



**COWCOWING THREATENED FLORA SURVEY;
AGLIME TENEMENTS AND REGIONAL SURVEYS**

Aglime of Australia

ecoscape

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Cowcowing Threatened Flora Survey; Aglime Tenements and Regional Surveys

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SUMMARY

Aglime of Australia (Aglime) appointed Ecoscape to undertake a threatened flora survey of an approximate 7 ha area associated with its mining leases in Cowcowing Lake in the Western Australian Wheatbelt, as Clearing Permit 6176/1 had identified the area as potentially having Threatened Flora.

Ecoscape undertook the threatened flora survey in October 2014, and identified that most of the area associated with the Clearing Permit has *Frankenia conferta*, or is within 50 m of mapped habitat. *Frankenia conferta* is listed as Threatened under the Western Australian *Wildlife Conservation Act 1950* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Subsequently Ecoscape was appointed to undertake a targeted search for this species on Aglime's previously mined and unmined tenements, as well as a regional survey of Cowcowing Lake, in order to determine the extent of the local population and make a population estimate in order to gauge the significance of the potential impact. Ecoscape undertook these additional assessments in December 2014 and, although the surveys were considered as out of season, the species is readily identifiable by vegetative and fruiting characteristics so there were no botanical constraints associated with this survey.

The December 2014 surveys identified:

- *Frankenia conferta* was widely distributed across Cowcowing Lake, and was associated with elevated areas on gypsum-derived substrate; the required elevation was estimated as being as little as 10 cm above the lake basement
- the population of *Frankenia conferta* within the 13 000 ha Cowcowing Lake was broadly estimated at over 10 000 000 individual plants
- the population of *Frankenia conferta* within the Clearing Permit area was broadly estimated at 17 000 plants, which represented approximately 0.17% of the broadly estimated population within the lake
- even if the broad population estimate is an overestimate, the proportional impact would still be less than 1% of the lake population
- *Frankenia conferta* is associated with a number of lakes, largely within the Western Australian Wheatbelt, therefore the potential impact on the total population would be even less
- *Frankenia conferta* was observed to recolonise suitable habitat in previously mined areas.

Ecoscape considers that the potential impact on the population of *Frankenia conferta* would be insignificant if clearing was permitted within the Clearing Permit area and, further, that the species recolonises suitable habitat when mining has ceased.

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

Aglime of Australia (Aglime) holds a number of mining leases on Cowcowing Lake, approximately 17 km north of Wyalkatchem, in the Western Australian Wheatbelt.

Cowcowing Lake (or Lakes) is a large, mainly dry, playa lake occupying approximately 13 700 ha. Most of the lake bed has sparse *Tecticornia* spp. (Samphire) shrubs over a relatively flat surface that has only minor variations in elevation (estimated at less than 20 cm). Within the lake are areas of lower elevation that may be seasonally wet and are salt-encrusted and unvegetated (lower elevation lakes). Most of these lower elevation lakes have sandy, concentric berms surrounding them, generally on the eastern and southern sides, vegetated with *Tecticornia* spp., *Atriplex* spp. and *Frankenia pauciflora*. Within the lake bed are also a number of linear gypsum mounds, mostly only approximately 20-30 cm higher than the lake bed however a number are approximately 3-5 m high and sparsely vegetated with *Tecticornia* spp., *Casuarina obesa*, *Hakea preissii*, *Lycium australe* and native and introduced grasses and herbs. These higher elevated mounds are of interest for gypsum mining, and are associated with mining tenements.

Figure 1 illustrates the mining leases on Cowcowing Lake. Aglime holds leases on tenements M70/1078, M70/173, M70/264, M70/172 and M70/171, within the south-eastern cluster of tenements. Tenement M70/559 is the western tenement. Aglime does not hold the lease on tenement M70/137 that is located between tenements M70/171 and M70/172 (in the south-eastern cluster), nor the tenements in the northern cluster.

Gypsum has been mined from tenements M70/172, M70/264 and part of M70/173. No mining has been conducted on tenements M70/171, M70/1078 and M70/559.

Approximately 7 ha within tenements M70/1078 and M70/173 have been proposed for mining, however a conservation significant flora survey was required to satisfy Conditions 7a-c of Clearing Permit 6176/1. Clearing Permit 6176/1 identified *Frankenia conferta* (Threatened Flora, TF) as having potential to occur.

Threatened Flora are protected under Sub-section 2 of Section 23F of the *Wildlife Conservation Act 1950* making it an offence to remove or damage rare flora (as they are termed in the *Act*) without Ministerial approval. Additional protection is provided as this species is also listed as Endangered under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. In general a 50 m buffer is applied to protect TF (Department of Environment Regulation & Government of Western Australia 2014), within which no disturbance is permitted.

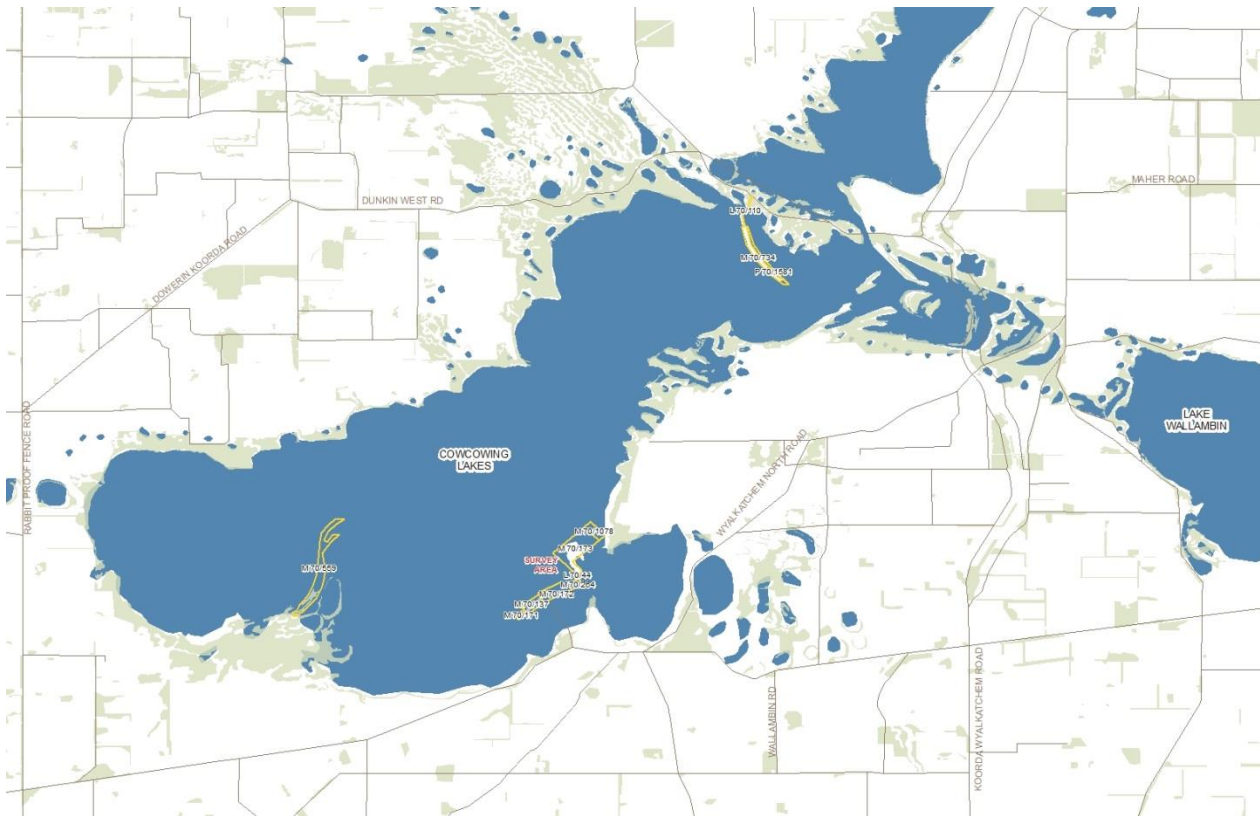


Figure 1: Active mining tenements on Cowcowing Lake

2.0 CLEARING PERMIT AREA FLORA SURVEY

Aglime appointed Ecoscape to undertake the conservation significant flora survey (also known as Threatened Flora Survey) of the Clearing Permit 6176/1 area.

2.1 DESKTOP ASSESSMENT

Commonwealth and DPaW Conservation Codes are listed in **Table 6** and **Table 7** (respectively) in **Appendix One**. The full list of conservation significant flora identified using the *NatureMap* search is provided in **Table 8** in **Appendix Two**.

Additional conservation significant flora that may occur within the Clearing Permit area were identified by a *NatureMap* (Department of Parks and Wildlife [DPaW] 2007-2014) search using a 30 km buffer and *FloraBase* (Western Australian Herbarium [WAH] 1998-2014) information to identify relevant habitat. Four additional species that are known to be associated with salt lake environments were identified: *Angianthus micropodioides* (Priority 3), *Caladenia drakeoides* (TF), *Fitzwillia axilliflora* (Priority 2) and *Frankenia glomerata* (Priority 3).

These were included as search species in the field survey.

The 6176/1 Clearing Permit Decision Report is provided in **Appendix Three**.

2.2 CLEARING PERMIT FIELD SURVEY METHODOLOGY

The field survey (conservation significant flora search) was undertaken on 29 October 2014 by Associate Environmental Scientist Lyn Atkins (flora collecting permit SL010888, Permit to collect Declared Rare Flora 99-1415). The proposed mining area consisted of two elevated gypsum mounds 3-5 m high, rising from the bed of Cowcowing Lake (**Figure 2**, the area included in Clearing Permit 6176/1 is within the red line). Mining has been conducted up to the southern edge of this area.

The area was searched using a wandering transect to cover the various habitat areas within the survey area. The distance between these transects varied but was generally at approximately 40 m spacing. Due to the sparseness of the vegetation, changes were clearly visible.

Locations of plants were recorded using a hand held GPS.

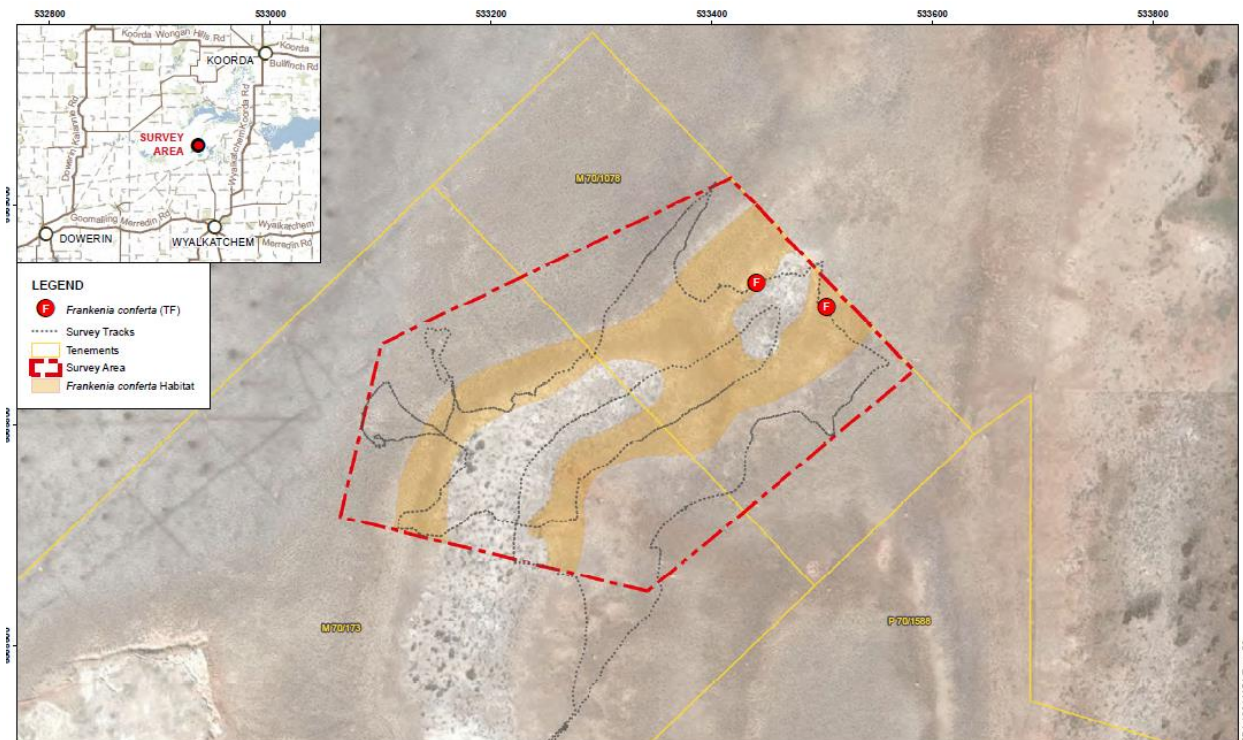


Figure 2: Clearing Permit 6176/1 area and results of the October 29 survey

2.3 CLEARING PERMIT AREA FIELD SURVEY RESULTS

Four *Frankenia* specimens were collected during the field survey; two of these, indicated in **Figure 2**, were determined to be *Frankenia conferta*. The habitat of this species is also shown in **Figure 2**.

The population consisted of over one thousand individual *Frankenia conferta* plants (**Plate 1**, **Plate 2**), and potentially as many as 17,000 individuals using the population estimation method that follows (although this is likely to be an overestimation in this area).

All of the proposed mining area is within the habitat area of this species or within 50 m of it. The habitat for this species was on the footslopes of the lake mounds and slightly elevated areas within the bed of Cowcowing Lake (**Plate 3**), with sparse individuals on the mound slopes and rarely on the mound. *Frankenia conferta* was not recorded from the lake bed (**Plate 4**).

The identification of *Frankenia conferta* was confirmed by WAH taxonomist Michael Hislop on 10 December 2014.

A Threatened and Priority Flora Report Form has been submitted to DPaW, and the WAH is retaining the specimen submitted for identification for inclusion in the Herbarium.

Additional information is available in Ecoscape (2014) report 9951-3318-14R.



Plate 1: *Frankenia conferta*



Plate 2: *Frankenia conferta*



Plate 3: *Frankenia conferta* footslope habitat



Plate 4: Lake bed

2.4 BOTANICAL LIMITATIONS (CLEARING PERMIT AREA)

Table 1: Botanical limitations (Clearing Permit area)

POSSIBLE LIMITATIONS	CONSTRAINTS (YES/NO): SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No	The botanist conducting the survey has approximately 30 years of botanical survey experience in Western Australia, including in the Wheatbelt.
Proportion of the flora identified	No	All collected specimens were identified to a level required to determine their conservation significance.
Proportion of the task achieved and further work that may need to be undertaken	Negligible	The survey area was adequately covered to determine the presence of larger conservation significant flora species. Smaller annual species may have been overlooked however, except for the mounds, almost no annual species were observed on the playa lake bed or footslopes (the exception being <i>Calandrinia eremaea</i>).
Timing/weather/season/cycle	Negligible	The field survey was conducted in October which is within the flowering period of the target conservation significant flora species. The weather during the field survey was heavily overcast, however visibility was sufficient to identify <i>Frankenia</i> spp. at approximately 10-15 m distance. Seasonal conditions were considered poor due to below average rainfall; the 2014 May – October rainfall at Cowcowing (Bureau of Meteorology station 10032, approximately 10 km east of the survey area) was 161.9 mm compared with the long-term average of 210.2 mm (77% of average rainfall) (Bureau of Meteorology 2014). Whilst these conditions had no constraints in terms of finding and identifying perennial species, annual and ephemeral species may have been absent or not flowering during this survey.
Intensity of survey (e.g. In retrospect was the intensity adequate?)	Negligible	The survey was adequate to identify the main species of interest and its habitat area. Individual plant numbers were not counted during the first survey, however there are likely to be at least several thousand <i>Frankenia conferta</i> plants in the survey area, as estimated during subsequent surveys.
Completeness (e.g. Was relevant area fully surveyed?)	Negligible	As above.
Resources (e.g. Degree of expertise available for plant identification)	No	There is adequate information available to identify target search species. The flora surveyor has considerable experience in Wheatbelt botanical surveys and can readily identify discrete species, and collect for confirmation when required. The taxonomist identifying the collected specimens has approximately 10 years' experience identifying Western Australia plants.
Remoteness and/or access problems	No	The site was readily accessible
Availability of contextual (e.g. bioregional) information for the survey area	No	There is adequate contextual available.

3.0 PREVIOUSLY MINED AREA FLORA SURVEY

As a result of the previous survey finding that *Frankenia conferta* was distributed over much of the area included in the Clearing Permit (see **Section 2.0**), Aglime appointed Ecoscape to conduct a targeted survey of its previously mined areas to determine if this species was recolonising following mining.

3.1 MINED AREA FIELD SURVEY METHODOLOGY

The targeted search for *Frankenia conferta* (and any other conservation significant flora) in the previously mined area was conducted by Lyn Atkins on 4 December 2014. The mined portion of tenement M70/173 and tenements M70/172 and M70/264 were included in the search.

The survey methodology, consisting of a wandering transect to investigate various habitat areas, was the same as used previously. Plant density was estimated using a count or estimation of the number of plants within a 5 m radius of recorded locations.

Frankenia conferta was identified as distinctive from other *Frankenia* spp. by the presence of hairs along the plant stems and at the leaf nodes, visible using a hand lens, and dense terminal flower heads. As there are collecting limitations on TF, comparison with a confirmed specimen was used for identification.

Aglime representatives were present for part of the survey.

3.2 MINED AREA FIELD SURVEY RESULTS

The previously mined areas consisted of a relatively flat surface, with minor variations in elevation, with banks generally around the outer edge of the mined area but also occasionally within it. Vegetation, largely *Tecticornia* spp., had recolonised much of the flatter areas particularly in the lower-lying parts and untrafficked areas, and on some of the older, more gently sloped banks. Vegetation on some of the older, more gently sloped banks resembled that of the uncleared mounds.

Frankenia conferta was recorded as recolonising various habitats within the previously mined areas:

- low-lying areas (but not the lowest-lying areas nor heavily trafficked, compacted areas) within the generally flat areas (**Plate 5, Plate 6**)
- gentle banks at the edges of flat areas (**Plate 7**)
- very rarely on steep banks (**Plate 8**).

Frankenia conferta is the low, rounded, grey-green plant in the foreground of these images.

Populations estimates are included in the discussion that follows.

Map 1 shows the area traversed and population count or estimate at each representative location where *Frankenia conferta* was recorded.



Plate 5: *Frankenia conferta* recolonising previously mined area



Plate 6: *Frankenia conferta* recolonising previously mined area



Plate 7: *Frankenia conferta* recolonising gentle banks within previously mined areas



Plate 8: *Frankenia conferta* recolonising steep bank on edge of previously mined area

3.1 BOTANICAL LIMITATIONS (PREVIOUSLY MINED AREAS)

Table 2: Botanical limitations (previously mined areas)

POSSIBLE LIMITATIONS	CONSTRAINTS (YES/NO): SIGNIFICANT, MODERATE OR NEGLECTIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No	The botanist conducting the survey has approximately 30 years of botanical survey experience in Western Australia, including in the Wheatbelt.
Proportion of the flora identified	No	The target species was readily identifiable from other <i>Frankenia</i> spp. using vegetative and fruiting characteristics.
Proportion of the task achieved and further work that may need to be undertaken	No	The survey area was adequately covered to determine the presence of <i>Frankenia conferta</i> and determine its habitat.
Timing/weather/season/cycle	No	The field survey was conducted in December which is outside the typical flowering period of <i>Frankenia conferta</i> , however the species is identifiable using vegetative and fruiting characteristics and is clearly visible in its habitat. The weather during the field survey was clear and sunny with no restrictions on visibility. Seasonal conditions were considered poor due to below average rainfall, however the survey was 'out of season' and therefore seasonal conditions were largely irrelevant.
Intensity of survey (e.g. In retrospect was the intensity adequate?)	No	The survey was adequate to identify the presence and habitat of the target species.
Completeness (e.g. Was relevant area fully surveyed?)	No	As above.
Resources (e.g. Degree of expertise available for plant identification)	No	There is adequate information available to identify <i>Frankenia conferta</i> , based on comparison with specimens collected during the first survey. The flora surveyor has considerable experience in Wheatbelt botanical surveys and can readily identify discrete species, and collect for confirmation when required. The identification was confirmed by both Ecoscape's and WAH's taxonomists.
Remoteness and/or access problems	No	The site was readily accessible
Availability of contextual (e.g. bioregional) information for the survey area	No	There is adequate contextual available.

4.0 REGIONAL AND UNMINED TENEMENT

FLORA SURVEY

As a result of the previous survey finding that *Frankenia conferta* was distributed over much of the area included in the Clearing Permit (see **Section 2.0**), Aglime appointed Ecoscape to conduct a regional survey of Cowcowing Lake to determine if the species is widespread over the lake or confined to the original survey area and its immediate surrounds, and to estimate the population to gauge the impact on the population of clearing in the Clearing Permit Area.

4.1 REGIONAL FIELD SURVEY METHODOLOGY

The regional and unmined tenements M70/171 and M70/559 targeted survey (abbreviated to 'regional survey') for *Frankenia conferta* was undertaken by Andrew Fry (flora collecting permit SL010884) on 4 December and 16 December and Lyn Atkins on 16 December 2014. Tenement M70/137, not held by Aglime, was traversed but not specifically targeted for searches, although habitat was noted. Other conservation significant flora were also included in the search, but were not the main target.

The regional targeted survey was conducted using quad bikes to traverse the lake bed, targeting potential habitat that was identified using aerial imagery, as well as crossing non target areas to confirm the absence of the species. The habitat areas on Cowcowing Lake were mapped. Locations of *Frankenia conferta* were recorded in representative areas and a population density estimated by counting (or estimating) the number of plants within a 5 m radius of each location point.

4.2 REGIONAL FIELD SURVEY RESULTS

The area to the east and south of the mined Aglime tenements, and unmined tenement M70/171, were searched on 4 December, with the area to northwest, west and southwest including unmined tenement M70/559, searched on December 16.

Tenement M70/559 consisted of a series of sparsely vegetated gypsum mounds up to approximately 3 m elevation above the lake bed. The majority of M70/559 could be considered as footslopes of these mounds.

Frankenia conferta was recorded in various habitats that largely corresponded with the habitat assessment of the Clearing Permit area. *Frankenia conferta* was found to be associated with:

- slightly elevated areas within the lake bed (no more than 10-20 cm above the general lake surface), visible as lighter coloured areas on the aerial imagery and probably of gypsum substrate
- footslopes of larger mounds (M70/559); gypsum substrate
- rarely on the larger gypsum mound (M70/559)
- elevated platforms of lower-elevation lakes within the lake bed, but only sparsely (or not at all) where these were sandy substrate
- edge banks of Cowcowing Lake.

The search area and population estimates at recording locations are shown on **Map 1**.



Plate 9: *Frankenia conferta* on slightly elevated area within lake bed



Plate 10: *Frankenia conferta* on slightly elevated area within lake bed, east of south-eastern tenements



Plate 11: *Frankenia conferta* on footslope of mound (tenement M70/559)



Plate 12: Sparse *Frankenia conferta* on elevated platform associated with lower elevation lake



Plate 13: *Frankenia conferta* on lake edge, east of south-eastern tenements



Plate 14: *Frankenia conferta* close to lake edge

Frankenia conferta was not associated with the basement lake bed or lower elevation lakes, nor with sandy substrate including to the south of M70/559, part of which had been previously cleared and possibly cropped.

4.2.1 Additional Conservation Significant Flora Species

Fitzwillia axilliflora (Priority 2) was recorded at two locations; one close to tenement M70/172 and the other adjacent to a lower elevation lake east of tenement M70/559. Their locations are indicated on **Map 1**.



Plate 15: *Fitzwillia axilliflora*

4.3 BOTANICAL LIMITATIONS (REGIONAL SURVEY AREAS)

Table 3: Botanical limitations (regional survey areas)

POSSIBLE LIMITATIONS	CONSTRAINTS (YES/NO): SIGNIFICANT, MODERATE OR NEGLECTIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No	The lead botanist conducting the survey has approximately 30 years of botanical survey experience in Western Australia, including in the Wheatbelt. The assistant botanist has approximately three years of botanical experience in Western Australia, however only one easily recognisable species was the main target of the survey.
Proportion of the flora identified	No	The target species was readily identifiable from other <i>Frankenia</i> spp. using vegetative and fruiting characteristics.
Proportion of the task achieved and further work that may need to be undertaken	No	Despite the wide survey spacing, the survey area was adequately covered to determine the presence of <i>Frankenia conferta</i> and determine its habitat.
Timing/weather/season/cycle	No	<p>The field survey was conducted in December which is outside the typical flowering period of <i>Frankenia conferta</i>, however the species is identifiable using vegetative and fruiting characteristics and is clearly visible in its habitat.</p> <p>The weather during the field survey was clear and sunny with no restrictions on visibility.</p> <p>Seasonal conditions were considered poor due to below average rainfall, however the survey was 'out of season' and therefore seasonal conditions were largely irrelevant.</p>
Intensity of survey (e.g. In retrospect was the intensity adequate?)	No	The survey was adequate to identify the presence and habitat of the target species.
Completeness (e.g. Was relevant area fully surveyed?)	No	As above.
Resources (e.g. Degree of expertise available for plant identification)	No	There is adequate information available to identify <i>Frankenia conferta</i> , based on comparing a confirmed specimen collected during the first survey. The flora surveyor has considerable experience in Wheatbelt botanical surveys and can readily identify discrete species, and collect for confirmation when required. The identification was confirmed by both Ecoscape's and WAH's taxonomists.
Remoteness and/or access problems	No	The site was readily accessible
Availability of contextual (e.g. bioregional) information for the survey area	No	There is adequate contextual available.

5.0 FRANKENIA CONFERTA POPULATION

ESTIMATION

5.1 POPULATION ESTIMATION METHOD

Frankenia conferta numbers were counted or estimated from within a 5 m radius of each location at which it was recorded. Contiguous populations were recorded separately from patchy populations.

Predicted *Frankenia conferta* habitat was mapped, using the recorded locations as a guide to identifying habitat areas from aerial imagery, or as interpreted during the field. Point radius counts were converted into *Frankenia conferta* density classes as follows:

- scattered (1-20 plants in 5 m radius or more dense but patchy population within habitat area)
- moderate (20-80 plants in 5 m radius)
- abundant (80+ plants in 5 m radius).

Each mapped habitat area was assigned a habitat class. Broad population estimates were then calculated using the density class and proportion of habitat (in relation to non-habitat) area in various parts of Cowcowing Lake. The population densities used in the population estimates were:

- scattered: two plants/100m² (e.g. **Plate 6**)
- moderate: 40 plants/100m² (e.g. **Plate 10**)
- abundant: 90 plant/100m² (e.g. **Plate 11**, although at times the density in the 'abundant' density area was greater than indicated).

Map 2 shows the predicted population extent based on habitat mapping and the population density assigned to each habitat patch.

Ecoscope is aware that these are very broad estimates, however they do provide an indication of population density and total numbers of *Frankenia conferta* on Cowcowing Lake, and the potential impact on the local population of mining being approved in the Clearing Permit area.

Mapping and calculations have been refined since the report that relates to the 4 December survey (supplied to Aglime).

5.2 POPULATION ESTIMATION RESULT

Based on the population methodology described above, the broadly estimated sub-populations of *Frankenia conferta* on Aglime tenements are shown in **Table 4**. Approximately 17 000 individual plants have been calculated as an estimated population of *Frankenia conferta* on the area of the Clearing Permit.

Table 4: Estimated sub-population of *Frankenia conferta* on Aglime tenements

TENEMENT	TENEMENT SIZE (m ²)	PREDICTED HABITAT (m ²)	ESTIMATED POPULATION
M70/171	36,798	17,186	6,800
M70/172	230,452	149,787	17,000
M70/173	557,249	140,630	11,000
M70/264	15,587	7,547	360
M70/559	474,400	257,235	197,000
M70/1078	100,502	20,407	8,000
Total (estimated)	1,414,988	592,792	231,000

Calculation data and regional sub-population estimates are provided in **Table 5**.

Table 5: Regional *Frankenia conferta* sub-population estimates

AREA NAME	AREA (ha)	POPULATION ESTIMATE
Clearing Permit area	7	17,000
Previously mined areas (approximate)	26	5,300
Regional Survey Area	4,134	3,041,000
Cowcowing Lake	13,720	10,091,000

As all habitat patches with *Frankenia conferta* are within 500 m of another patch, it is considered that the entire population of this species on Cowcowing Lake will represent a single population.

Ecoscope considers that it has adequately surveyed approximately 30% of Cowcowing Lake sufficiently to assess *Frankenia conferta* habitat, and to broadly estimate the population in the surveyed area.

Although only a broad estimate and based on the wider lake being of similar habitat, Ecoscope has estimated that there are over 10 000 000 individual *Frankenia conferta* plants associated with Cowcowing Lake. Approximately 7.6% of the total estimated population of *Frankenia conferta* on Cowcowing Lake is associated with Aglime tenements.

Approximately 0.17% of the estimated population of *Frankenia conferta* on Cowcowing Lake is associated with the Clearing Permit area.

6.0 DISCUSSION

6.1 ESTIMATED POPULATION OF *FRANKENIA CONFERTA*

Using the methodology detailed above, Ecoscape has broadly estimated that there are over 10 000 000 individual *Frankenia conferta* plants associated with Cowcowing Lake.

Frankenia conferta is not confined to this lake; review of *NatureMap* (DPaW 2007-2014) records indicates that there are 56 records for this species (four of which are associated with Cowcowing Lake), and it is associated with a number lakes in the Western Australian Wheatbelt (Avon Wheatbelt IBRA region, with some records in the Geraldton Sandplains and Coolgardie IBRA region) (Figure 3). Therefore the Cowcowing Lake population is potentially only a small proportion of the total population.

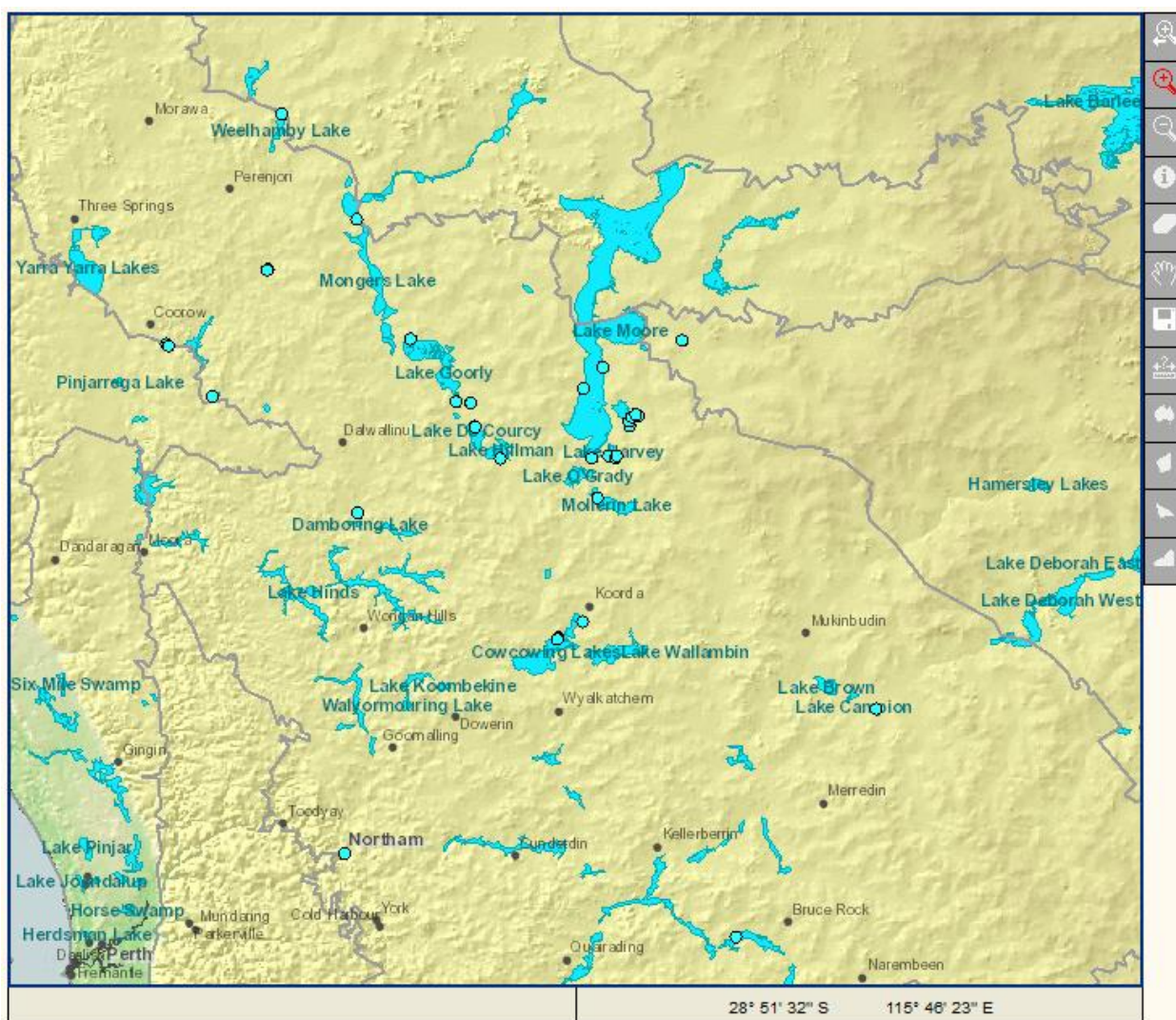


Figure 3: *NatureMap* (DPaW 2007-2014) records of *Frankenia conferta* (accessed 19/12/2014)

6.2 IMPACT OF CLEARING IN PERMIT AREA 6176/1

Ecoscope has broadly estimated that there are approximately 17 000 individual *Frankenia conferta* plants associated with the 7 ha area included in Clearing Permit 6176/1. As a proportion of *Frankenia conferta* broadly estimated to be associated with Cowcowing Lake, the plants on this area represent approximately 0.17% of the total population. Even if the broad population estimates are overestimates, the proportions would remain broadly similar and therefore the impact on the Cowcowing Lake population of *Frankenia conferta*, if mining was to be allowed, is considered to be insignificant.

Further, the Cowcowing Lake population is not the only population of this species, and therefore the impact on the total population of *Frankenia conferta*, if mining in the Clearing Permit 6176/1 area is allowed, is even less.

Additionally, *Frankenia conferta* was recorded as recolonising previously mined areas. Whilst this species' habitat is specific, being confined to elevated gypsum-derived soils, it is not difficult to recreate this habitat when mining has been completed. The required elevation appears to be very small, with sub-populations being at a density described as abundant, in areas of the Cowcowing Lake bed that are only elevated 10-20 cm above the basement level.

6.3 APPLICATION AGAINST CLEARING PRINCIPLE (C)

The Clearing Permit Decision Report for Clearing Permit 6176/1 (**Appendix Three**) states that the proposal may be at variance to Principle (c) *Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora*.

Whilst clearing of this area is clearly in contravention of this principle (i.e. the area proposed to be cleared does include rare flora, specifically *Frankenia conferta*), it is not necessary for the continued existence of this species. Further, the impact on rare flora, if clearing was to be allowed, is considered to be insignificant when taking into account the total population of this species (overall and within Cowcowing Lake), with the additional consideration that this species has been shown to recolonise previously mined areas.

6.4 APPROVALS

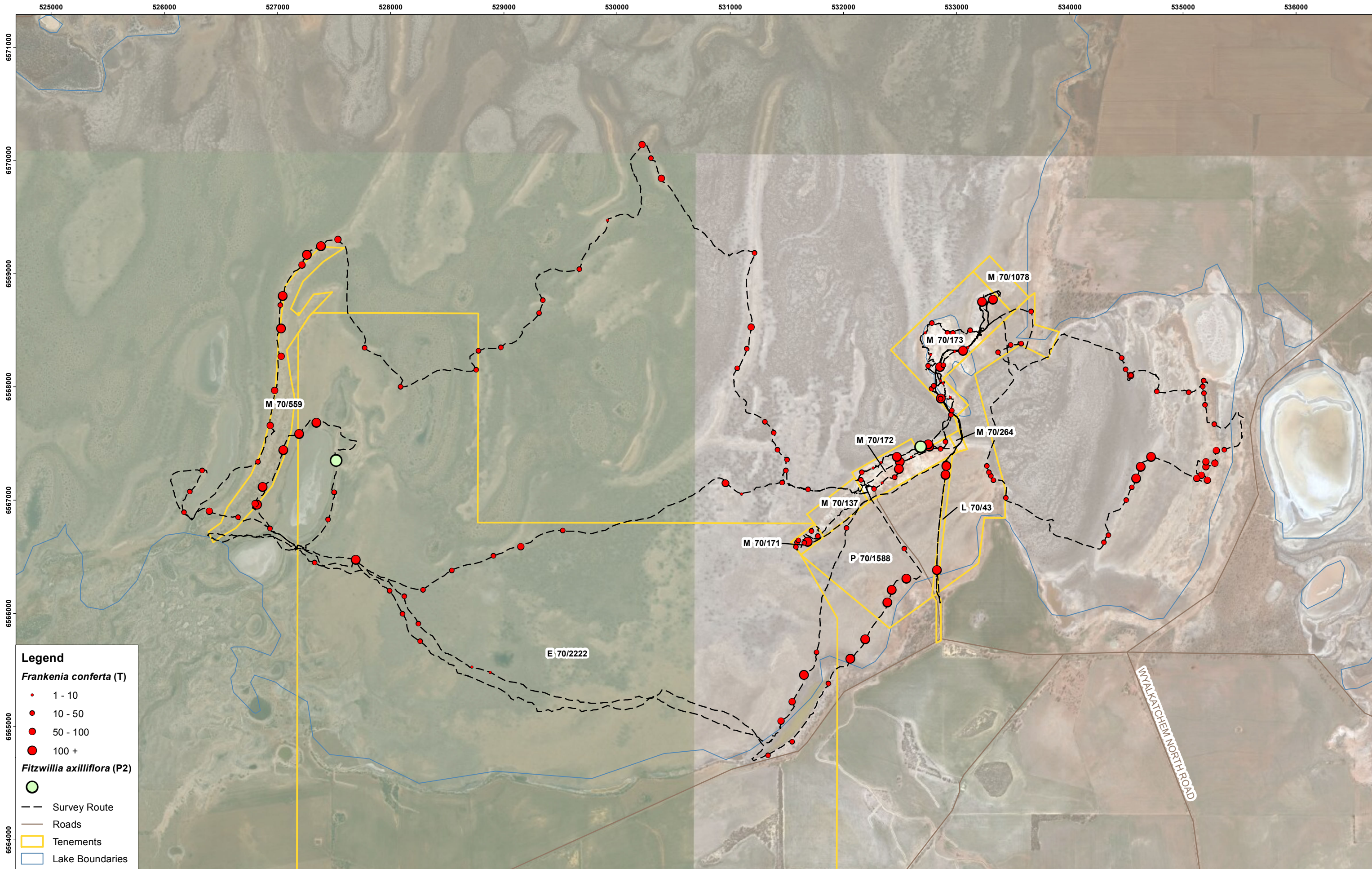
As *Frankenia conferta* is listed by the State as rare, Ministerial approval is required to 'take' Threatened Flora.

As *Frankenia conferta* is also listed under the *EPBC Act 1999*, this clearing permit may also require referral to the Commonwealth Department of the Environment for assessment, however only 'significant impacts' require referral. The decision relating to significance, and therefore referral, is generally the responsibility of State regulatory authorities (Department of Environment Regulation, Department of Parks and Wildlife, Department of Mines and Petroleum).

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MAPS



Legend

Frankenia conferta (T)

- 1 - 10
- 10 - 50
- 50 - 100
- 100 +

Fitzwillia axilliflora (P2)

-

--- Survey Route

— Roads

▭ Tenements

▭ Lake Boundaries

SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRIID, IGN, IGP, SWISSTOPO, AND THE GIS USER

AUTHOR: AF
DATE: DEC-2014

CHECKED: JN
PROJECT NO: 3318-14

SCALE: 1:30,000 @ A3



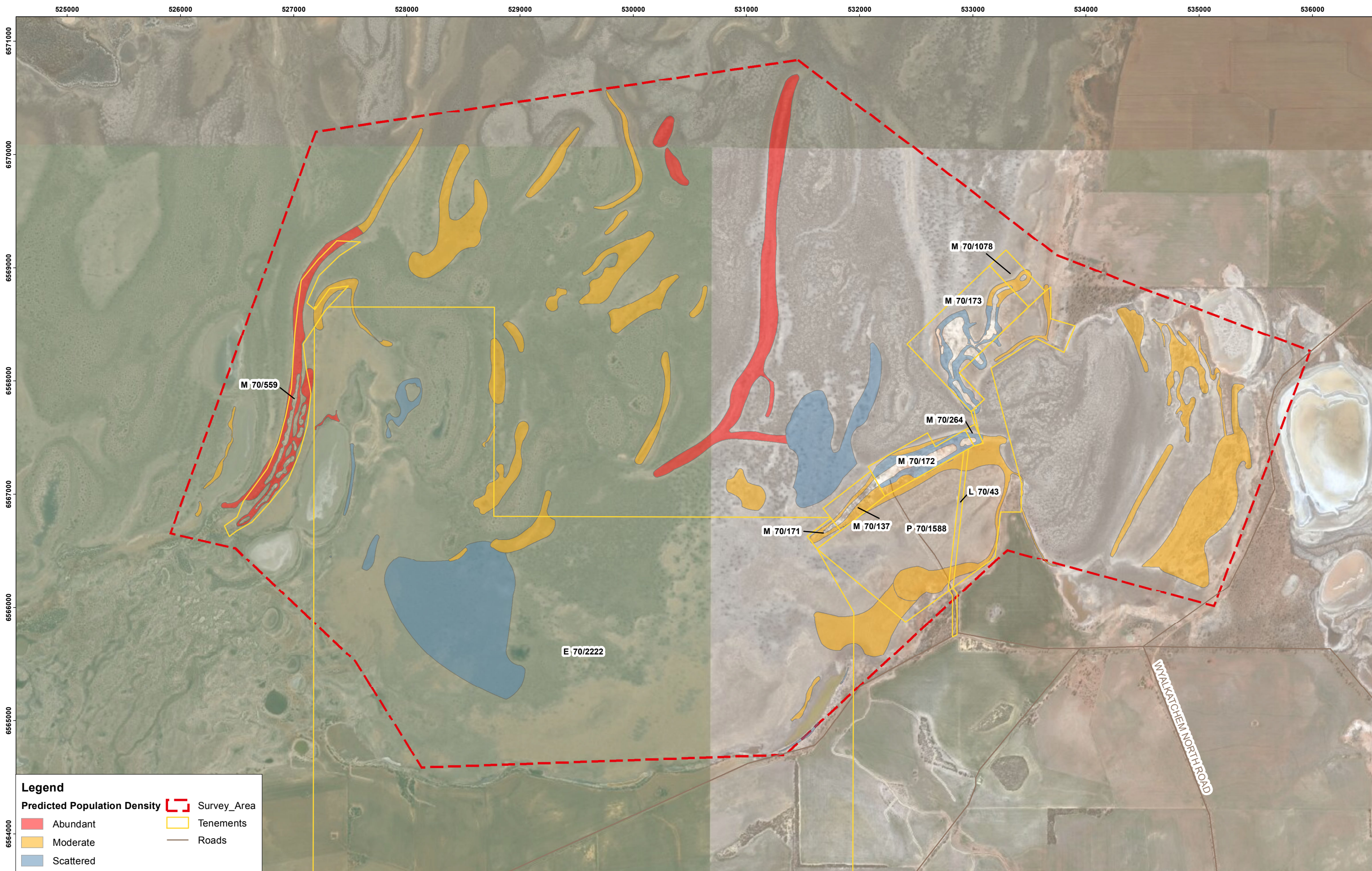
COWCOWING LAKE FRANKENIA CONFERTA SURVEY

CLIENT: AGLIME OF AUSTRALIA

SURVEY RESULTS

MAP 1





Legend

■ Abundant	 Survey_Area
 Moderate	 Tenements
 Scattered	 Roads

SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRIID, IGN, IGP, SWISSTOPO, AND THE GIS USER

AUTHOR: AF
 DATE: DEC-2014

CHECKED: JN
 PROJECT NO: 3318-14

SCALE: 1:30,000 @ A3



COWCOWING LAKE FRANKENIA CONFERTA SURVEY

CLIENT: AGLIME OF AUSTRALIA

PREDICTED EXTENT OF FRANKENIA CONFERTA POPULATIONS

MAP 2



APPENDIX ONE: DEFINITIONS AND CATEGORIES

Table 6: *EPBC Act 1999* categories for flora and fauna (Commonwealth of Australia 1999)

EPBC ACT CATEGORY	DEFINITION
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: <ul style="list-style-type: none"> (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: <ul style="list-style-type: none"> (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: <ul style="list-style-type: none"> (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: <ul style="list-style-type: none"> (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: <ul style="list-style-type: none"> (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Table 7: Western Australian Conservation Codes (DPaW 2014)

CONSERVATION CODES FOR WESTERN AUSTRALIAN FLORA AND FAUNA	
T	<p>Threatened species – Specially protected under the <i>Wildlife Conservation Act 1950</i>, listed under Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).</p> <p>Species* which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.</p> <p>Threatened Fauna and Flora are further recognised by the Department according to their level of threat using IUCN Red List criteria: CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild. EN: Endangered – considered to be facing a very high risk of extinction in the wild. VU: Vulnerable – considered to be facing a high risk of extinction in the wild.</p>
X	<p>Presumed extinct species – Specially protected under the <i>Wildlife Conservation Act 1950</i>, listed under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora).</p> <p>Species* which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.</p>
IA	<p>Migratory birds protected under an international agreement – Specially protected under the <i>Wildlife Conservation Act 1950</i>, listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice.</p> <p>Birds that are subject to an agreement between governments of Australia and Japan, China and The Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.</p>
S	<p>Other specially protected fauna – Specially protected under the <i>Wildlife Conservation Act 1950</i>, listed under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.</p> <p>Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna 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 flora or fauna. 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 list for other than taxonomic reasons, are placed in Priority 4. These taxa require regular monitoring. Conservation Dependent species are placed in Priority 5.</p>
P1	<p>Priority One: Poorly-known species</p> <p>Species that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, rail reserves and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.</p>
P2	<p>Priority Two: Poorly-known species</p> <p>Species that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes</p>
P3	<p>Priority Three: Poorly-known species</p> <p>Species that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat.</p> <p>Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them</p>
P4	<p>Priority Four: Rare, Near Threatened and other species in need of monitoring</p> <p>(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.</p> <p>(b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>
P5	<p>Priority Five: Conservation Dependent species</p> <p>Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.</p>
<p>*Species includes all taxa (plural of taxon—a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies, variety or forma).</p>	

APPENDIX TWO: NATUREMAP SEARCH RESULTS

Table 8: Conservation significant flora identified from the *NatureMap* (DPaW 2007-2014) search

SPECIES NAME	CONSERVATION CODE	SPECIES NAME	CONSERVATION CODE
<i>Acacia ancistrophylla</i> var. <i>perarcuata</i>	P3	<i>Eremophila resinosa</i>	TF
<i>Acacia caesariata</i>	TF	<i>Eremophila viscida</i>	TF
<i>Acacia campylophylla</i>	P3	<i>Eucalyptus erythronema</i> subsp. <i>inornata</i>	P3
<i>Acacia cochlocarpa</i> subsp. <i>velutinos</i>	TF	<i>Eucalyptus recta</i>	TF
<i>Acacia deflexa</i>	P3	<i>Fitzwillia axilliflora</i>	P2
<i>Acacia dissona</i> var. <i>indoloria</i>	P3	<i>Frankenia conferta</i>	TF
<i>Acacia leptoneura</i>	TF	<i>Frankenia glomerata</i>	P3
<i>Acacia</i> sp. Manmanning (B.R. Maslin 7711)	P1	<i>Grevillea dryandroides</i> subsp. <i>hirsuta</i>	TF
<i>Acacia</i> sp. Petrudor Rocks (B.R. Maslin 7714)	P1	<i>Grevillea haplantha</i> subsp. <i>recedens</i>	P3
<i>Aluta aspera</i> subsp. <i>localis</i>	P2	<i>Grevillea rosieri</i>	P2
<i>Angianthus micropodioides</i>	P3	<i>Hypocalymma puniceum</i> subsp. Cadoux (H. Demarz 10533)	P1
<i>Austrostipa</i> sp. Dowerin (G. Wiehl F 8004)	P2	<i>Lepidium genistoides</i>	P3
<i>Banksia shanklandiorum</i>	P4	<i>Leucopogon</i> sp. Bungulla (R.D. Royce 3435)	P3
<i>Beyeria constellata</i>	P1	<i>Melaleuca grieviana</i>	P1
<i>Boronia ericifolia</i>	P2	<i>Melaleuca manglesii</i>	P1
<i>Bossiaea atrata</i>	P3	<i>Persoonia pungens</i>	P3
<i>Caladenia drakeoides</i>	TF	<i>Phebalium drummondii</i>	P3
<i>Calytrix parvivalis</i>	P2	<i>Pityrodia scabra</i> subsp. <i>scabra</i>	TF
<i>Calytrix plumulosa</i>	P3	<i>Prostanthera nanophylla</i>	P3
<i>Conostylis wonganensis</i>	TF	<i>Synaphea constricta</i>	P3
<i>Cryptandra dielsii</i>	P3	<i>Urodon capitatus</i>	P3
<i>Cyphanthera odgersii</i> subsp. <i>occidentalis</i>	TF	<i>Verticordia mitchelliana</i> subsp. <i>mitchelliana</i>	P3
<i>Daviesia euphorbioides</i>	TF	<i>Verticordia venusta</i>	P3
<i>Daviesia smithiorum</i>	P2		

TF = Threatened Flora; P1-4 = Priority Flora

Highlighted species are those that are associated with salt lakes.

APPENDIX THREE: CLEARING PERMIT DECISION REPORT



Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 6176/1
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: Westdeen Holdings Pty Ltd

1.3. Property details

Property: Mining Lease 70/173
Mining Lease 70/1078
Local Government Area: Shire of Wyalkatchem
Colloquial name: Cowcowing Lakes Project

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
6.97		Mechanical Removal	Mineral Production

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 11 September 2014

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
Beard vegetation associations have been mapped for the whole of Western Australia and are useful to look at vegetation in a regional context. Two Beard vegetation associations have been mapped within the application area: Beard vegetation association 125: Bare areas; salt lakes; and Beard vegetation association 1061: Mosaic: Medium sparse woodland, salmon gum and yorrell / Succulent steppe; saltbush and samphire.	Cowcowing Lakes Project. Westdeen Holdings Pty Ltd (Westdeen) proposes to clear up to 6.97 hectares of native vegetation within a total boundary of 11.5 hectares for the purpose of gypsum mining. The project is located approximately 18 kilometres north of Wyalkatchem, in the Shire of Wyalkatchem.	Excellent: Vegetation structure intact; disturbance affecting individual species, weeds non-aggressive (Keighery, 1994).	Vegetation condition was determined by the assessing officer following a review of aerial imagery and photographs provided by the proponent.

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 is not likely to be at variance to this Principle

The application area occurs within the Merredin or AW1 - Ancient Drainage sub-region of the Avon Wheatbelt Interim Biogeographic Regionalisation for Australia (IBRA) (GIS Database). This bioregion is characterised by residual lateritic uplands and derived sandplains which support proteaceous scrub-heaths rich in endemics, and Quaternary alluvials and eluvials which support mixed eucalypt, *Allocasuarina huegeliana* and Jam-York Gum woodlands (CALM, 2002). Salt lake chains occur as remnants of ancient drainage systems that only function during years with above-average rainfall (CALM, 2002). Gypsum dunes, such as those that may occur within the application area, provide habitat for several gypsum-specialist Threatened and Priority flora (Mattiske Consulting, 1995 as cited in CALM, 2002).

A vegetation assessment within gypsiferous salt lake habitat within the Avon Wheatbelt recorded five Threatened and 25 Priority flora species (Rick, 2011). The vegetation assessment also suggests that many vegetation communities which occur within this habitat may be of conservation significance, including three within Cowcowing Lakes (Rick, 2011). Following floristic analysis, vegetation composition within Cowcowing Lakes was not shown to be significantly different from other lake systems in the area (Rick, 2011).

The vegetation within the application area is mapped as belonging to Beard vegetation associations 125 and 1061. Vegetation is described as sparse or bare, in parts comprising medium sparse woodland, succulent steppe, saltbush and samphire (Government of Western Australia, 2013; GIS Database). Using a 10 kilometre

buffer of the application area, NatureMap (DEC, 2014) returned records for 115 flora species, including two Priority flora (*Fitzwillia axilliflora*; Priority 2 and *Verticordia mitchelliana* subsp. *mitchelliana*; Priority 3) and two Threatened flora (*Frankenia conferta* and *Pityrodia scabra* subsp. *scabra*).

Frankenia conferta is a small shrub with small, pale pink flowers grouped in dense heads at the tops of branches (DEC, 2008a). Potential habitat occurs within the application area for this species, and it has been recorded elsewhere within Cowcowing Lakes (DPaW, 2014c). However, its occurrence cannot be confirmed in the absence of a flora survey. The habitat type present within the application area is also compatible with *Fitzwillia axilliflora* (DPaW, 2014c). This species occurs from the margins of salt lakes or saline flats, and has been previously recorded from within Cowcowing Lakes (DPaW, 2014c). There are a limited number of records for this species, and therefore DPaW (2014c) advise that any occurrences of *F. axilliflora* may be of conservation significance. DPaW (2014c) advise that based on the hydrology of the Cowcowing lakes system, clearing within 50 metres of flora has the potential to cause indirect impacts to individuals. Impacts to conservation significant flora may be minimised by the implementation of a flora management condition which requires a targeted survey to be conducted for rare or priority flora, and a 50 metre buffer to be maintained around rare or priority flora recorded within the application area.

The application area is unlikely to provide habitat for *Pityrodia scabra* subsp. *scabra* or *Verticordia mitchelliana* subsp. *Mitchelliana*. *Pityrodia scabra* subsp. *scabra* is a conspicuous shrub which occurs only in Dowerin and Wyalkatchem (DPaW, 2014, Westdeen, 2014a). It is found at a single site adjacent to the application area, but does not occur within the application boundary (DPaW, 2014a; Westdeen, 2014a). Florabase records for *Verticordia mitchelliana* subsp. *mitchelliana* originate from brown or yellow sand, and do not appear to occur within salt lake habitat (DPaW, 2014b). Furthermore, this species does not have a highly restricted distribution (DPaW, 2014b). Therefore, the proposed clearing is not likely to impact the conservation of this species.

Vegetation within the application area does not represent either a Threatened Ecological Community (TEC), or a Priority Ecological Community (PEC) (GIS Database).

There is one habitat type within the application area, which may be described as 'sparsely vegetated salt lake' (GIS Database). Naturemap returned records for 54 avian, one mammal, two reptile and 13 invertebrate species within 10 kilometres of the application area (DEC, 2014). Species recorded include two conservation significant fauna; the Peregrine Falcon (*Falco peregrinus*; Schedule 1), and the Western Spiny-tailed Skink (interior WA and Shark Bay) (*Egernia stokesii* subsp. *Badia*; Threatened). However, neither species is likely to be significantly dependent on habitat within the application area.

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

Methodology CALM (2002)
DEC (2008a)
DEC (2014)
DPaW (2014a)
DPaW (2014b)
Government of Western Australia (2013)
Rick (2011)
Westdeen (2014a)
GIS Database:
- IBRA WA (Regions - Sub Regions)
- Pre-European Vegetation
- Threatened Ecological Sites Buffered

(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 is not likely to be at variance to this Principle

No fauna surveys have been conducted over the application area. According to available imagery, there is one fauna habitat within the application area, which could be described as 'sparsely vegetated salt lake' (GIS Database). The proponent has observed the presence of rabbit burrows within the application area (Westdeen, 2014).

Two conservation significant fauna (the Peregrine Falcon and Western Spiny-tailed Skink) have been recorded within 10 kilometres of the application area (DEC, 2014). However, the application area is highly unlikely to represent important habitat for either species, based on the absence of suitable nesting trees and microhabitat suitable for shelter (Westdeen, 2014; GIS Database).

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

Methodology DEC (2014)
Westdeen (2014)
GIS Database:
- Cowcowing Lakes 25cm Orthomosaic - Landgate 2004

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

Comments Proposal may be at variance to this Principle

A search within the NatureMap database (DEC, 2014) shows records for the Threatened flora *Frankenia conferta* within 10 kilometres of the application area. This species has a distribution which extends between Koorda, Dallwallinu, Perenjori and Coorow, growing around the high water mark of salt lake shorelines to the tops of low berms within saline pans (DEC, 2008a). *F. conferta* also occur on the floor of major drainage lines within localised swales subject to seasonal inundation (DEC, 2008a). Populations occur among other halophytic shrubs on clay sands with gypsum or white-grey shallow sand over clay (DEC, 2008a).

A Management Plan produced for this species suggests that all populations are important (DEC, 2008a). DPaW (2014c) advise that this species has the potential to occur within the application area, and any occurrence within the application area would represent a range extension. DPaW also advise that the clearing activity has the potential to have indirect hydrological impacts on flora within a range of 50 metres (DPaW, 2014c). Potential impacts to rare flora may be minimised by the implementation of a flora management condition.

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

Methodology DEC (2008a)
DEC (2014)
DPaW (2014c)

(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

According to available databases, there are no known Threatened Ecological Communities (TECs) within the application area (GIS Database). There are no TECs within 100 kilometres of the application area (GIS Database).

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

Methodology GIS Database:
- Threatened Ecological Sites Buffered

(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 likely to be at variance to this Principle

The application area falls within the Avon Wheatbelt Biogeographic Regionalisation of Australia (IBRA) bioregion in which approximately 18.7% of the pre-European vegetation remains (see table) (Government of Western Australia, 2013; GIS Database). According to the 'Bioregional Conservation Status of Ecological Vegetation Classes' (Department of Natural Resources and Environment, 2002), this value gives the region a Conservation Status of 'Vulnerable'.

The vegetation of the application area has been mapped as the following Beard vegetation associations (GIS Database):

125: Bare areas; salt lakes

1061: Mosaic: Medium sparse woodland, salmon gum and yorrell / Succulent steppe; saltbush and samphire.

Approximately 90.25% and 9.8% of Beard vegetation association 125 remains at a state and bioregional level, respectively (Government of Western Australia, 2013). Approximately 47.6% of Beard vegetation association 1061 remains at both a state and bioregional level (Government of Western Australia, 2013). The percentage of remaining vegetation association 125 at a bioregional level is below the 30% threshold recommended in the National Objectives Targets for Biodiversity Conservation, due to the extensive clearing which has occurred within the Avon Wheatbelt bioregion. However, according to both photographs of the application area provided by the proponent and aerial imagery, vegetation within the application area appears to be comprised of small to medium shrubs (mostly samphire and saltbush), with few trees, that provide a moderate to low level of ground cover (GIS Database). Therefore, vegetation within the application area is more likely to represent Beard vegetation association 1061, which is above the 30% threshold.

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-European % in DPaW Managed Lands (and post clearing %)
IBRA Bioregion – Avon Wheatbelt	9,517,109	1,778,407	~18.7	Vulnerable	~2.4 (9.6)
IBRA Subregion - Merredin	6,524,181	1,368,789	~21.0	Vulnerable	~2.5 (9.1)
Local Government – Shire of Wyalkatchem	159,510	13,203	~8.3	Endangered	~0.9 (9.92)
Beard veg assoc. – State					
125	3,485,787	3,146,091	~90.3	Least Concern	~9.0 (8.1)
1061	42,747	20,361	~47.6	Depleted	~17.8 (26.1)
Beard veg assoc. – Bioregion					
125	167,448	16,356	~9.8	Endangered	~20.0(20.25)
1061	42,747	20,361	~47.6	Depleted	~17.8 (26.14)
Beard veg assoc. – subregion					
125	148,564	13,695	~9.2	Endangered	~16.5 (12.78)
1061	42,747	20,361	~47.6	Depleted	~17.8 (26.14)

* Government of Western Australia (2013)

** Department of Natural Resources and Environment (2002)

Aerial imagery indicates that a majority (approximately 95%) of the Cowcowing lakes are undisturbed, and that similar vegetation exists outside of the application area within the lakes (GIS Database). Vegetation outside the Cowcowing lakes has been extensively cleared for agricultural purposes (GIS Database), and therefore the Cowcowing lakes may be considered as a remnant on a local scale. There is a small remnant of woodland vegetation approximately 200 metres east of the application area (GIS Database). However, the application area is unlikely to be significant to maintaining connectivity within the landscape, due to the significant difference in vegetation type within the Cowcowing lakes compared to the surrounding vegetation. The saline nature of the salt lake, combined with the absence of woodland vegetation, results in a low potential for the application area to function as a dispersal corridor for fauna.

Part of the lake system approximately 7.5 kilometres north-east of the application area is protected within the Dukin Nature Reserve and Warramuggan Nature Reserve (GIS Database). The proposed clearing of 6.97 hectares within Cowcowing Lakes, which covers an approximate 15,000 hectares (GIS Database), will not impact the fragmentation of habitat within the Cowcowing lakes, or impact connectivity to the Dukin and Warramuggan Nature Reserves. Therefore, the application area is not considered to be a significant remnant within the Cowcowing lakes.

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

Methodology Department of Natural Resources and Environment (2002)
Government of Western Australia (2013)
GIS Database:
- Cowcowing Lakes 25cm Orthomosaic - Landgate 2004
- DEC Tenure
- Geomorphic Wetlands Wheatbelt
- 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 is at variance to this Principle

The proposed clearing is situated on the salt lake floor of Cowcowing lakes, which is an ephemeral wetland (DEC, 2008b; GIS Database). However, inundation events are likely to take the form of small 'pools' following rainfall rather than large-scale inundation of the lake system.

A review of aerial imagery suggests that vegetation within Cowcowing lakes is distinct from vegetation surrounding the salt lake (GIS Database). Given that the application area is located within a lake, the proposed clearing will impact vegetation growing in association with a wetland. However, as a majority of vegetation within the Cowcowing lakes is undisturbed, the proposed clearing is not expected to have a significant impact on the representation of riparian vegetation or the hydrogeological values of the Cowcowing lakes.

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

Methodology DEC (2008b)
GIS Database:
- Cowcowing Lakes 25cm Orthomosaic - Landgate 2004

(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 occurs within a salt lake in the Avon Wheatbelt bioregion. Soil within this area is characteristically seasonally wet with variable textures, highly saline, and often gypseous or calcerous (Schoknecht and Pathan, 2013). Based on data provided by CSIRO (2013), there is a potential for Acid Sulphate Soils (ASS) to occur within the application area. However, clearing activity is unlikely to disturb any ASS which may be present in the area, and the proponent has advised that any disturbance occurs at least 1 metre above the winter water table (Westdeen, 2014).

The Avon Wheatbelt bioregion has extensive areas with shallow groundwater levels (DEC, 2008b). According to available databases, groundwater salinity within the application area is in excess of 35,000 milligrams/Litre Total Dissolved Solids (TDS) (GIS Database). A majority of the vegetation within the application area does not appear to comprise deep-rooted vegetation (Schoknecht and Pathan, 2013), and therefore there may be limited capacity for the proposed clearing to result in secondary salinity within the local area.

There is the potential for wind erosion to occur following the removal of vegetation. Land degradation caused by erosion may be minimised by the implementation of a staged clearing condition.

No weed species have been identified by the proponent. However, invasive flora species contribute to land degradation within an area, as they out-compete native vegetation for available resources and increase the frequency and intensity of fires (DEC, 2011). Potential land degradation as a result of the proposed clearing may be minimised by the implementation of a weed management condition.

Methodology Based on the above, the proposed clearing may be at variance to this Principle.
CSIRO (2013)
DEC (2008b)
DEC (2011)
Schoknecht and Pathan (2013)
Westdeen (2014b)
GIS Database:
- Groundwater Salinity, 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

The application area does not lie within any conservation areas of Department of Parks and Wildlife managed lands (GIS Database). The nearest conservation area is the Dukin Nature Reserve, located approximately 7.5 kilometres north-east of the application area (GIS Database). From this distance, the proposed clearing is not likely to impact the environmental values of the Nature Reserve, and is not likely to have any impact on connectivity between the Nature Reserve and surrounding landscape.

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

Methodology GIS Database:
- DEC 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

The application area does not occur within a Public Drinking Water Source Area (PDWSA) (GIS Database). The proposed clearing occurs within Cowcowing lakes, which is a large saline lake system that experiences seasonal inundation. The lake is rarely submerged, and instead experiences 'damp soil' conditions following rainfall (DEC, 2008b). Any surface water which does occur is expected to have naturally moderate to high levels of salinity and sedimentation. Therefore, the proposed clearing is not likely to impact on any surface water values on a local or regional scale.

The Avon Wheatbelt has typically shallow water table (DEC, 2008b), and groundwater salinity within the application area exceeds 35,000 TDS (GIS Database). The proposed clearing is not likely to significantly impact the quality of groundwater on a local or regional scale.

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

Methodology DEC (2008b)
GIS Database:
- Groundwater Salinity, Statewide
- Public Drinking Water Source Areas (PDWSAs)

(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 application area is located on the lake floor of Cowcowing lakes (GIS Database). Cowcowing lakes experience a seasonal hydroperiod, with small-scale and infrequent inundation (DEC, 2008b; GIS Database). The removal of 6.97 hectares of native vegetation within Cowcowing lakes, which cover up to 15,000 hectares (GIS Database), is unlikely to increase the incidence or intensity of inundation events.

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

Methodology DEC (2008b)
GIS Database:
- Geomorphic wetlands
- Hydrography, linear

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

There is one native title claim in the application area (GIS Database). This claim (WC2000/7) has been registered with the National Native Title Tribunal on behalf of the claimant group (GIS Database). 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 Sites of Aboriginal Significance located in the area applied to clear (GIS Database). It is the proponent's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Sites of Aboriginal Significance are damaged through the clearing process.

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

The clearing permit application was advertised on 21 July 2014 by the Department of Mines and Petroleum inviting submissions from the public. There were no submissions received.

Methodology GIS Database:
- Aboriginal Sites of Significance
- Native Title Claims - Registered with the NNTT
- Native Title Claims - Filed at the Federal Court

4. References

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- DPaW (2014b) Florabase profile for *Verticordia mitchelliana* subsp. *Mitchelliana*, <https://florabase.dpaw.wa.gov.au/search/specimen/?genus=Verticordia&species=mitchelliana&infrasubsp=mitchelliana&collector=&collno=&sheetno=&locality=&state=WA&origin=&duplicates=&type=sum>, accessed August 2014.
- DPaW (2014c) Flora advice to the assessing officer from Species and Communities Branch, Department of Parks and Wildlife. Received 26 August 2014.
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Schoknecht and Pathan (2013) Soil Groups of Western Australia: a simple guide to the main Soils of Western Australia, Resource Management Technical Report 380, Fourth Edition, Department of Agriculture and Food, Perth.
 Westdeen (2014a) Clearing Application Support Document, Westdeen Holdings Pty Ltd, Perth.
 Westdeen (2014b) Additional information provided to the assessing officer on 13 August, 2013.

5. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government
CALM	Department of Conservation and Land Management (now DEC), Western Australia
DAFWA	Department of Agriculture and Food, Western Australia
DEC	Department of Environment and Conservation, Western Australia
DEH	Department of Environment and Heritage (federal based in Canberra) previously Environment Australia
DEP	Department of Environment Protection (now DEC), Western Australia
DIA	Department of Indigenous Affairs
DLI	Department of Land Information, Western Australia
DMP	Department of Mines and Petroleum, Western Australia
DoE	Department of Environment (now DEC), Western Australia
DoIR	Department of Industry and Resources (now DMP), Western Australia
DOLA	Department of Land Administration, Western Australia
DoW	Department of Water
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
RIWI Act	Rights in Water and Irrigation Act 1914, Western Australia
s.17	Section 17 of the Environment Protection Act 1986, Western Australia
TEC	Threatened Ecological Community

Definitions:

{Atkins, K (2005). *Declared rare and priority flora list for Western Australia, 22 February 2005*. Department of Conservation and Land Management, Como, Western Australia} :-

- P1** **Priority One - Poorly Known taxa:** taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P2** **Priority Two - Poorly Known taxa:** taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P3** **Priority Three - Poorly Known taxa:** taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
- P4** **Priority Four – Rare taxa:** taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.
- R** **Declared Rare Flora – Extant taxa (= Threatened Flora = Endangered + Vulnerable):** taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.
- X** **Declared Rare Flora - Presumed Extinct taxa:** taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.

{Wildlife Conservation (Specially Protected Fauna) Notice 2005} [Wildlife Conservation Act 1950] :-

- Schedule 1** **Schedule 1 – Fauna that is rare or likely to become extinct:** being fauna that is rare or likely to become extinct, are declared to be fauna that is need of special protection.
- Schedule 2** **Schedule 2 – Fauna that is presumed to be extinct:** being fauna that is presumed to be extinct, are

declared to be fauna that is need of special protection.

Schedule 3 **Schedule 3 – Birds protected under an international agreement:** being birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is need of special protection.

Schedule 4 **Schedule 4 – Other specially protected fauna:** being fauna that is declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 or 3.

{CALM (2005). *Priority Codes for Fauna*. Department of Conservation and Land Management, Como, Western Australia} :-

- P1** **Priority One: Taxa with few, poorly known populations on threatened lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P2** **Priority Two: Taxa with few, poorly known populations on conservation lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P3** **Priority Three: Taxa with several, poorly known populations, some on conservation lands:** Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P4** **Priority Four: Taxa in need of monitoring:** Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
- P5** **Priority Five: Taxa in need of monitoring:** Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Categories of threatened species (*Environment Protection and Biodiversity Conservation Act 1999*)

- EX** **Extinct:** A native species for which there is no reasonable doubt that the last member of the species has died.
- EX(W)** **Extinct in the wild:** A native species which:
(a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
(b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
- CR** **Critically Endangered:** A native species which is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
- EN** **Endangered:** A native species which:
(a) is not critically endangered; and
(b) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
- VU** **Vulnerable:** A native species which:
(a) is not critically endangered or endangered; and
(b) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
- CD** **Conservation Dependent:** A native species which is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.