprint**

NVCP Ten Clearing Principles



## 1.2. Biological Surveys

A detailed flora and vegetation assessment was undertaken by Maia (Maia, 2021a) at the Lake Throssell project. The report for this assessment is currently in preparation, however a site by species matrix was provided which listed the full species inventory for the Maia 2021 Survey Area. In addition, Maia undertook a targeted flora and vegetation survey at Lake Throssell in 2021 (Maia, 2021a) to support a NVCP of a smaller section within the Project Area. This memo report detailed some of the results from the detailed assessment and this has been used in this assessment.

Western Wildlife undertook a single-phase detailed vertebrate fauna survey in 2021 (Western Wildlife, 2021a). The report for this assessment is currently in prep, however an interim draft version was available for use.

The flora and fauna assessments conducted did not cover the entirety of the Project Area being assessed in this report (Map 1.1). Satellite analysis of the Project Area suggests that the vegetation in the south is reliably homogenous. Therefore, this report includes the unsurveyed south section of the Project Area in its analysis of the ten clearing principles. The unsurveyed northern section of the Project Area is not included in the analysis of the ten clearing principles, as the vegetation is variable and could not be reliably assessed using satellite imagery.

## 1.3. Assessment Objectives

The objective of the NVCP supporting report is to provide:

- A brief review of the regional environment;
- A brief review of significant flora and fauna species previously recorded in the area;
- A brief discussion of the conservation significance of the flora, fauna, and vegetation of the exploration area; and
- An assessment against the ten clearing principles required for an NVCP application Table 5.1.

## 1.4. Bioregion

The Great Victoria Desert IBRA region is made up of six sub regions and three are located within Western Australia: Shield, Central, and Eastern. The Project Area is in the middle-western section of the Great Victoria Desert within the Central IBRA subregion. The Central subregion is characterised by arid active sand-ridge deserts with extensive dune fields of deep Quaternary aeolian sands overlying Permian strata of the Gunbarrel Basin (Barton and Cowan, 2001). Landforms consist of salt lakes and major valley floors with lake derived dunes. Sand plains with extensive seif dunes running east west, occasional outcropping (breakaways) and quartzite hills provide minor relief. The Central subregion is mainly used for UCL and Crown reserves (78.9%) with lesser areas of grazing (4.4%), Aboriginal Reserve (7.4%), Conservation Reserves (9.1%), and a small area for lakes and watercourses (0.2%; Barton and Cowan, 2001).

## 1.5. Beard Vegetation

Pre-European vegetation mapping was originally undertaken by Beard at various scales across the state and has since been updated to be consistent with the National Vegetation Information System (NVIS) descriptions at a scale of 1:250,000 (Department of Primary Industry and Regional Development, 2019). State-wide vegetation statistics are available from 2018 for these associations which lists pre-European extent, current extent, area in DBCA managed lands and is a tool to determine if a vegetation association is rare or otherwise significant (Government of Western Australia, 2019).

The Project Area occurs across eight difference vegetation sub-associations (SA18.15, SA19.1, SA24.3, SA39.9, SA45.1, SA84.0, SA125.0, SA676.22), including five mosaics. The most widespread sub-associations were SA24.3 and SA676.22, which were mapped as 41.0% and 33.1% of the Project Area. Both sub-association (SA24.3 and SA676.22) appear to be regionally restricted, with 11.6% and 10.4% of their total extents located within the Project area, respectively. Over 99.9% of the pre-European vegetation extent remains for all eight sub-associations.

The vegetation sub-associations are listed in Table 1.1 and displayed on Map 1.2.

Table 1.1: Beard Vegetation Sub-Associations

| SA    | NVIS Level V Description  | Area in Project Area (ha) | % of Project Area | Pre-European Extent WA (ha) | Current Extent WA (ha) | Current GVD Extent WA (ha) | % Remaining | % of Current WA Extent in Project Area | % Current GVD Extent in Project Area |
|-------|---|---------------------------|-------------------|-----------------------------|------------------------|----------------------------|-------------|--|--------------------------------------|
| 18.15 | <i>Acacia aneura</i> , <i>Acacia pruinocarpa</i> , and <i>Acacia ramulosa</i> var. <i>linophylla</i> tall open shrubland, over <i>Schoenia cassiniana</i> , <i>Podolepis canescens</i> , and <i>Waitzia acuminata</i> low sparse forbland.  | 614.9                     | 1.0               | 1,949,199                   | 1,949,199              | 1949030                    | 100.0       | 0.0                                    | 0.0                                  |
| 19.1  | <b>Mosaic 1:</b><br><i>Acacia aneura</i> , <i>Acacia pruinocarpa</i> , and <i>Acacia ramulosa</i> var. <i>linophylla</i> tall open shrubland, over <i>Schoenia cassiniana</i> , <i>Podolepis canescens</i> , and <i>Waitzia acuminata</i> low sparse forbland.<br><b>Mosaic 2:</b><br><i>Acacia aneura</i> tall open shrubland, over <i>Triodia basedowii</i> mid open hummock grassland.<br><b>Mosaic 3</b><br><i>Grevillea junceifolia</i> , <i>Grevillea eriostachya</i> , and <i>Hakea lorea</i> tall sparse shrubland, over <i>Triodia basedowii</i> low open hummock grassland. | 0.3                       | 0.0               | 2868777                     | 2,868,344              | 2865491                    | 100.0       | 0.0                                    | 0.0                                  |
| 24.3  | <b>Mosaic 1</b><br><i>Casuarina cristata</i> low woodland, over <i>Acacia aneura</i> , <i>Pittosporum phillyreoides</i> , and <i>Eremophila miniata</i> tall sparse shrubland, over <i>Ptilotus obovatus</i> low open forbland.<br><b>Mosaic 2</b><br><i>Casuarina cristata</i> low open shrubland, over <i>Eremophila miniata</i> and <i>Acacia</i> sp. tall sparse shrubland.   | 26,262.4                  | 41.0              | 226,208                     | 226,208                | 225,874                    | 100.0       | 11.6                                   | 11.6                                 |
| 39.9  | <b>Mosaic 1</b><br><i>Acacia aneura</i> , <i>Acacia sibirica</i> , and <i>Eucalyptus oxymitra</i> tall sparse mallee shrubland, over <i>Cryptandra</i> sp., <i>Calytrix longiflora</i> , and <i>Gompholobium polyzygum</i> low sparse shrubland.  | 723.8                     | 1.1               | 1,184,525                   | 1,184,525              | 1,183,011                  | 100.0       | 0.1                                    | 0.1                                  |

| SA   | NVIS Level V Description  | Area in Project Area (ha) | % of Project Area | Pre-European Extent WA (ha) | Current Extent WA (ha) | Current GVD Extent WA (ha) | % Remaining | % of Current WA Extent in Project Area | % Current GVD Extent in Project Area |
|------|---|---------------------------|-------------------|-----------------------------|------------------------|----------------------------|-------------|--|--------------------------------------|
|      | <p><b>Mosaic 2</b><br/><i>Eucalyptus oxymitra</i> low open mallee woodland, over <i>Acacia grasbyi</i>, <i>Hakea rhombales</i>, and <i>Acacia sibirica</i> mid open shrubland, over <i>Triodia pungens</i> low sparse hummock grassland.</p> <p><b>Mosaic 3</b><br/><i>Acacia aneura</i>, <i>Acacia pruinocarpa</i>, and <i>Acacia tetragonophylla</i> low woodland, over <i>Eremophila latrobei</i>, <i>Senna artemisioides</i> subsp. <i>sturtii</i>, and <i>Senna</i> sp. mid sparse shrubland, over <i>Ptilotus exaltatus</i>, <i>Helipterum floribundum</i>, and <i>Waïtzia acuminata</i> low sparse forbland.</p> <p><b>Mosaic 4</b><br/><i>Eucalyptus</i> sp. mid sparse mallee shrubland with <i>Acacia aneura</i> and <i>Eremophila</i> sp. aff. <i>hughesii</i> mid sparse shrubland, over <i>Helipterum adpressum</i> sparse forbland, <i>Sarcostemma australe</i> sparse vineland, or <i>Triodia melvillei</i> spare hummock grassland.</p> |                           |                   |                             |                        |                            |             |  |                                      |
| 45.1 | <p><b>Mosaic 1</b><br/><i>Eucalyptus gamophylla</i> and <i>Eucalyptus oxymitra</i> low mallee woodland, over <i>Acacia helmsiana</i>, <i>Grevillea eriostachya</i>, and <i>Acacia salicina</i> tall sparse shrubland, over <i>Triodia basedowii</i> and <i>Triodia melvillei</i> mid sparse hummock grassland.</p> <p><b>Mosaic 2</b><br/><i>Acacia salicina</i>, <i>Santalum acuminatum</i>, and <i>Melaleuca lasiandra</i> tall open shrubland.</p> <p><b>Mosaic 3</b></p>  | 4.2                       | 0.0               | 170,390                     | 170,390                | 170,380                    | 100.0       | 0.0                                    | 0.0                                  |



| SA     | NVIS Level V Description   | Area in Project Area (ha) | % of Project Area | Pre-European Extent WA (ha) | Current Extent WA (ha) | Current GVD Extent WA (ha) | % Remaining | % of Current WA Extent in Project Area | % Current GVD Extent in Project Area |
|--------|--|---------------------------|-------------------|-----------------------------|------------------------|----------------------------|-------------|--|--------------------------------------|
|        | <i>Eucalyptus comitae-vallis</i> mid mallee woodland, over <i>Triodia basedowii</i> mid sparse hummock grassland.<br><b>Mosaic 4</b><br><i>Eucalyptus oleosa</i> mid mallee woodland, over <i>Triodia basedowii</i> and <i>Triodia scariosa</i> mid sparse hummock grassland.  |                           |                   |                             |                        |                            |             |  |                                      |
| 84     | <i>Eucalyptus gongylocarpa</i> low isolated trees, over <i>Eucalyptus youngiana</i> low isolated mallee trees, over <i>Triodia basedowii</i> low open hummock grassland.   | 8,176.0                   | 12.8              | 1,799,366                   | 1,799,366              | 1,781,533                  | 100.0       | 0.5                                    | 0.5                                  |
| 125    | <i>Tecticornia halocnemoides</i> , <i>Tecticornia indica</i> subsp. <i>leiostachya</i> , and <i>Sesuvium portulacastrum</i> low open samphire shrubland.   | 7,008.0                   | 11.0              | 3,483,840                   | 3,144,541              | 225,109                    | 100.0       | 0.2                                    | 3.1                                  |
| 676.22 | <b>Mosaic 1</b><br><i>Eucalyptus oleosa</i> , <i>Eucalyptus</i> sp. mid open mallee woodland over <i>Triodia pungens</i> , <i>Triodia scariosa</i> mid open hummock grassland.<br><b>Mosaic 2</b><br><i>Melaleuca glomerata</i> tall shrubland.<br><b>Mosaic 3</b><br><i>Roepera fruticulosa</i> and <i>Atriplex</i> sp. low open chenopod shrubland.<br><b>Mosaic 4</b><br><i>Tecticornia</i> sp., <i>Frankenia</i> sp., and <i>Atriplex</i> low open chenopod shrubland. | 21,193.4                  | 33.1              | 213,448                     | 212,926                | 204,571                    | 100.0       | 10.0                                   | 10.4                                 |

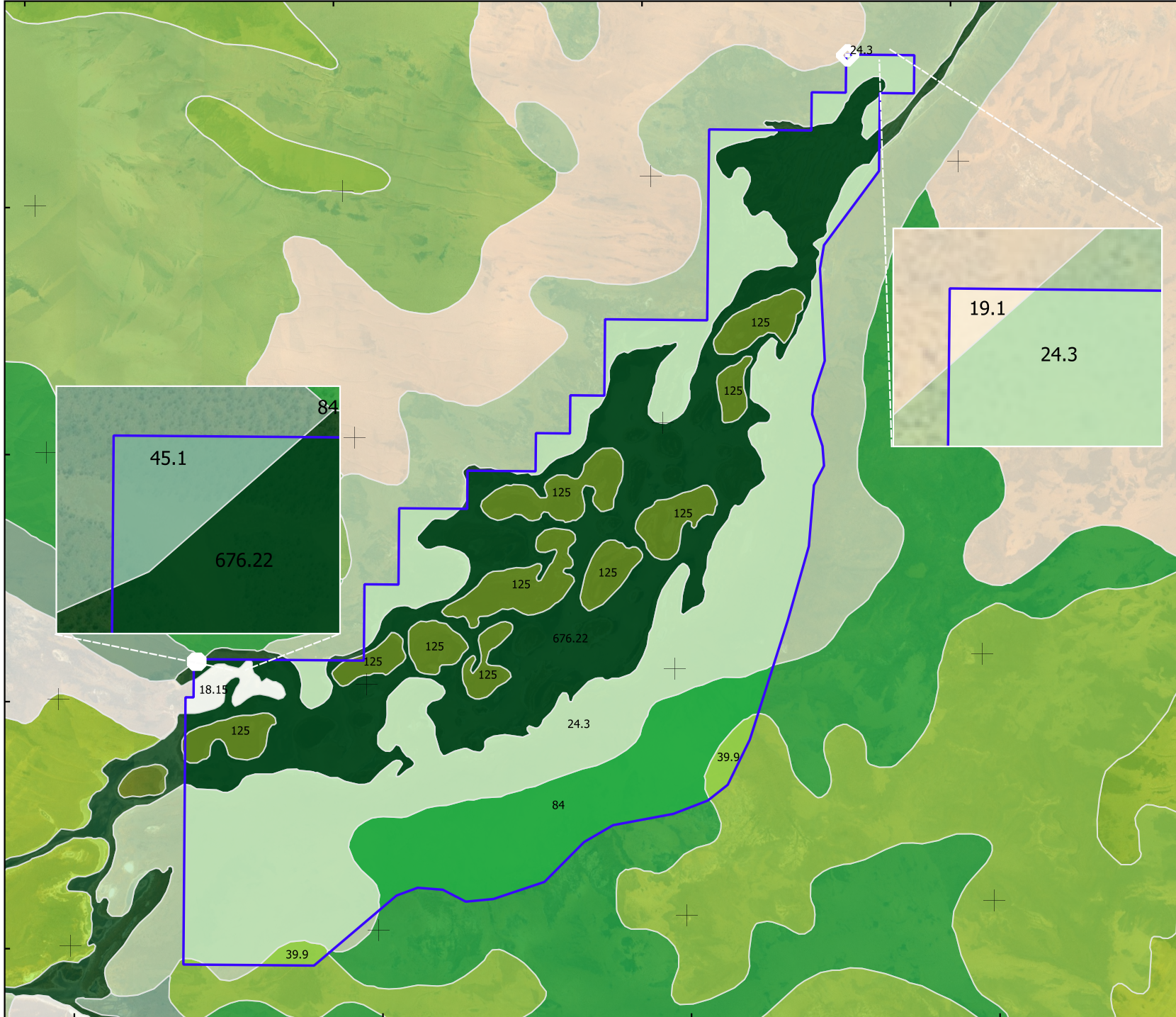
1185000 1200000 1215000 1230000

6948000

6936000

6924000

6912000



### Legend

Project Area

#### Beard Vegetation Mapping Units

- 18.15
- 19.10
- 24.30
- 39.90
- 45.10
- 84.00
- 125.00
- 676.22



0 1 2 3 4 5 km

Scale 1:259,000 @ A4

Coordinate System: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Units: Meter



Author: EC

Date: 29-06-2022

## Beard Vegetation Mapping

NVCP Ten Clearing Principles

MAP

# 1.2

Prepared for  
Trigg Mining Pty Ltd

## 2. FLORA

### 2.1. Literature Review

Two desktop assessments were undertaken by Maia (2021) and Blueprint (2020) to estimate the likelihood of Conservation Significant species occurring within the Project Area. The desktop assessment identified one Threatened species, *Seringia exastia*, approximately 8.5 km northeast of the Project Area. *Seringia exastia* is in the process of being reclassified and synonymised with *S. elliptica*, this newly circumscribed species will represent a common and widespread taxon that does not meet any of the conservation listing criteria (Binks *et al.*, 2020). Maia undertook a targeted flora and vegetation survey, the results of which were summarised in the survey results and clearing principles short report (Maia, 2021a). This short report identified the presence of the Priority Flora taxon *Melaleuca apostiba* (Priority 3) within the Project Area, in addition to a potential new species of *Tecticornia* (*Tecticornia* sp. nov) in the northern section. The reconnaissance survey undertaken by Maia (2021b) covered a small section in the south-east of the Project Area and mapped the dominant vegetation types as: mixed open tussock grassland, *Eucalyptus* open mallee woodland, *Triodia* hummock grassland, and mixed *Acacia* tall open shrubland to low woodland. The detailed two phase flora and vegetation report from Maia was not available for evaluation at the time of this literature review.

The previous surveys do not cover the entirety of the Project Area and approximately 22,923 ha (35.8%) has not been surveyed. Nevertheless, the recommendations from Maia are still relevant to the NVCP Clearing Principles. Maia (2021a, 2021b) recommended that, due to the presence of introduced species, weed management strategies should be employed to prevent the introduction of new weed species in weed-free areas. It was also recommended that impact to Sandalwood should be avoided, direct impact to vegetation should be minimised, adopting a precautionary principle regarding the potentially novel *Tecticornia* sp. would avoid impact to a novel taxon.

Table 2.1 lists the previous flora and fauna assessments conducted within 50 km of the Project Area.

**Table 2.1: Previously Conducted Flora Assessments**

| Report Title   | Level of Assessment                          | Field Survey Timing  |
|--|--|----------------------|
| Lake Throssell Project Area, Flora and Vegetation Reconnaissance Survey (Maia, 2021b)              | Reconnaissance Flora and Vegetation Survey   | 19/02/21 to 25/02/21 |
| Lake Throssell Project Area – Exploration Tracks Targeted Flora and Vegetation Survey (Maia, 2021) | Phase 1 Targeted Flora and Vegetation Survey | 09/10/21 to 13/10/21 |
| Desktop Flora and Fauna Assessment – Lake Throssell (Blueprint, 2020)                              | Desktop Flora and Fauna Assessment           | -                    |



### 2.1.1. Detailed Flora & Vegetation Assessment

A total of 257 taxa from 38 families and 102 genera were recorded during the detailed flora and vegetation assessment (Maia, 2021a). The most species rich family was Chenopodiaceae, with 46 species from 10 genera recorded, followed by Fabaceae with 36 species from six genera (Maia, 2021a).

### 2.1.2. Significant Flora

No Threatened Flora taxa were recorded within the Project Area. One Priority Flora taxon, *Melaleuca apostiba* (P3), was recorded in the south of the Project Area and one potentially novel species, *Tecticornia* sp. nov, was recorded in the north of the Project Area (Map 2.1).

### 2.1.3. Significant Lands

#### 2.1.3.1. Conservation Estate & Environmentally Sensitive Areas

The Western Australian conservation estate includes land and waters vested in the Conservation and Parks Commission under the Conservation and Land Management Act (Department of Biodiversity Conservation and Attractions, 1984). The conservation estate is generally managed by the Department of Biodiversity, Conservations, and Attractions (DBCA) to protect Western Australia's biodiversity and includes National Parks, Nature Reserves, Conservation Reserves, and other areas managed primarily for biodiversity conservation (Department of the Environment and Energy, 2016 [DoEE]).

The Project Area is 4.0 km north of the Yeo Lake Nature Reserve boundary, which acts as a refugia for biological diversity in arid and semi-arid Australia (Lake et al., 2009a; Map 2.2, Table 2.1).

#### 2.1.3.2. Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESA) associated with flora and vegetation are defined by the Department of Water and Environmental Regulation (DWER 2019) as:

- A defined wetland and the area within 50 m of a wetland;
- The area covered by vegetation within 50 m of Threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened flora is located;
- The area covered by a Threatened Ecological Community (TEC);
- A Bush Forever site;
- Areas covered by the Gngangara Mound Crown Land Policy and Western Swamp Tortoise Policy; and
- Areas covered by lakes, wetlands, and fringing vegetation of the Swan Coastal Plain Lakes Policy, including South West Agricultural Zone Wetlands Policy and Swan and Canning Rivers Policy.

One ESA, Lake Throssell, is located within and makes up the majority of the Project Area. The next closest known ESA to the Project Area is Yeo Lake which is 4.0 km from the Project Area (Map 2.2, Table 2.1). No Threatened or Priority Ecological Communities (TEC/PECs) were present within 50 km of the Project Area.

#### 2.1.3.3. Australian Wetlands Database

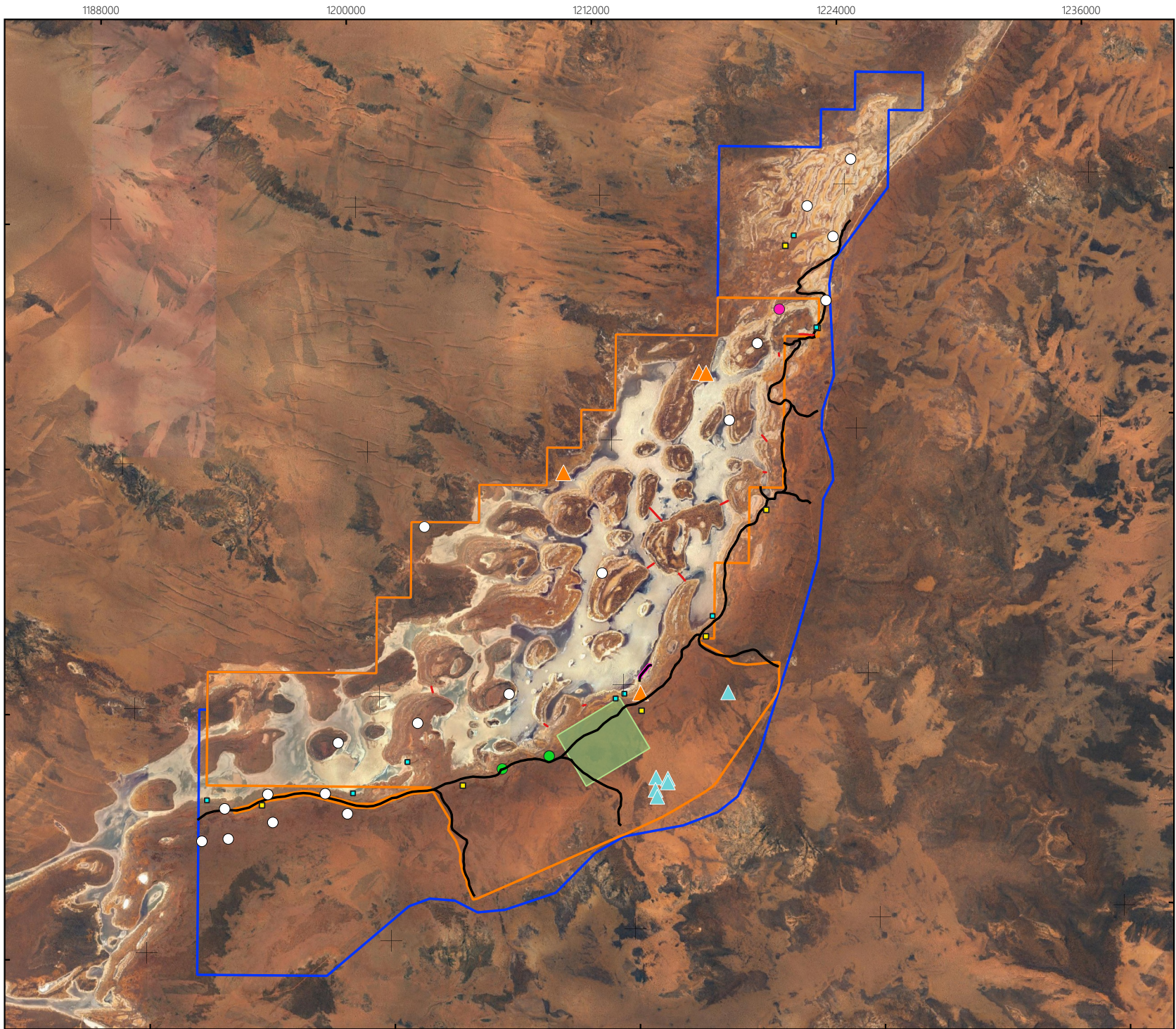
The Australian Wetlands Database includes nationally significant wetlands, as listed in the Directory of Important Wetlands (DIWA), wetlands listed under the Ramsar convention, wetlands that are representative, rare, or unique, or wetlands that are considered of international importance (DoEE 2019).

One nationally significant wetland, Lake Throssell, is located within and makes up the majority of the Project Area. The closest nationally significant wetland is Yeo Lake the boundary of which is 4.0 km south of the Project Area (Map 2.2, Table 2.2).

Table 2.2: Significant Lands

| Status              | Description  | Distance from Project Area |
|---------------------|--|----------------------------|
| ESA                 | Lake Throssell Environmentally Sensitive Area  | 0.0 km                     |
| ESA                 | Yeo Lake Environmentally Sensitive Area  | 4.0 km                     |
| DIWA                | Directory of Important Wetlands of Australia. Yeo Lake is recognised as a nationally important wetland       | 34.9 km                    |
| DIWA                | Directory of Important Wetlands of Australia. Lake Throssell is recognised as a nationally important wetland | 0.0 km                     |
| Conservation Estate | Yeo Lake Nature Reserve  | 4.0 km                     |





**Legend**

- Maia Previous Survey Area
- Exploration Area

- Exploration Footprint**
- Conceptual Water Bores
  - Causeways Excavation
  - Laydowns
  - Camps
  - Access Track
  - Burrow Pit
  - Test Pits (Geotech) polygon

- Significant Flora & Fauna**
- Melaleuca apostiba
  - Seringia exastia
  - Tecticornia sp. nov location
  - Southern Marsupial Mole
  - Brush-tailed Mulgara

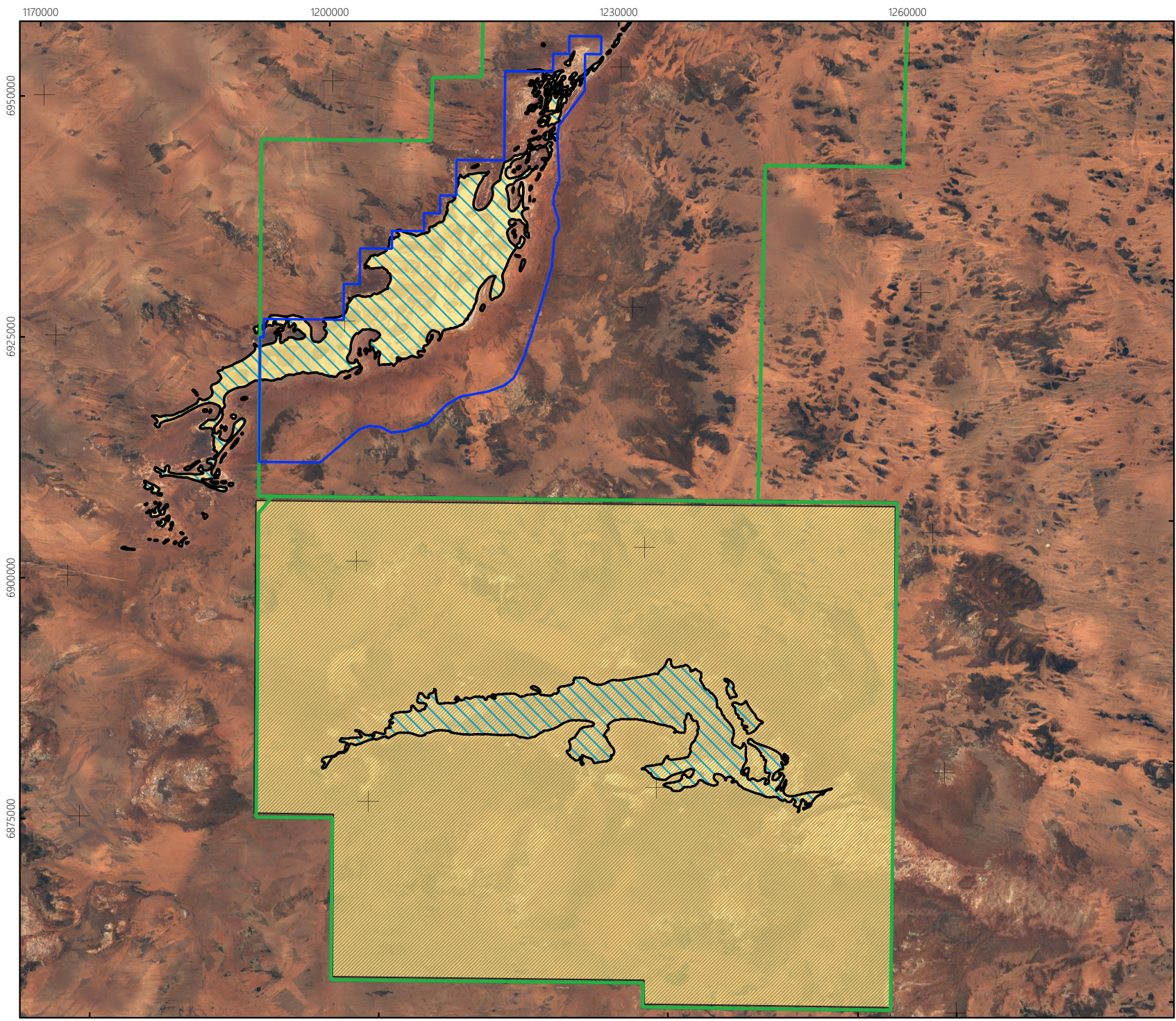
0 1 2 3 4 5 km  
 Scale 1:259,000 @ A4  
Coordinate System: GDA 1994 MGA Zone 51  
 Projection: Transverse Mercator  
 Units: Meter

Author: EC Date: 29-06-2022

## Locations of Significant Flora & Fauna

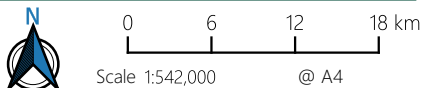
NVCP Ten Clearing Principles





**Legend**

- Project Area
- EPA Redbook Recommended Conservation Reserves
- Directory of Important Wetlands in Australia
- Conservation Estates
- Environmentally Sensitive Areas



Coordinate System: GDA 1994 MGA Zone 51  
 Projection: Transverse Mercator  
 Units: Meter



Author: EC Date: 29-06-2022

**Significant Lands**

NVCP Ten Clearing Principles










### 3. VEGETATION

#### 3.1. Vegetation Types


Eleven vegetation types were identified within the Project Area through the literature review, however, only eight were described in detail. Vegetation mapping for the Survey Area was not available. Eight vegetation types with descriptions and associated species are described in Table 3.1 (Maia, 2021a).

Table 3.1: Vegetation Types

| Unit  | Description   | Associated Species   | Representative Photo   |
|-------|---|--|--|
| ASTSL | <i>Acacia burkittii</i> tall sparse shrubland with <i>Eremophila miniata</i> mid open shrubland, over <i>Ptilotus obovatus</i> , <i>Frankenia laxiflora</i> and <i>Frankenia cinerea</i> isolated low shrubs.                             | <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Enneapogon caerulescens</i> , <i>Enteropogon ramosus</i> , <i>Eragrostis laniflora</i> , <i>Scaevola spinescens</i> , <i>Sclerolaena fimbriolata</i> .   |    |
| CLWL  | <i>Casuarina obesa</i> low open woodland, over <i>Acacia tysonii</i> mid open shrubland.  | <i>Aristida contorta</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Enneapogon caerulescens</i> , <i>Eragrostis laniflora</i> , <i>Eremophila miniata</i> , <i>Ptilotus obovatus</i> .  |   |
| MLOSL | <i>Frankenia laxiflora</i> , <i>Maireana pyramidata</i> , and <i>Maireana amoena</i> low open shrubland, over <i>Enteropogon ramosus</i> , <i>Enneapogon caerulescens</i> , and <i>Eragrostis laniflora</i> mid isolated tussock grasses. | <i>Aristida contorta</i> , <i>Atriplex nana</i> , <i>Eragrostis dielsii</i> , <i>Eremophila miniata</i> , <i>Maireana tomentosa</i> , <i>Salsola australis</i> , <i>Sclerolaena cuneata</i> , <i>Sclerolaena diacantha</i> , <i>Tecticornia auriculata</i> , <i>Tecticornia calyptrata</i> , <i>Tecticornia halocnemoides</i> subsp. <i>longispicata</i> . |  |

| Unit    | Description   | Associated Species   | Representative Photo   |
|---------|---|--|--|
| MLSSL   | <i>Tecticornia calyprata</i> , <i>Tecticornia halocnemoides</i> subsp. <i>longispicata</i> and <i>Tecticornia pruinosa</i> low open shrubland.  | <i>Eragrostis ?lacunaria</i> , <i>Frankenia cordata</i> , <i>Maireana amoena</i> , <i>Tecticornia auriculata</i> , <i>Tecticornia</i> sp. Dennys Crossing (K.A. Shepherd & J. English KS 552).   |    |
| MSSL    | <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Grevillea juncifolia</i> subsp. <i>juncifolia</i> , and <i>Aluta maisonneuvei</i> mid sparse shrubland, with <i>Ptilotus obovatus</i> low sparse shrubland, over <i>Triodia schinzii</i> and <i>Triodia basedowii</i> low sparse hummock grassland. | <i>Acacia burkittii</i> , <i>Acacia ligulata</i> , <i>Alyogyne pinoniana</i> , <i>Aristida contorta</i> , <i>Aristida holathera</i> var. <i>holathera</i> , <i>Eragrostis laniflora</i> , <i>Eremophila glabra</i> subsp. <i>tomentosa</i> , <i>Eremophila miniata</i> , <i>Senna artemisioides</i> subsp. <i>petiolaris</i> .             |   |
| THG (1) | <i>Triodia schinzii</i> open hummock grassland, over <i>Lomandra leucocephala</i> subsp. <i>robusta</i> low open forbland and <i>Jacksonia arida</i> sparse low shrubland.  | <i>Acacia burkittii</i> , <i>Acacia ligulata</i> , <i>Acacia prainii</i> , <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i> , <i>Aristida holathera</i> var. <i>holathera</i> , <i>Dicrasyllis sessilifolia</i> , <i>Prostanthera wilkieana</i> .  |  |
| THG (2) | <i>Acacia burkittii</i> , <i>Acacia prainii</i> and <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> mid open shrubland, over <i>Eremophila platythamnus</i> subsp. <i>exotrachys</i> and <i>Ptilotus obovatus</i> low open shrubland, with <i>Triodia schinzii</i> low open hummock grassland.           | <i>Acacia ligulata</i> , <i>Acacia murrayana</i> , <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i> , <i>Alyogyne pinoniana</i> , <i>Aristida holathera</i> var. <i>holathera</i> , <i>Eragrostis laniflora</i> , <i>Eucalyptus gongylocarpa</i> , <i>Grevillea juncifolia</i> subsp. <i>juncifolia</i> , <i>Paractaenum refractum</i> . |  |



| Unit    | Description   | Associated Species  | Representative Photo   |
|---------|---|---|--|
| THG (3) | <i>Eucalyptus concinna</i> and/or <i>Eucalyptus eremicola</i> subsp. <i>peeneri</i> open mallee woodland, over <i>Triodia basedowii</i> low open hummock grassland. | <i>Acacia ligulata</i> , <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i> , <i>Alyogyne pinoniana</i> , <i>Anthotroche pannosa</i> , <i>Euphorbia tannensis</i> subsp. <i>eremophila</i> , <i>Ptilotus obovatus</i> , <i>Senna artemisioides</i> subsp. <i>petiolaris</i> . |  |

## 3.2. Vegetation Condition

The vegetation condition within the Project Area was generally categorised as 'Very Good' to 'Excellent' (Maia, 2021a). Maia reported obvious signs of damage from feral animals, including camels, and old exploration tracks and drills pads were present.

## 4. VERTEBRATE FAUNA

### 4.1. Literature Review

A single-phase detailed fauna survey was completed at the Project Area in 2021 by Western Wildlife (Western Wildlife, 2021a; Table 2.1). The second phase of the survey has not been completed. An additional two reports (desktop assessment and aquatic fauna) are available from the Project Area (Table 2.1).

**Table 4.1: Previously Conducted Fauna Assessments**

| Report Title  | Level of Assessment                                      | Field Survey Timing  |
|---|--|----------------------|
| Desktop Flora and Fauna Assessment – Lake Throssell (Blueprint, 2020)                           | Desktop Flora and Fauna Assessment                       | -                    |
| Preliminary Aquatic Ecology Assessment of Lake Throssell (Stantec, 2021)                        | Preliminary Survey                                       | April 2021           |
| Lake Throssell Potash Project: Detailed Vertebrate Fauna Survey 2021 (Western Wildlife, 2021b). | Phase 1 Detailed Vertebrate and Fauna Habitat Assessment | 27/04/21 to 05/05/21 |

#### 4.1.1. Fauna Assemblage

The desktop assessment identified a potential fauna assemblage of 10 frogs, 110 reptiles, 145 birds, 32 native, and nine introduced mammals to occur at the Project Area (Western Wildlife, 2021a).

The faunal assemblage of the Lake Throssell Project Area recorded during the first phase of surveying includes a diverse range of species. The main faunal groups are discussed below:

- **Mammals:** A total of 18 native species (including four bats) and five introduced species were recorded during the first phase of surveying at the Lake Throssell Project Area. Common species such as the Wongai Ningai (*Ningai ridei*), Spinifex Hopping Mouse (*Notomys alexis*), Sandy Inland Mouse (*Pseudomys hermannsburgensis*), Woolley's Pseudantechinus (*Pseudantechinus woolleyae*), Little Long-tailed Dunnart (*Sminthopsis dolichura*), and Euro (*Osphranter robustus*) were recorded. These species may exploit a variety of habitats while feeding on seeds, roots, shoots, and small invertebrates in the local area. Small mammal populations may exhibit a boost and bust pattern,



with higher, more widely distributed populations evident after rainfall events. Bat species such as the Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*), Hills Sheath-tail Bat (*Taphozous hilli*), Gould's Wattled Bat (*Chalinobus gouldii*), Inland Forest Bat (*Vespadelus baverstocki*), and Finlayson's Cave Bat (*Vespadelus finlaysoni*) have been recorded in the Project Area and may roost in caves, crevices, or small hollow in stunted trees.

- Birds: A total of 45 species were recorded. Species such as the Zebra Finch (*Taeniopygia castanotis*), Red-capped Robin (*Petroica goodenovii*), Grey Shrike-thrush (*Colluricincla harmonica*), and Black-faced Woodswallow (*Artamus cinereus*) were found during the fauna survey (Western Wildlife, 2021a). Thornbill species such as the Inland Thornbill (*Acanthiza apicalis*), and Chestnut-rumped Thornbill (*Acanthiza uropygialis*) may feed on small insects, or built nests in the Mulga Woodland habitats. Honeyeaters such as the Yellow-plumed Honeyeater (*Ptilotula ornata*), Singing Honeyeater (*Gavicalis virescens*), and the Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*) may feed on nectar or small insects in Mulga woodland and other shrubland habitats. The Purple-backed Fairywren (*Malurus assimilis*; previously Variegated Fairywren (*Malurus lamberti*)), White-winged Fairywren (*Malurus leucopterus*), and Splendid Fairywren (*Malurus splendens*) may forage in low vegetation or build nests in low shrubs and grasses (Western Wildlife, 2021a).
- Reptiles: A total of 46 species were recorded. Gecko species such as the Southern Barking Gecko (*Underwoodisaurus milii*), Beaded Gecko (*Lucasium damaeum*), Northern Spiny-tailed Gecko (*Strophurus ciliaris*), and Purple Dotted Gecko (*Gehyra purpurascens*) were recorded and can be found in tree hollows and logs in the woodland habitats. Lizards such as Burton's Legless Lizard (*Lialis burtonis*), the Central Military Dragon (*Ctenophorus isolepis*), Thorny Devil (*Moloch horridus*), and Long-nosed Dragon (*Gowidon longirostris*) may be found in scrubland or desert habitats within the Project Area. Skink species such as *Ctenotus* spp., Western Narrow-banded Skink (*Eremiascincus pallidus*), and Dwarf Skink (*Menetia greyii*) may be found in logs and hollows. Snake species such as Reticulated Whipsnake (*Demansia psammophis reticulata*), Jan's Banded Snake (*Simoselaps bertholdi*), and Interior Blind Snake (*Anilius endoterus*) may utilise rock crevices and logs in order to hunt smaller lizards in the area (Western Wildlife, 2021a).
- Amphibians: No frogs were recorded during phase 1 of the survey at the Lake Throssell Project.

#### 4.1.2. Conservation Significant Fauna

The desktop assessment identified 25 significant fauna species that have been recorded or may occur within the Project Area: six mammal species, 16 birds, and three reptiles. During the field survey in 2021, the presence of two of the conservation significance species known to occur in the area was confirmed: the DBCA listed Brush-tailed Mulgara (*Dasyercus blythi*; Priority 4) was discovered on sandplains and the Southern Marsupial Mole (*Notoryctes typhlops*; Priority 4) was found on sand dunes. The desktop assessment surmised that 12 conservation significant species were likely to occur within the Project Area, including: Malleefowl (*Leipoa ocellata*), Buff-snouted Blind Snake (*Anilius margaretae*), Long-tailed Dunnart (*Sminthopsis longicaudata*), and several species of migratory shorebirds (Table 4.2).

Migratory shorebirds may be present at Lake Throssell after rainfall events when the wetland habitat is inundated, these species included: Sharp-tailed Sandpiper (*Calidris acuminata*), Red-necked Stint (*Calidris ruficollis*), Pectoral Sandpiper (*Calidris melanotos*), Wood Sandpiper (*Tringa glareola*), Common Greenshank (*Tringa nebularia*), Marsh Sandpiper (*Tringa stagnatilis*), Common Sandpiper (*Tringa hypoleucos*), and Oriental Plover (*Charadrius veredus*; Western Wildlife, 2021a). Migratory birds fly thousands of miles from their breeding grounds in the Northern hemisphere to their non-breeding grounds in the Southern hemisphere. During this journey, they may utilise ephemeral wetlands, like Yeo Lake and Lake Throssell, across inland Australia as staging area (Government Department of the Environment, 2015). The ecology of

migratory birds is complex in Australia and dispersal can be hard to decipher, as certain migratory shorebird populations decrease, there is a growing need to minimise threats to remaining habitat (Government Department of the Environment, 2015).

All significant species identified by the assessment undertaken by Western Wildlife (2021) along with their conservation status and assigned likelihood of occurrence are summarised in Map 2.1 and Table 4.2.

It was suggested that a second phase summer survey may clarify the capacity of Lake Throssell to provide intermittent refugia for Migratory shorebirds, by surveying the Lake when it is inundated. The phase 2 fauna and fauna habitat report from Western Wildlife was not available for evaluation at the time of this literature review.

**Table 4.2: Conservation Significant Fauna Recorded or Potentially Occurring in the Project Area**

| Species   | Conservation Status |        |      | Likelihood of occurrence |
|---|---------------------|--------|------|--------------------------|
|   | EPBC Act            | BC Act | DBCA |                          |
| <b>Mammals</b>  |                     |        |      |                          |
| Sandhill Dunnart ( <i>Sminthopsis psammophila</i> )                   | EN                  | EN     |      | Possible                 |
| Bilby ( <i>Macrotis lagotis</i> )                                     | VU                  | VU     |      | Unlikely                 |
| Central Long-eared Bat ( <i>Nyctophilus major tor</i> )               |                     |        | P3   | Potential                |
| Southern Marsupial Mole ( <i>Notoryctes typhlops</i> )                |                     |        | P4   | Known to occur           |
| Brush-tailed Mulgara ( <i>Dasyercus blythi</i> )                      |                     |        | P4   | Known to occur           |
| Long-tailed Dunnart ( <i>Sminthopsis longicaudata</i> )               |                     |        | P4   | Likely                   |
| <b>Birds</b>  |                     |        |      |                          |
| Night Parrot ( <i>Pezoporus occidentalis</i> )                        | EN                  | CR     |      | Possible                 |
| Malleefowl ( <i>Leipoa ocellata</i> )                                 | VU                  | VU     |      | Likely                   |
| Grey Falcon ( <i>Falco hypoleucos</i> )                               | VU                  | VU     |      | Potential                |
| Princess Parrot ( <i>Polytelis alexandrae</i> )                       | VU                  |        | P4   | Possible                 |
| Common Greenshank ( <i>Tringa nebularia</i> )                         | MI                  | MI     |      | Likely                   |
| Common Sandpiper ( <i>Actitis hypoleucos</i> )                        | MI                  | MI     |      | Likely                   |
| Fork-tailed Swift ( <i>Apus pacificus</i> )                           | MI                  | MI     |      | Possible                 |
| Red-necked Stint ( <i>Calidris ruficollis</i> )                       | MI                  | MI     |      | Likely                   |
| Oriental Plover ( <i>Charadrius veredus</i> )                         | MI                  | MI     |      | Likely                   |
| Pectoral Sandpiper ( <i>Calidris melanotos</i> )                      | MI                  | MI     |      | Potential                |
| Sharp-tailed Sandpiper ( <i>Calidris acuminata</i> )                  | MI                  | MI     |      | Likely                   |
| Wood Sandpiper ( <i>Tringa glareola</i> )                             | MI                  | MI     |      | Likely                   |
| Marsh Sandpiper ( <i>Tringa stagnatilis</i> )                         | MI                  | MI     |      | Likely                   |
| Gull-billed Tern ( <i>Gelochelidon nilotica</i> )                     | MI                  | MI     |      | Possible                 |
| Peregrine Falcon ( <i>Falco peregrinus</i> )                          |                     | OS     |      | Likely                   |
| Striated Grasswren - sandplain ( <i>Amytornis striatus striatus</i> ) |                     |        | P4   | Likely                   |
| <b>Reptiles</b>   |                     |        |      |                          |
| Great Desert Skink ( <i>Liopholis kintorei</i> )                      | VU                  | VU     |      | Possible                 |
| Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )                |                     |        | P2   | Likely                   |
| Woma Python ( <i>Aspidites ramsayi</i> )                              |                     |        | P1   | Possible                 |

## 4.2. Fauna Habitats

Seven fauna habitats were identified within the Project Area, the most dominant of which were the salt lake and samphire shrubland habitats. These two habitats may be locally significant as they could provide refugia for fauna species during fire events (Western Wildlife, 2021a). Fauna habitats and their associated conservation significant species are detailed in Table 4.3. The Buff-snouted Blind Snake has been included in all categories as specific habitat data is limited.

**Table 4.3: Fauna Habitats within the Project Area.**

| Habitat            | Key Habitat Elements   | Conservation Significant Associated Species   |
|--------------------|--|---|
| Salt Lake          | Water- holding depressions provide habitat for shorebirds and other waterbirds.  | Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )<br>Migratory shorebirds<br>Peregrine Falcon ( <i>Falco peregrinus</i> )  |
| Samphire Shrubland | May provide habitat for migratory shorebirds.  | Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )<br>Migratory shorebirds<br>Night Parrot ( <i>Pezoporus occidentalis</i> )<br>Woma Python ( <i>Aspidites ramsayi</i> )<br>Peregrine Falcon ( <i>Falco peregrinus</i> )  |
| Sand Dune          | Loose sands provide habitat for fossorial reptiles while Eucalypts, where present, provide nesting for birds and hollows/crevices for arboreal fauna.  | Brush-tailed Mulgara ( <i>Dasymercus blythi</i> )<br>Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )<br>Southern Marsupial Mole ( <i>Notoryctes typhlops</i> )<br>Sandhill Dunnart ( <i>Sminthopsis psammophila</i> )<br>Peregrine Falcon ( <i>Falco peregrinus</i> )  |
| Gypsum Dune        | Large <i>Casuarina</i> and <i>Eucalyptus</i> provide tree hollows and crevices for birds, bats, and arboreal reptiles. Dense leaf litter and fallen logs provide shelter for reptiles and <i>Eremophila</i> and <i>Grevillea</i> spp. provide seasonal resources for nectar-feeding birds.   | Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )<br>Peregrine Falcon ( <i>Falco peregrinus</i> )  |
| Spinifex Sandplain | Consolidated sands for burrowing mammals and reptiles. Eucalypts, where present, provide hollows and crevices for birds, bats, and arboreal reptiles. <i>Eucalypts</i> and <i>Grevillea</i> spp. provide seasonal resources for nectar-feeding birds.  | Brush-tailed Mulgara ( <i>Dasymercus blythi</i> )<br>Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )<br>Great Desert Skink ( <i>Liopholis kintorei</i> )<br>Greater Bilby ( <i>Macrotis lagotis</i> )<br>Grey Falcon ( <i>Falco hypoleucos</i> )<br>Long-tailed Dunnart ( <i>Sminthopsis longicaudata</i> )<br>Night Parrot ( <i>Pezoporus occidentalis</i> )<br>Princess Parrot ( <i>Polytelis alexandrae</i> )<br>Woma Python ( <i>Aspidites ramsayi</i> )<br>Peregrine Falcon ( <i>Falco peregrinus</i> ) |
| Mulga Woodland     | Hollows and crevices in large Mulga and Eucalypts provide roosting and nesting habitat for birds, bats, and arboreal reptiles. Where present, accumulations of leaf litter and fallen logs provide shelter for reptiles. Mulga trees and taller shrubs provide nesting habitat for birds, particularly where the Mulga occurs in groves or dense stands. | Brush-tailed Mulgara ( <i>Dasymercus blythi</i> ).<br>Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )<br>Central Long-eared Bat ( <i>Nyctophilus major tor</i> )<br>Greater Bilby ( <i>Macrotis lagotis</i> )<br>Grey Falcon ( <i>Falco hypoleucos</i> )<br>Malleefowl ( <i>Leipoa ocellata</i> )<br>Woma Python ( <i>Aspidites ramsayi</i> )<br>Peregrine Falcon ( <i>Falco peregrinus</i> )  |
| Breakaway          | Cracks and crevices in rocks provide shelter for reptiles and mammals. <i>Eremophila</i> spp. provide seasonal resources for nectar-feeding birds.   | Buff-snouted Blind Snake ( <i>Anilius margaretae</i> )<br>Central Long-eared Bat ( <i>Nyctophilus major tor</i> )<br>Long-tailed Dunnart ( <i>Sminthopsis longicaudata</i> )<br>Peregrine Falcon ( <i>Falco peregrinus</i> )  |

## 5. Assessment Against the Ten Clearing Principles

Schedule 5 of the *Environmental Protection Act 1986* stipulates ten clearing principles to be followed when determining impacts to native vegetation. An assessment on how the proposed vegetation clearing within the Project Area relative to the principles and the Guideline document '*A guide to the assessment of applications to clear native vegetation*' (Department of Environment Regulation, 2014b) is presented below for the Project Area in Table 5.1.

**Table 5.1: Ten Native Vegetation Clearing Principles**

| Principle Number | Principle  | Assessment  | Outcome         |
|------------------|--|---|-----------------|
| (a)              | Native vegetation should not be cleared if it comprises a high level of biological diversity.  | <p>Maia (2021) carried out a two-phase detailed flora and vegetation survey in the Lake Throssell Project Area. Ninety-two quadrats were sampled within eight vegetation types, resulting in two hundred and fifty-seven taxa being recorded over the two phases. The average species richness per quadrat was 16.4 and this ranged from one to 38 species. Maia (2021) compared the Lake Throssell diversity to the diversity of other lakes in the region and concluded that the Lake Throssell Project Area has similar diversity to the surrounding areas.</p> <p>The seven fauna habitats at Lake Throssell supports a predicted faunal assemblage of 10 frogs, 110 reptiles, 145 birds, 32 native mammals, and nine introduced mammals. Twenty-five conservation significant fauna have been recorded or potentially occur in the Project Area. Lake Throssell is therefore unlikely to represent an area of particularly high faunal biodiversity in endemism or in richness of numbers.</p> <p>Breakaways were present in the Lake Throssell Project Area and are an important feature to note when searching for Priority Flora, any reference to breakaway locations in the Detailed Flora and Vegetation Report (in progress) should be taken into consideration before clearing (Maia, 2022).</p> | Not at variance |
| (b)              | Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia. | <p>Seven fauna habitats were identified during the fauna and fauna habitat assessment (Western Wildlife, 2021a), including: Salt Lakes, Samphire Shrublands, Gypsum Dunes, Sand Dunes, Sandplains, Mulga Woodlands, and Breakaways. Breakaways and habitats around the Salt Lake, particularly the islands, may have local importance as refugia for fauna particularly during fire events.</p> <p>There are 25 vertebrate fauna of conservation significance that potentially occur in the Project Area: seven Threatened, 10 migratory, one specially protected, six Priority, and one locally significant species. Two conservation significant species have been recorded in the Project Area: the Brush-tailed Mulgara (<i>Dasyercus blythi</i>; DBCA Priority 4), which occurs on the sandplains, and the Southern Marsupial Mole (<i>Notoryctes typhlops</i>; DBCA Priority 4), occurring on the sand dunes (Western Wildlife, 2021a).</p>   | Not at variance |

| Principle Number | Principle   | Assessment   | Outcome         |
|------------------|---|--|-----------------|
|                  |   | <p>The Samphire shrubland habitat and fringing Sandplain habitat (where it supports spinifex grassland) are the most likely to harbour Threatened fauna species such as the Night Parrot, Sandhill Dunnart and Great Desert Skink which are potentially occurring at the Project Area.</p> <p>The Mulga Woodland fauna habitat type is likely to support the Malleefowl, which are listed as Vulnerable under the EPBC/BC Act and potentially occur in the area as individuals have recently been recorded in the region northeast of the Project area and at Yeo Lake (Western Wildlife, 2021a). Malleefowl mounds are easy to recognise, and any project and site staff should be trained on how to identify them. If Malleefowl nests are seen during exploration and clearance phase, a 50 m no-go buffer zone should be observed, and GPS coordinates should be taken of nests.</p> <p>The remaining three species listed under the EPBC/BC Act (Table 4.2) are either unlikely to occur (Bilby), or utilise a variety of habitats for perching and foraging (Grey Falcon &amp; Princess Parrot).</p> <p>Following significant rain events, the salt lake and samphire shrublands may provide foraging habitat for migratory shorebirds and wetland dependent bird species. Migratory birds are not always present on site, which does not exclude the area from being ephemerally important foraging/resting areas (Western Wildlife, 2021b). Seven species of waterbird have been recorded in Yeo Lake approximately 40 km south of Lake Throssell (Lake et al., 2009b). While Lake Throssell is not known to support significant numbers of migratory shorebirds (Government Department of the Environment, 2017), this may reflect a lack of survey effort instead of negating the presence of significant habitats.</p> <p>Major rainfall events are also likely to initiate the emergence of aquatic biota and, within Lake Throssell, these communities have been associated with the central southern and northern sections of the playa. These areas support higher ecological values as the benthic algal, diatom and aquatic invertebrate taxa may form the basis of the food chain that may sustain waterbirds during major flood events (Stantec, 2021).</p> |                 |
| (c)              | Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora. | <p>One Threatened species has been recorded by Maia during the detailed flora and vegetation assessment within the Lake Throssell project area – <i>Seringia exastia</i> (Maia, 2021a). A recent taxonomic study has concluded that <i>S. exastia</i> and <i>S. elliptica</i> are the same species, and the two species have been synonymised under the oldest name – <i>S. exastia</i> (Binks et al., 2020). A nomination by the WA Threatened Species Scientific Committee (TSSC) to delist the species has recently been advertised on DBCA's website.</p> <p>One Priority Flora species was recorded within the Project Area – <i>Melaleuca apostiba</i> (P3) – with 10 individuals recorded at two locations on the ASTSL vegetation type. Maia, 2021 reported that the individuals recorded could be avoided during clearing activities and, if a 50 m buffer is adhered to, it is unlikely that any direct impacts to this taxon will occur. When clearing is occurring</p>   | Not at variance |



| Principle Number | Principle   | Assessment  | Outcome         |
|------------------|---|---|-----------------|
|                  |   | <p>in vegetation type ASTSL, project staff should be made aware of this species, trained how to identify it, and it avoided where possible.</p> <p>One novel species, <i>Tecticornia</i> sp. nov, was recorded within the Project Area which was identified by the <i>Tecticornia</i> expert at the WA Herbarium, Dr Kelly Shepherd. This species was recorded at one location, with one individual in the north of the Project Area, the exact location of this species should be avoided during the clearing/exploration process. A survey to investigate the distribution and abundance of this novel species is speculatively planned for October and any new locations discovered during this survey should not be cleared. Clearing of <i>Tecticornia</i> (Samphire) species should be minimised or avoided where possible.</p>   |                 |
| (d)              | Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a TEC.                 | The vegetation of the Project Area does not comprise the whole or part of a currently listed TEC. The vegetation of the Project Area does not comprise the whole or part of a currently listed PEC.   | Not at variance |
| (e)              | Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.  | Native vegetation in the Great Victoria Desert Bioregion has not been extensively cleared. The eight beard sub-associations that occur in the Project Area have more than 99.9% of their original extents remaining. The native vegetation to be cleared is not significant as a remnant of native vegetation that has been extensively cleared.  | Not of variance |
| (f)              | Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland. | <p>Yeo Lake - Lake Throssell is listed in the Directory of Important Wetlands in Australia. They are classified as Inland Wetlands (B) described as B2 (seasonal and irregular rivers and streams; includes minor anabranches, braided channel complexes) and B8 (seasonal / intermittent saline lakes). The Directory Criteria for Inclusion on the list are 1 (it is a good example of a wetland type occurring within a biogeographic region in Australia) and 6 (the wetland is of outstanding historical or cultural significance); Lake et al., 2009b).</p> <p>The EPA states that fringing vegetation associated with a watercourse or wetland can constitute as a foreshore area or buffer. <i>Tecticornia</i> communities comprise the fringing vegetation at Lake Throssell and are important to the salt lake systems of inland Australia (Moir-Barnetson, 2014). They respond well to waterlogged soils and high levels of salinity and, due to this hyper-specialisation, may respond poorly to environmental changes such as extreme soil salinity and alteration in flooding regime (Moir-Barnetson, 2014). There is a paucity of information regarding the ecophysiology of <i>Tecticornia</i> and its role in the management of ephemeral inland salt lakes.</p> | At variance     |

| Principle Number | Principle  | Assessment   | Outcome         |
|------------------|--|--|-----------------|
| (g)              | Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.   | As the clearing will take place within a large lake system (approximately 92 km long x 11 km wide), and the area to be cleared is relatively small compared with the size of the lake itself (0.2% of the Project Area), it is unlikely that the activity will cause appreciable land degradation.   | Not at variance |
| (h)              | Native vegetation should not be cleared if the clearing of vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area. | The closest conservation area is Yeo Lake Nature Reserve, approximately 4.0 km south of the Project Area. Ecological linkages are necessary to establish connectivity between areas of native vegetation, while increasing the ecological functionality and value of smaller, fragmented areas (Department of Environment Regulation, 2014a). Lake Throssell has the potential to act as an ecological link with Yeo Lake Nature Reserve, and to provide an alternative refugia for fauna throughout more extreme environmental conditions, like fire events. However, given the small exploration footprint, clearing is unlikely to impact the environmental values of Yeo Lake. | Not at variance |
| (i)              | Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.                 | Lake Throssell has a high potential of acting as a Ground Dependent Ecosystem (GDE; Maia, 2021a). These ecosystems are increasingly under threat from climate change as environmental pressures can modify groundwater levels and threaten vital ecosystem services (Kløve et al., 2014). The relatively small area of clearing within this large lake system is unlikely to diminish the quality of underground water but care should be taken if exploration is undertaken during or after a heavy rainfall events.  | Not at variance |
| (j)              | Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.                       | The clearing is to be carried out within the boundaries of a large lake system and it is unlikely to cause or exacerbate the incidence and intensity of flooding in the area.  | Not at variance |

## 6. CONCLUSIONS

The Lake Throssell Project Area is located within an Environmentally Sensitive Area (ESA) and is listed in the Directory of Important Wetlands (DIWA). One Priority Flora taxon, *Melaleuca apostiba* (P3), was recorded in the south of the Project Area and one potentially novel species, *Tecticornia* sp. nov, was recorded in the north of the Project Area. Two conversation significant fauna species were recorded; the DBCA listed Brush-tailed Mulgara (*Dasycercus blythi*; Priority 4) was discovered on sandplains and the Southern Marsupial Mole (*Notoryctes typhlops*; Priority 4) was found on sand dunes.

The ecological values for this report were assessed against the ten clearing principles as stipulated under Schedule 5 of the of the *Environment Protection Act 1986* (Western Australian Government, 1986). Clearing principle (f) '*Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland*' was found to be at variance with the ten clearing principles.

It is recommended that, due to the presence of introduced species, weed management strategies should be employed to prevent the introduction of new weed species in weed-free areas. It was also recommended that impact to Sandalwood should be avoided and direct impact to vegetation should be minimised, adopting a precautionary principle regarding the potentially novel *Tecticornia* sp. would avoid impact to a novel taxon.

## 7. REFERENCES

Binks, R.M. *et al.* (2020) "Genomic data and morphological re-assessment reveals synonymy and hybridisation among *Seringia* taxa (Lasiopetaleae, Malvaceae) in remote north-western Australia," *Taxon*, 69(2), pp. 307–320. Available at: <https://doi.org/10.1002/tax.12233>.

Blueprint (2020) *Desktop Flora and Fauna Assessment-Lake Throssell*. Available at: <https://data.museum.wa.gov.au>.

Department of Biodiversity Conservation and Attractions (1984) *Conservation and Land Management Act*.

Department of Environment Regulation (2014a) *A guide to the assessment of applications to clear native vegetation*. Available at: [www.der.wa.gov.au](http://www.der.wa.gov.au).

Department of Environment Regulation (2014b) *A guide to the assessment of applications to clear native vegetation under part V division 2 of the Environmental Protection Act 1986*. Available at: [www.der.wa.gov.au](http://www.der.wa.gov.au).

Department of Primary Industry and Regional Development (2019) "Pre-European Vegetation - Western Australia (NVIS Compliant Version 20110715)."

Department of the Environment and Energy (2016) "Collaborative Australian Protected Areas Database - Terrestrial CAPAD2016." Australian Government.

Department of the Environment and Energy (2019) "Australian Wetlands Database." Australian Government.

Department of Water and Environmental Regulation (2019) "Clearing Regulations - Environmentally Sensitive Areas." Government of Western Australia.

Government Department of the Environment, A. (2015) *Wildlife Conservation Plan for Migratory Shorebirds*. Available at: [www.environment.gov.au/resource/wildlife-conservat](http://www.environment.gov.au/resource/wildlife-conservat).

Government Department of the Environment, A. (2017) *EPBC Act Policy Statement 3.21*.

Government of Western Australia (2019) "2018 Statewide Vegetation Statistics Incorporating the CAR Reserve Analysis (Full Report). Current as of December 2018." Perth: WA Department of Biodiversity, Conservation and Attractions. Available at: <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>.

Kløve, B. *et al.* (2014) "Climate change impacts on groundwater and dependent ecosystems," *Journal of Hydrology*, 518(PB), pp. 250–266. Available at: <https://doi.org/10.1016/j.jhydrol.2013.06.037>.

Lake, Y. *et al.* (2009a) *Resource Condition Report for a Significant Western Australian Wetland*.

Lake, Y. *et al.* (2009b) *Resource Condition Report for a Significant Western Australian Wetland*.

Maia (2021a) "Lake Throssell Project Area - Exploration Tracks Targeted Flora and Vegetation Survey."

Maia (2021b) *Trigg Mining Limited: Lake Throssell Project Area Flora and Vegetation Reconnaissance Survey*.

Maia (2022) *Lake Throssell Detailed Flora and Vegetation Report (in prep)*.

Moir-Barnetson, L. (2014) *Ecophysiological responses to changes in salinity and water availability in stem-succulent halophytes (Tecticornia spp.) from an ephemeral salt lake*.

Stantec (2021) *Preliminary Aquatic Ecology Assessment of Lake Throssell*.

Western Australian Government (1986) *Environmental Protection Act 1986*.

Western Wildlife (2021a) *Lake Throssell Potash Project: Detailed Vertebrate Fauna Survey*.

Western Wildlife (2021b) *Lake Throssell Potash Project: Detailed Vertebrate Fauna Survey 2021-Draft Interim Report Prepared for: Trigg Mining Limited Executive Summary.*