Government of Western Australia
Department of Mines, Industry Regulation and Safety

Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 8797/1
Permit type: Area Permit

1.2. Proponent details

Proponent's name: **Evolution Mining (Mungari) Pty Ltd**

1.3. Property details

Property: Mining Lease 15/829
Local Government Area: Shire of Coolgardie
Colloquial name: Mungari Tailings Storage Facility 3 and 4 Expansion

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
210.3		Mechanical Removal	Mineral production and associated activities

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 16 April 2020

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description

The vegetation of the application area is broadly mapped as the following Beard vegetation associations:
468: Medium woodland; salmon gum & goldfields blackbutt; and
540: Succulent steppe with open low woodland; sheoak over saltbush (GIS Database).

A flora and vegetation assessment was conducted over the application area and surrounds by Spectrum Ecology between 19-25 August 2019. The following vegetation types were recorded within the application area (Spectrum Ecology, 2019b):

Vegetation type ii: *Tecticornia halocnemoides* ssp. *halocnemoides*, *T. indica* ssp. *indica* and *T. chartacea* low open chenopod shrubland;

Vegetation type iii: *Eucalyptus yilgarnensis*, *E. salubris* and *E. clelandiorum* mid woodland over *Eremophila scoparia*, *Senna artemisiodes* ssp. *filifolia* mid open shrubland over *Ptilotus obovatus* low isolated shrubs;

Vegetation type iv: *Eucalyptus salubris*, *E. clelandiorum* (+/- *E. salmonophloia*) mid open woodland over *Eremophila scoparia* and *Senna artemisiodes* ssp. *filifolia* mid open shrubland over *Atriplex* sp. and *Olearia muelleri* low open shrubland;

Vegetation type v: *Casuarina pauper* low isolated trees over *Melaleuca lateriflora* mid open shrubland over *Frankenia setosa* and *Atriplex stipitata* low open shrubland; and

Vegetation type xi: *Duma florulenta* mid sparse shrubland.

Clearing Description

Mungari Tailings Storage Facility 3 and 4 Expansion.
Evolution Mining (Mungari) Pty Ltd proposes to clear up to 210.3 hectares of native vegetation within a boundary of approximately 210.3 hectares, for the purpose of expanding the existing Tailings Storage Facility (TSF). The project is located approximately 20 kilometres west of Kalgoorlie-Boulder, within the Shire of Coolgardie.

Vegetation Condition

Excellent: Vegetation structure intact; disturbance affecting individual species, weeds non-aggressive (Keighery, 1994).

To:

Very Good: Vegetation structure altered; obvious signs of disturbance (Keighery, 1994).

Comment

The vegetation condition was derived from a vegetation survey conducted by Spectrum Ecology (2019b).

The proposed clearing is for the expansion of the existing TSF.

3. Assessment of application against Clearing Principles

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Comments

Proposal may be at variance to this Principle

The clearing permit application area is located within the Eastern Goldfields subregion of the Interim Biogeographic Regionalisation for Australia (IBRA) Coolgardie Bioregion (GIS Database). The Eastern Goldfield subregion is characterised by gently undulating plains interrupted by low hills and ridges of Archaean greenstones, supporting mallees, *Acacia* thickets and shrub-heaths on sandplains and diverse *Eucalyptus* woodlands occur around salt lakes, on ranges, and in valleys. Salt lakes support dwarf shrublands of samphire. The subregion is rich in endemic *Acacia* species (CALM, 2002).

The application area falls within the area known as the Great Western Woodlands, which represents the largest and most intact eucalypt woodland remaining in southern Australia and is one of the best examples of its type in the world (DEC, 2010). The Great Western Woodlands covers a total area of approximately 16 million hectares, and is recognised for its flora and fauna species richness and high number of endemic flora species (DEC, 2010). However, at approximately 210.3 hectares in size, the clearing permit application area represents approximately 0.001% of the area covered by the Great Western Woodlands, and the proposed clearing is unlikely to have any significant impact on the conservation values of the Great Western Woodlands.

A vegetation assessment of the application area and surrounds was conducted by Spectrum Ecology (2019b) during 19-25 August 2019. The application area is dominated by low isolated *Casuarina pauper* trees and mid open *Melaleuca laterifora* shrubland over *Frankenia setosa* and *Atriplex stipitata* low open shrubland, with smaller communities of *Eucalyptus* woodlands (Spectrum Ecology, 2019b; Talis, 2020). No Threatened or Priority Ecological Communities were identified as potentially occurring in the application area and the field assessment of the application did not record any (Spectrum Ecology, 2019b; Talis, 2020).

The broader assessment recorded a total of 113 taxa from 28 families and 49 genera, including one invasive species *Erodium cicutarium* (Spectrum Ecology; 2019). The assessment identified eleven vegetation types, five of which were recorded within the application area (Spectrum Ecology, 2019b). The majority of the application area is comprised of vegetation type v, along with type iv, which are widely distributed throughout the Eastern Goldfields subregion (Talis, 2020). Vegetation types ii, iii and xi are considered to be locally significant due to their association with salt lake systems (Spectrum Ecology, 2019b; Talis, 2020). Vegetation types described within the application area were all represented in surrounding areas, indicating a wider distribution.

A desktop assessment of the application area and surrounds identified a total of 62 conservation significant species (two Threatened, 21 Priority 1, eight Priority 2, 25 Priority 3, five Priority 4 and one species of interest) within 50 kilometres of the application area (Spectrum Ecology, 2019b). Two conservation significant species, *Calandrinia lefroyensis* (P1) and *Eremophila praecox* (P1), were identified as having a high likelihood of occurrence within the application area due to suitable habitat (Spectrum Ecology, 2019b; Talis, 2020). However, no Threatened or Priority flora were recorded during the flora and vegetation assessment within the application area (Spectrum Ecology, 2019b).

A targeted survey for *Calandrinia lefroyensis* was conducted by Spectrum Ecology (2019a) in November 2019 approximately 1 kilometre west of the application area. 253 individuals from three local populations were identified during the survey, indicating that the species is present in the surrounds and may be present within the application area (Spectrum Ecology, 2019a). Vegetation types ii and v are known habitat for *Calandrinia lefroyensis*, thus the proposed clearing may impact potentially present *Calandrinia lefroyensis* (Spectrum Ecology, 2019b; Talis, 2020). *Eremophila praecox* is common in the local area with 18 desktop records within 40 kilometres of the broader assessment area (Spectrum Ecology, 2019b). Vegetation type iv is known habitat for *Eremophila praecox* and is considered to be a significant refuge for this species (Spectrum Ecology, 2019b; Talis, 2020).

A desktop assessment of the application area with a 15 kilometre buffer identified three Threatened or Priority fauna species (Talis, 2020). This includes *Calidris acuminata* (Sharptailed Sandpiper) (MI), *Leipoa ocellata* (Malleefowl) (VU), and *Tringa nebularia* (Common Greenshank) (MI). Malleefowl have been recorded in the surrounds and the application area hosts suitable foraging and nesting habitat, indicating that there is a possibility of occurrence (Spectrum Ecology, 2019b; Talis, 2020). The two migratory bird species are unlikely to occur within the application area given there is no suitable foraging habitat (Spectrum Ecology, 2019b).

A fauna survey of the application area and surrounds was conducted by Spectrum Ecology (2019b) during 19-25 August 2019. A total of 13 vertebrate fauna species were recorded during the survey, including one native mammal species, three introduced mammal species and nine bird species, all of which are widespread species (Spectrum Ecology, 2019b). The survey did not record any Threatened or Priority Fauna within the application area (Spectrum Ecology, 2019b, GIS Database).

A total of 25 potential Short Range Endemic (SRE) invertebrate fauna species were recorded during the survey of the application area and surrounds (Spectrum Ecology, 2019b). Of these 25 potential SRE, no conservation significant species were recorded. Two conservation significant SRE species, the Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) (CR at both State and Federal level) and; the Inland Hairstreak (*Jalmenus aridus*) (P1) may potentially occur within the application area and surrounds due to suitable habitat, however none were recorded during the recent survey (Spectrum Ecology, 2019b).

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology

CALM (2002)
DEC (2010)
Spectrum Ecology (2019a)
Spectrum Ecology (2019b)
Talis (2020)

GIS Database:
- IBRA Australia
- Pre-European Vegetation
- Threatened and Priority Ecological Communities Boundaries
- Threatened and Priority Ecological Communities Buffers
- Threatened and Priority Flora
- Threatened Fauna

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments

Proposal may be at variance to this Principle

The following three fauna habitats have been recorded within the application area (Talis, 2020):

Eucalypt Woodland over Open Shrubland: Isolated trees of *Casuarina pauper* and *Melaleuca lateriflora* with patches of Eucalypt trees (*Eucalyptus yilgarnensis*, *E. salubris and E. clelandiorum*) over an open layer of lower shrubs of *Eremophila scoparia*, *Senna artemisiodes*, *Frankenia setosa* and *Atriplex stipitata* and *Ptilotus obovatus*. Over substrate of brown sandy clay with plentiful leaf litter accumulated underneath trees and shrubs.

Mixed Dense Shrubland: Dense layer of tall and mid shrubs of *Casuarina pauper*, *Melaleuca lateriflora*, *Frankenia setosa* and *Atriplex stipitata* on sandy clay. Leaf litter is present under large shrubs and trees. The substrate was dominated by loamy clay with a slightly sandy cover.

Saltbush Shrubland: Samphire shrubs (*Tecticornia halocnemoides*, *T. indica* and *T. chartacea*). The substrate was crusty loamy clay to sandy clay and leaf litter was very limited.

No malleefowl (*Leipoa ocellata*, VU at both state and federal level) or malleefowl mounds were observed during the fauna survey within the application area (Spectrum Ecology, 2019b; Talis, 2020). A previous fauna survey observed a single Malleefowl mound with egg fragments present approximately 5 kilometres west of the application area and one Malleefowl individual was observed approximately 1 kilometre west-northwest of the mound (Phoenix, 2019; Talis, 2020). The Eucalypt Woodland over Open Shrubland and Mixed Dense Shrubland types were considered suitable nesting and foraging habitat for the species (Talis, 2020; Spectrum Ecology, 2019b). The fauna habitat types within the application area are commonly recorded in the region and are not restricted to the application area (Spectrum Ecology, 2019b). However, the application area may represent significant habitat if malleefowl are nesting in the vicinity. Potential impacts to malleefowl as a result of the proposed clearing may be minimised by the implementation of a fauna management condition.

A desktop assessment of the application area with a 15 kilometre buffer identified two conservation significant migratory bird species, the Sharp-tailed Sandpiper (*Calidris acuminata*) and the Common Greenshank (*Tringa nebularia*) as potentially occurring within the application area (Talis, 2020). Spectrum Ecology (2019b) considers these migratory birds have a low likelihood of occurring within the application area due to no suitable habitat present. Records of these birds are scarce in the region and limited to large inland wetlands (Spectrum Ecology, 2019b).

Four potential short range endemic (SRE) species were recorded within the application area, including one pseudoscorpion Chernetidae sp., two isopods *Buddelundia* 'BIS350', one geophilomorph *Sepedonophilus* 'BGE043', and one mollusc *Basedowena* cf. *holoserica* (Spectrum, 2019; Talis, 2020). These species were found in vegetation types iii and v (Talis, 2020). Vegetation type v is broadly distributed throughout the region, type iii is associated with salt lake systems though unlikely to represent significant habitat given the Beard association (540) remains largely uncleared (~97%) in the Coolgardie bioregion (Government of Western Australia, 2019; Talis, 2020).

Subterranean fauna are known to occur within the Goldfields region, however the hypersaline condition of the application area is unfavourable to these fauna species (Talis, 2020). Subterranean fauna are not anticipated to occur within the application area (Bennelongia, 2019; Talis, 2020).

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology

Bennelongia (2019)
Government of Western Australia (2019)
Phoenix (2019)
Spectrum Ecology (2019b)

Talis (2020)

GIS Database:
- Imagery
- Pre-European Vegetation
- Threatened Fauna

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments

Proposal is not likely to be at variance to this Principle

There are no known records of Threatened flora within the application area (GIS Database). Flora surveys of the application area did not record any species of Threatened flora (Spectrum Ecology, 2019b; Talis, 2020).

The vegetation associations within the application area are common and widespread within the region (Spectrum Ecology, 2019b; Talis, 2020; GIS Database), and the vegetation proposed to be cleared is unlikely to be necessary for the continued existence of any species of Threatened (rare) flora.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

Spectrum Ecology (2019b)
Talis (2020)

GIS Database:
- Pre-European Vegetation
- Threatened and Priority Flora

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Comments

Proposal is not likely to be at variance to this Principle

There are no known Threatened Ecological Communities (TECs) located within or in close proximity to the application area (GIS Database).

A flora and vegetation survey of the application area did not identify any TECs (Spectrum Ecology, 2019b; Talis, 2020).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

Spectrum Ecology (2019b)
Talis (2020)

GIS Database:
- Threatened and Priority Ecological Communities Boundaries
- Threatened and Priority Ecological Communities Buffers

(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.

Comments

Proposal is not at variance to this Principle

The application area falls within the Coolgardie Bioregion of the Interim Biogeographic Regionalisation for Australia (IBRA) (GIS Database). Approximately 97% of the pre-European vegetation still exists in the IBRA Coolgardie Bioregion (Government of Western Australia, 2019). The application area is broadly mapped as Beard vegetation associations 468: Medium woodland; salmon gum & goldfields blackbutt; and 540: Succulent steppe with open low woodland; sheoak over saltbush (GIS Database). Approximately 97-98% of the pre-European extent of each of these vegetation associations remains uncleared at both the state and bioregional level (Government of Western Australia, 2019).

Therefore, the application area does not represent a significant remnant of native vegetation in an area that has been extensively cleared.

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-European % in DBCA managed lands
IBRA Bioregion – Coolgardie	12,912,204	12,648,491	~97	Least Concern	16.39
Beard vegetation associations – WA					

468	592,022	583,902	~98	Least Concern	22.86
540	202,423	200,158	~98	Least Concern	27.87
Beard vegetation associations – Coolgardie Bioregion					
468	583,357	575,360	~98	Least Concern	22.43
540	75,810	73,619	~97	Least Concern	N/A

* Government of Western Australia (2019)
** Department of Natural Resources and Environment (2002)

Based on the above, the proposed clearing is not at variance to this Principle.

Methodology Department of Natural Resources and Environment (2002)
Government of Western Australia (2019)

GIS Database:
- IBRA Australia
- Pre-European Vegetation

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments

Proposal may be at variance to this Principle

The application area contains three vegetation types that are growing in association with salt lakes (Spectrum Ecology, 2019b; Talis, 2020):

Vegetation type ii: *Tecticornia halocnemoides* ssp. *halocnemoides*, *T. indica* ssp. *indica* and *T. chartacea* low open chenopod shrubland;

Vegetation type iii: *Eucalyptus yilgarnensis*, *E. salubris* and *E. clelandiorum* mid woodland over *Eremophila scoparia*, *Senna artemisiodes* ssp. *filifolia* mid open shrubland over *Ptilotus obovatus* low isolated shrubs;

Vegetation type xi: *Duma florulenta* mid sparse shrubland.

There are no permanent watercourses or wetlands within the area proposed to clear (Talis, 2020; GIS Database). The application area intersects with an area prone to inundation in the northwest and an ephemeral lake in the southeast, which typically only become briefly inundated following periods of significant rainfall (Talis, 2020). Vegetation types ii and xi are present in these two areas respectively, and fall outside Evolution's proposed clearing footprint (Talis, 2020). Vegetation type iii does not occur within any ephemeral watercourse despite growing in association with salt lakes (GIS Database).

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology Spectrum Ecology (2019b)
Talis (2020)

GIS Database:
- Hydrography, Lakes
- Hydrography, linear

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments

Proposal may be at variance to this Principle

The application area lies within the Coolgardie bioregion (GIS Database), within the Eastern Goldfields subregion (CALM, 2002). The subregion is comprised of gently undulating plains, interrupted by greenstone belts and rocky granite outcrops, covered by weathered in-situ soil material with the occasional breakaway (CALM, 2002; Soilwater, 2019).

At a regional scale, the soils of the application area are mostly comprised of SV15 soils, with a very small area of Mx43 soils in the northeast corner of the application area (GIS Database). The SV15 soil type is characterised as salt lakes and their associated areas, where common soils are gypseous and saline loams, together with gypseous and saline soils on the lake beds (Northcote et al., 1960-68). The Mx43 soil type is characterised as gently undulating valley plains and pediments, with some outcrop of basic rock (Northcote et al., 1960-68). Primary soils are alkaline red earths with limestone or limestone nodules at shallow depth (Northcote et al., 1960-68).

However, a survey of the application area describes the soils as reddish brown loamy earths, due to the application area existing on a slight elevation relative to the surrounding playa lake systems and more closely resembles the Mx43 soil type (Soilwater, 2019).

The proposed clearing may cause localised wind and surface water erosion to occur (Talis, 2020). The clearing will be undertaken progressively, with appropriate measures such as installing drainage channels to divert surface water and applying dust suppressing techniques to minimise any potential land degradation (Talis, 2020). Potential land degradation impacts as a result of the proposed clearing may be minimised by the implementation of a staged clearing condition.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology
CALM (2002)
Northcote et al. (1960-68)
Soilwater (2019)
Talis (2020)

GIS Database:
- Soils, Statewide

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Comments

Proposal is not likely to be at variance to this Principle

There are no conservation areas in the vicinity of the application area. The nearest DBCA (formerly DPaW) managed land is the Kurrawang Nature Reserve which is located approximately 12 kilometres southeast of the application area (GIS Database). The proposed clearing is unlikely to impact on the environmental values of any conservation area.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology
GIS Database:
- DPaW Tenure

(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.

Comments

Proposal is not likely to be at variance to this Principle

There are no Public Drinking Water Source Areas within or in close proximity to the application area (GIS Database). There are no permanent watercourses or wetlands within the area proposed to clear (GIS Database). The application area intersects a small area subject to inundation in the northwest and a saline ephemeral lake system in the southeast, which are typically only briefly inundated following periods of intense rainfall (GIS Database; Talis, 2020; RPS, 2017). Drainage lines in the region are dry for most of the year, only flowing briefly immediately following significant rainfall. The proposed clearing is unlikely to result in significant changes to surface water flows.

Regional groundwater recharge primarily occurs from underlying aquifers with minimal direct infiltration due to the regions high evaporation rate (Talis, 2020). The proposed clearing is unlikely to cause deterioration in the quality of underground water.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology
RPS (2017)
Talis (2020)

GIS Database:
- Hydrography, Linear
- Public Drinking Water Source Areas

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments

Proposal is not likely to be at variance to this Principle

The climate of the region is semi-arid to arid, with an average annual rainfall of 200-300 millimetres, the pattern is bimodal with peaks in summer and winter (CALM, 2002; Soilwater, 2019). The nearest weather station is Coolgardie, approximately 20 kilometres south of the application area, with an average rainfall of approximately 269.6 millimetres per year (BoM, 2020).

There are no permanent water courses or waterbodies within the application area (GIS Database). The

application area intersects small claypan areas subject to inundation in the northwest and southeast (Spectrum Ecology, 2019b; Talis, 2020). Temporary ponding and subsequent surface water runoff is typical in the region following significant rainfall events, flowing into the surrounding catchment systems (RPS, 2017). While seasonal drainage lines are common in the region and temporary localised flooding may occur briefly following heavy rainfall events, the proposed clearing is unlikely to increase the incidence or intensity of natural flooding events.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology CALM, 2002
BoM (2020)
RPS (2017)
Soilwater (2019)
Talis (2020)

GIS Database:
- Hydrography, linear

Planning Instrument, Native Title, previous EPA decision or other matter.

Comments

The clearing permit application was advertised on 24 February 2020 by the Department of Mines, Industry Regulation and Safety (DMIRS), inviting submissions from the public. No submissions were received in relation to this application.

There are two native title claims (WC2017/007; WC2017/001) over the area under application (DPLH, 2020). These claims have been registered with the National Native Title Tribunal / determined by the Federal Court on behalf of the claimant groups. However, the mining tenure has been granted in accordance with the future act regime of the *Native Title Act 1993* and the nature of the act (i.e. the proposed clearing activity) has been provided for in that process, therefore, the granting of a clearing permit is not a future act under the *Native Title Act 1993*.

There are no registered Aboriginal Sites of Significance within the application area (DPLH, 2020). It is the proponent's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

It is the proponent's responsibility to liaise with the Department of Water and Environmental Regulation and the Department of Biodiversity, Conservation and Attractions, to determine whether a Works Approval, Water Licence, Bed and Banks Permit, or any other licences or approvals are required for the proposed works.

Methodology DPLH (2020)

4. References

Bennelongia (2019) Mungari Operations: desktop assessment of subterranean fauna values at Castle Hill, Rayjax and Cutters Ridge. Report prepared for Evolution Mining (Mungari) Pty Ltd, by Bennelongia Environmental Consultants, September 2019.

BoM (2020) Bureau of Meteorology Website – Climate Data Online, Weather Station Name. Bureau of Meteorology. http://www.bom.gov.au/climate/data/ (Accessed 11 March 2020).

CALM (2002) A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002. Department of Conservation and Land Management, Western Australia.

DEC (2010) A Biodiversity and Cultural Conservation Strategy for the Great Western Woodlands. Department of Environment and Conservation, Western Australia.

DPLH (2020) Aboriginal Heritage Inquiry System. Department of Planning, Lands and Heritage. http://maps.daa.wa.gov.au/AHIS/ (Accessed 26 March 2020).

Department of Natural Resources and Environment (2002) Biodiversity Action Planning. Action planning for native biodiversity at multiple scales; catchment bioregional, landscape, local. Department of Natural Resources and Environment, Victoria.

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

Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Northcote, K.H., Beckmann, G.G., Bettenay ,E., Churchward, H.M., van Dijk, D.C., Dimmock, G.M., Hubble, G.D., Isbell, R.F., McArthur, W.M., Murtha, G.G., Nicolls, K.D., Paton, T.R., Thompson, C.H., Webb, A.A. and Wright, M.J. (1960-68) 'Atlas of Australian Soils, Sheets 1 to 10, with explanatory data'. CSIRO and Melbourne University Press: Melbourne.

Phoenix (2019) Fauna survey for Mungari Gold Operations Cutters Ridge Project. Report prepared for Evolution Mining (Mungari) Pty Ltd, by Phoenix Environmental Sciences Pty Ltd, May 2019.

RPS (2017) Mungari TSF Expansion: Surface Water Assessment. Report prepared for Evolution Mining (Mungari) Pty Ltd, by RPS, April 2017.

Soilwater (2019) TSF3/4 Soil Characterisation Report. Report prepared for Evolution Mining (Mungari) Pty Ltd, by Soilwater Group, January 2019.
Spectrum Ecology (2019a) Evolution Mining – Targeted Flora Search: *Calandrinia lefroyensis/quartzitica*. Report prepared for Evolution Mining Ltd, by Spectrum Ecology Pty Ltd, November 2019.
Spectrum Ecology (2019b) Rayjax & Castle Hill Reconnaissance Flora & Level 1 Fauna Survey. Report prepared for Evolution Mining (Mungari) Pty Ltd, by Spectrum Ecology Pty Ltd, September 2019.
Talis (2020) Mungari TSF 3 & 4 NVCP Application – Supporting Document. Report prepared for Evolution Mining (Mungari) Pty Ltd, by Talis Consultants Pty Ltd, January 2020.

5. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government
DAA	Department of Aboriginal Affairs, Western Australia (now DPLH)
DAFWA	Department of Agriculture and Food, Western Australia (now DPIRD)
DBCA	Department of Biodiversity, Conservation and Attractions, Western Australia
DEC	Department of Environment and Conservation, Western Australia (now DBCA and DWER)
DoEE	Department of the Environment and Energy, Australian Government
DER	Department of Environment Regulation, Western Australia (now DWER)
DMIRS	Department of Mines, Industry Regulation and Safety, Western Australia
DMP	Department of Mines and Petroleum, Western Australia (now DMIRS)
DPIRD	Department of Primary Industries and Regional Development, Western Australia
DPLH	Department of Planning, Lands and Heritage, Western Australia
DRF	Declared Rare Flora
DoE	Department of the Environment, Australian Government (now DoEE)
DoW	Department of Water, Western Australia (now DWER)
DPaW	Department of Parks and Wildlife, Western Australia (now DBCA)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DoEE)
DWER	Department of Water and Environmental Regulation, Western Australia
EPA	Environmental Protection Authority, Western Australia
EP Act	*Environmental Protection Act 1986*, Western Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Federal Act)
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
PEC	Priority Ecological Community, Western Australia
RIWI Act	*Rights in Water and Irrigation Act 1914*, Western Australia
TEC	Threatened Ecological Community

Definitions:

{DBCA (2019) Conservation Codes for Western Australian Flora and Fauna. Department of Biodiversity, Conservation and Attractions, Western Australia}:-

T **Threatened species:**

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR **Critically endangered species**
Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN **Endangered species**

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU **Vulnerable species**

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct Species:

EX **Extinct species**

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW **Extinct in the wild species**

Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species:

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI **Migratory species**

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD **Species of special conservation interest (conservation dependent fauna)**

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS **Other specially protected species**

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P **Priority species:**

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

P1 **Priority One - Poorly-known species**
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

P2 **Priority Two - Poorly-known species**
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

P3 **Priority Three - Poorly-known species**
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

P4 **Priority Four - Rare, Near Threatened and other species in need of monitoring**
(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.