Department of Industry and Resources

Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 2680/1

Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: **Iluka Resources Limited**

1.3. Property details

Property: *Mineral Sands* (Eneabba) *Agreement Act 1975*, Mineral Lease 267SA

Local Government Area: Carnamah

Colloquial name: Adamson West Project

1.4. Application

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

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description

Beard vegetation associations have been mapped at a 1:250,000 scale for the whole of Western Australia, and are a useful tool to examine the vegetation extent in a regional context. One Beard vegetation association is located within the application area (GIS Database):

379; shrublands; scrub-heath on lateritic sandplain in the central Geraldton Sandplain Region.

Woodman Environmental Consulting (2008) conducted a flora survey over the application area in spring 2006 and summer 2007. The flora survey identified eight floristic community types (FCT's) within the application area (Iluka Resources, 2008; Woodman Environmental Consulting, 2008). These are:

FCT 1C; open woodland to shrubland of *Eucalyptus pleurocarpa* and *Eucalyptus todtiana* over mixed shrubs dominated by *Banksia* spp. on yellow and grey sandy loams on mid and lower slopes;

FCT 1D; low shrubland of mixed species, with common species including *Schoenus pedicellatus, Stylidium repens, Hakea eneabba* and *Dryandra stenoprion* with very occasional open woodland of *Eucalyptus todtiana* on grey-brown to brown sands with very occasional laterite influence;

FCT 2; predominantly low open woodland of *Eucalyptus todtiana* and *Banksia menziesii* with occasional *Xylomelum angustifolium*, over low shublands of mixed species including *Banksia leptophylla var. leptophylla*, *Melaleuca leuropoma* and *Hibbertia hypericoides* on grey over brown sands;

FCT 3B; low shrubland of mixed species including *Beaufortia elegans* and *Goodinia coerulea* with occasional low woodlands of *Eucalyptus pleurocarpa* on soil types ranging from white-grey, grey and brown sands and brown clays;

FCT 3C; predominantly low woodland of *Eucalyptus pleurocarpa* over low shrubland of mixed species including *Tetraria octandra, Cristonia biboba* and *Hibbertia spicata* as well as *Mesomelaena* tetragonal on white-grey, grey and brown sands with lateritic gravel or over laterite;

FCT 4; shrublands and heaths, with occasional woodland of *Eucalyptus pleurocarpa*, dominated by *Melaleuca* spp. and sedges on flats and depressions on grey-brown sands and sandy-clay;

FCT 5; shrubland and thickets dominated by *Melaleuca* spp. and *Banksia leptophylla* on sandy clays and sandy loams with some lateritic gravel on flats, depressions and creek-lines; and

FCT 7; woodland of *Eucalyptus accedens* and occasional *Eucalyptus pleurocarpa* on brown sandy-loam with some lateritic gravel.

Clearing Description

Iluka Resources Ltd (Iluka Resources) have applied to clear 91.6 hectares of native vegetation, within a purpose permit boundary totalling approximately 112 hectares within the *Mineral Sands* (Eneabba) *Agreement Act 1975,* Mineral Lease 267SA (Iluka Resources, 2008).

The application area is comprised of several closely bunched plots of land, running in an elongated nature, in a north-south direction.

The proposed clearing is for mineral sands mining as a continuation of the existing mining activities at Iluka Resources Eneabba mineral sands operation (Iluka Resources, 2008). Clearing will be conducted mechanically with a lowered blade, in accordance with methods already in practice at the mine site (Iluka Resources, 2008).

Vegetation Condition

Very Good: Vegetation structure altered; obvious signs of disturbance
To
Degraded: Structure severely disturbed; regeneration to good condition requires intensive management (Keighery, 1994).

Comment

The vegetation condition of the application area has been derived from the vegetation description provided by Woodman Environmental Consulting (2008), Iluka Resources (2008) and aerial photography viewed by the assessing officer.

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 application area is situated 10 kilometres south of the town site of Eneabba, within the Lesueur Sandplains subregion of the Geraldton Sandplains Interim Biogeographic Regionalisation for Australia (IBRA) bioregion (GIS Database).

Desmond and Chant (2001) summarised the biodiversity values of the Lesueuer Sandplains subregion as; shrub-heaths rich in endemics which occur on a mosaic of lateritic mesas, sandplains, coastal sands and limestone. The area exhibits extremely high floristic endemism, with over 250 species of sandplain flora endemic to the subregion (Desmond and Chant, 2001).

Historic and current mining activities surround the current application area with clearing approvals granted for CPS 389/1, CPS 1549/1, CPS 1662/1, CPS 1704/2 and CPS 1851/1 (GIS Database). This has left the landscape in a mosaic of mining activities, rehabilitation and undisturbed vegetation. Thirteen hectares of the application area consists of rehabilitation following mining and 78 hectares of previously undisturbed vegetation (Iluka Resources, 2008).

A total of 19 floristic community types were described for the Eneabba mining lease areas which have been mapped to date (Iluka Resources, 2008). Eight of these floristic community types will be impacted by this proposal, with a maximum of 1.5 % of mapped native vegetation possibly cleared for this proposal. The single highest impact falling on floristic community type 3B (5%) and the lowest impact on floristic community type 2 (less than 1%) (Iluka Resources, 2008). According to maps and statistics developed by Woodman Environmental Consulting (2008) the application area does not contain higher floristic community diversity than other areas mapped on the Iluka Resources Eneabba leases.

A total of 384 vascular plant species have been recorded from the Adamson Survey area which totals approximately 1,613 hectares including and surrounding the application area (Woodman Environmental Consulting, 2008). Similar species diversity have been recorded at other survey sites on the Iluka leases, with 360 flora species recorded at the Allied Tails site which totals 952 hectares, 354 flora species from the Hopkins survey area totalling 649 hectares and 509 flora species from the large Priority 1 survey area totalling 2,929 hectares (Woodman Environmental Consulting, 2008). In total over 900 flora species have been recorded within the Eneabba region (Iluka Resources, 2008).

No Declared Rare Flora was recorded within the application area, however, Priority flora will be impacted by this proposal (Iluka Resources, 2008). In total, 330 individual Priority plants from 21 species occur within the application area (Iluka Resources, 2008). Priority flora is relatively common within the Lesueur Sandplains IBRA subregion, with 72 listed Priority flora species being recorded within the Iluka Resources Eneabba lease areas (Woodman Environmental Consulting, 2005; 2008).

From previous studies and known records, 26 species of vertebrate fauna that are of conservation significance may occur in the Eneabba area. This includes 2 reptiles, 23 birds and 1 mammal species (Iluka Resources, 2008). Fauna diversity of the application area is typical of the Lesueur Sandplain IBRA subregion which is generally not noted for its fauna diversity.

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

There are four species of dieback (*Phytophthora cinnamomi, Phytophthora citricola Phytophthora megasperma* and *Phytophthora drechsleri*) which have been recorded in the Geraldton Sandplains region (Iluka Resources, 2007). Phytophthora cinnamomi has been shown to cause widespread disease in natural ecosystems with the

capacity to affect 40% of the native plants in the Geraldton Sandplains region (Iluka Resources, 2007). *Phytophthora citricola* and *Phytophthora megasperma* are thought to have the potential to cause localised disease outbreaks at the Eneabba mine site as the warmer conditions at Eneabba favour the establishment and proliferation of these species in sites under rehabilitation (Iluka Resources, 2007). Should the permit be granted it is recommended that a condition be placed on the permit for the purposes of dieback management.

Supporting documentation for this Iluka Resources clearing permit application did not indicate the occurrences of weeds in the application area. Following the Precautionary Principle, should the permit be granted it is recommended that a condition be placed on the permit for weed management.

Although the application area occurs within an area noted for its high floristic diversity, information provided by Woodman Environmental Consulting (2008) indicates that the application area itself does not appear to support higher floristic diversity than surrounding areas. Similar numbers of vascular flora species and similar floristic community structures have been recorded in surveys conducted in other areas of the Iluka Resources Eneabba mining leases (Woodman Environmental Consulting, 2008). Areas of highest flora species diversity generally correlate to areas with abundant soil types. The 'South Tails' locality south of the application area recorded higher species diversity than the larger Adamson (this project area) area for this reason (Woodman Environmental Consultants, 2005).

Methodology

Desmond & Chant (2001)
Iluka Resources (2007)
Iluka Resources (2008)
Woodman Environmental Consulting (2005)
Woodman Environmental Consulting (2008)
GIS Database:
-Clearing Instruments (PMV_Status)
-Interim Biographic Regionalisation for Australia

(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

A review of the fauna information that has been gained from previous studies at Iluka Resources operations at Eneabba was undertaken in 2005. This review included a one day site inspection which occurred in October 2005 (Bancroft and Bamford, 2006). Trapping and surveys for vertebrate species have occurred at Eneabba since 1981, and studies focusing on invertebrates as an indicator of rehabilitation success since 1980 (Bancroft and Bamford, 2006).

From previous studies and known records, 26 species of vertebrates that are of conservation significance may occur in the Eneabba area. This includes 2 reptiles, 23 birds and 1 mammal species (Iluka Resources, 2008). Based on habitat preferences it is unlikely all of the 26 recorded conservation significant fauna species would be present in the application area (Iluka Resources, 2008). Species that may be impacted are discussed below.

The Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) is listed as Schedule 1 - fauna that is rare or likely to become extinct, *Wildlife Conservation (Specially Protected Fauna) Notice, 2008*. This species forages on heathland vegetation and has been recorded in the vicinity of the Eneabba mine (Iluka Resources, 2008). There appears to be a lack of apparent suitable breeding habitat, either on the lease or sufficiently close, for breeding birds to rely solely on the lease for foraging (Iluka Resources, 2008). Surveys have also identified that birds recorded at Eneabba are seasonally vagrant, most likely from east to north-east (Carnamah – Three Springs region) where there are good stands of tall eucalypts for breeding (Johnston, 2007 as cited in Iluka Resources, 2008). However, the Adamson West area is still an important food source, given the land clearing which has occurred in the area. Short term impacts are expected, however, rehabilitation will bring these food sources back, therefore no long term impacts are expected.

The Peregrine Falcon (*Falco peregrinus*) is listed as Schedule 4 - other specially protected fauna, *Wildlife Conservation (Specially Protected Fauna) Notice, 2008*. This species may occur sporadically in the vicinity of the Eneabba mine but is unlikely to be solely reliant on the Iluka Resources lease areas (Bamford, 2006 as cited in Iluka Resource, 2008). The Peregrine Falcon is cosmopolitan but uncommon throughout Australia, and prefers to inhabit sites that provide tall perching structures such as cliffs, gorges, timbered watercourses, and tall man-made structures such as power-poles and buildings (Iluka Resources, 2008). It is unlikely the vegetation in the application area will be significant habitat for this species.

The Rainbow Bee-eater (*Merops ornatus*) and Fork-Tailed Swift (*Apus pacificus*) are classified as migratory birds under the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (Iluka Resources, 2008). Bird species listed under JAMBA are also protected under Schedule 3 of the *Wildlife Conservation Act 1950* (Iluka Resources, 2008).

The Rainbow Bee-eater is a common breeding resident in northern Australia and a summer breeding migrant to south-east and south-west Australia (Pizzey and Knight, 1998, as cited in Iluka Resources, 2008). The Rainbow Bee-eater is an opportunistic species known to inhabit a wide range of habitats (Pizzey and Knight, 1998 as

cited in Iluka Resources, 2008). It is an aerial feeder and is therefore not likely to be directly reliant on the vegetation within the application area (M. Bamford pers.comm as cited in Iluka Resources, 2008).

The Fork-tailed Swift is a regular summer migrant throughout Western Australia (Pizzey and Knight, 1998 as cited in Iluka Resources, 2008). Although reported roosting on cliffs and large trees it prefers open country where it is an aerial feeder rarely landing, and known to spend nights on wing (Pizzey and Knight, 1998 as cited in Iluka Resources, 2008). The Fork-tailed Swift populations are unlikely to be reliant on the vegetation within the application area.

A review of historic pit trapping data from detailed invertebrate surveys conducted at Eneabba over the last 25 years in both native vegetation and rehabilitation areas yielded no recordings of either the Shield-backed Trapdoor Spider (*Idiosoma nigrum*) (Schedule 1 - fauna that is rare or likely to become extinct, *Wildlife Conservation (Specially Protected Fauna) Notice, 2008)* or the Scorpio Fly (*Mecopteran austromerope poultoni*) (listed by DEC as Priority 2) (Iluka Resources, 2008).

The Rufous Fieldwren (*Calamanthus campestris montanellus*) is a priority sub-species, listed on DEC's own priority list as Priority 4. It is a species that inhabits very low heath; has previously been recorded at Eneabba; and is likely to be a permanent and widespread resident species (Iluka Resources, 2008). Although this species is likely to disappear from the directly impacted area for two-three years following the clearing and mining activities, there is a significant proportion of remaining habitat in the general area to support the displaced birds (Iluka Resources, 2008). This bird has been found to recolonise rehabilitation very well (M. Bamford pers.comm. as cited in Iluka Resources, 2008). It is unlikely the vegetation within the application area would be significant habitat for this species.

The vegetation within the application area is unlikely to constitute significant habitat for fauna indigenous to Western Australia. Similar habitat to that of the application area occurs in several conservation reserves surrounding the mining operations and within the Iluka Resources lease areas in Eneabba. Several conservation significant species may utilise the application area periodically for feeding, however, clearing associated with this proposal is not expected to have a regional impact on any of the 26 species of vertebrates that are of conservation significance which may occur in the Eneabba area. In order to ensure similar fauna habitats to the existing ones are replaced post mining, should the permit be granted it is recommended that a rehabilitation condition be placed on the permit.

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

Methodology Bancroft and Bamford (2006)
Iluka Resources (2008)

(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

Woodman Environmental Consulting (2008) conducted a flora survey over the application area in spring 2006 and summer 2007. Priority flora species listed with the Department of Environment and Conservation (DEC) were recorded within the application area. These are listed below:

Priority Flora Species	Priority Status (P)	Number mapped on Iluka Lease **	No. in proposed disturbance area	% disturbance in Lease area
Banksia tortifolia	P3	148	1	1%
Calytrix superba	P3	556	19	3%
Comesperma acerosum	P3	256	51	20%
Darwinia sanguinea	P4	179	8	4%
Daviesia epiphyllum	P3	641	5	1%
Desmocladus elongatus	P3	127	6	5%
Eucalyptus macrocarpa subsp. elachantha	P4	123	16	13%
Georgeantha hexandra	P4	756	32	4%
Grevillea rudis	P4	121	1	1%
Haemodorum loratum	P3	154	18	12%
Hakea polyanthema	P3	108	10	9%
Hemiandra sp. eneabba (H. Demarz 3687)	P1	421	26	6%
Hypocalymma gardneri	P2	229	13	6%
Isopogon tridens	P3	1101	54	5%
Mesomelaena stygia subsp. deflexa	P1	875	18	2%
Persoonia filiformis	P2	87	7	8%
Persoonia rudis	P3	6	1	17%
Stachystemon axillaris	P4	51	2	4%
Verticordia argentea	P2	68	3	4%

Verticordia fragrans	P3	36	2	6%
Total Impact on Priority Flora	-	**6322**	**330**	**5%**

** Only mineral resource areas have been mapped to date, not the complete Iluka lease areas

In total, 330 individual Priority plants from 21 species will be impacted by this proposal (Iluka Resources, 2008). Plant species of highest concern due to there high Priority listing or high percentage of impact are: *Hemiandra sp. eneabba* (P1), *Mesomelaena stygia subsp. deflexa* (P1), *Hypocalymma gardneri* (P2), *Persoonia filiformis* (P2).

Hemiandra sp. eneabba is listed as Priority 1, under the DEC's Declared Rare and Priority flora list. This species generally grows in white, grey or brown sands and has been found to re-colonise disturbed sites (Western Australian Herbarium, 2008). A total of 26 plants of this species occur in the application area (Iluka Resources, 2008). This represents six percent of the plants which have been surveyed on the Iluka Resources leases in Eneabba. As there is still 94 percent of the local population remaining, it is unlikely the clearing of native vegetation in this clearing proposal will adversely impact on the continued existence of this species.

Mesomelaena stygia subsp. deflexa is listed as Priority 1, under DEC's Declared Rare and Priority flora list. This speices generally occurs on sand dunes and has been known to re-inhabit rehabilitated areas (Western Australian Herbarium, 2008). A total of 18 plants of this speices were recorded within the application area (Iluka Resources, 2008). This represents two percent of the plants which have been recorded on the Iluka Resources leases in Eneabba. As there is still 98 percent of the local population remaining, it is unlikely the clearing of native vegetation will adversely impact on the continued existence of this species.

Hypocalymma gardneri is listed as Priority 2, under the DEC's Declared Rare and Priority flora list. This species generally occurs on grey-brown sand on sandplains (Western Australian Herbarium, 2008). A total of 13 plants of this species occur in the application area (Iluka Resources, 2008). This represent six percent of the plants which have been recorded on the Iluka leases in Eneabba. As there is still 94 percent of the local population remaining, it is unlikely the clearing of native vegetation will adversely impact the continued existence of this speices.

Persoonia filiformis is listed as Priority 2, under the DEC's Declared Rare and Priority flora list. This species generally grows in yellow or white sand over laterite (Western Australian Herbarium, 2008). A total of seven plants of this species occur within the application area (Iluka Resources, 2008). This represents eight percent of the plants which have been surveyed on the Iluka Resources leases in Eneabba. As there is still 92 percent of the local population remaining, it is unlikely the clearing of native vegetation associated with this proposal will adversely impact the conservation status of this species.

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

Although 330 individuals Priority plant species will be impacted by this proposal, only a small percentage of their populations in the region will be impacted (Iluka Resources, 2008). To date 6322 individuals of Priority listed flora have been mapped on the Iluka Resources leases in Eneabba. Therefore, the total impact to the local population of Priority flora is approximately five percent, leaving 95 percent of Priority flora remaining on the Iluka Resources leases in Eneabba (refer to table above) (Iluka Resources, 2008). Furthermore, areas which have been mapped correlate to areas with mineral depsits and equates to approximately 11 percent of all remnant native vegetation in the region (Woodman Environmental Consulting, 2007). Therefore, it is expected that the number of priority flora in region is much higher than what has been recorded within close vicinity of the application area (Woodman Environmental Consulting, 2007).

Both of the Priority 1 species of plants which will be impacted by this proposal have been noted as recolonising disturbed or rehabilitated areas (Western Australian Herbarium, 2008), hence, these species are expected to return post-mining, once the area is rehabilitated. It is recommended that should the permit be granted that a condition be placed on the permit for the purposes of rehabilitation.

Methodology Iluka Resources (2008)
Western Australian Herbarium (2008)
Woodman Environmental Consulting (2007)

(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 (TEC's) within the application area (GIS Database). The nearest registered TEC's occur approximately five kilometres to the south-west of the application area (GIS Database). It is unlikely these communities will be impacted by this proposal.

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

Methodology GIS Database:
- Threatened Ecological Communities

(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 is within the Interim Biogeographic Regionalisation for Australia (IBRA) Geraldton Sandplains bioregion (GIS Database). According to Shepherd et al. (2001) there is approximately 42.2% of the pre-European vegetation remaining in the Geraldton Sandplains bioregion which places it as 'depleted' according to the 'Biological Conservation Status of Ecological Vegetation Classes' (Department of Natural Resources and Environment, 2002).

One Beard vegetation associations was located within the application area; 379 (GIS Database). Shepherd et al. (2001) report that approximately 20.7% of the pre-European vegetation still exists in this Bioregion. This vegetation types is represented in IUCN Class I-IV Reserves within both the bioregion and the State (refer to table below).

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	% of Pre-European area in IUCN Class I-IV Reserves (and current %)
IBRA Bioregion – Geraldton Sandplains	3,136,277	1,324,440	~42.2	Depleted	15.3
IBRA Subregion – Lesueur Sandplains	1,171,805	478,987	~40.9	Depleted	17.7
Local Government – Carnamah	287,493	113,136	~39.4	Depleted	N/A
Beard veg assoc. – State					
379	547,767	113,427	~20.7	-Vulnerable	22.4 (5)
Beard veg assoc. – Bioregion					
379	546,586	113,268	~20.7	-Vulnerable	5 (22.4)
Beard veg assoc. – Subregion					
379	370,097	98,744	~26.7	-Vulnerable	5.5 (18.7)

* Shepherd et al. (2001) updated 2005

Whilst the sub-region has been significantly cleared, the proposed clearing of 91.6 hectares is unlikely to significantly reduce the extent of Beard vegetation association 379 below current levels. Therefore, the vegetation within the application area is not likely to be a significant remnant in an area that has been extensively cleared.

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)
Shepherd et al. (2001)
GIS Database:
- Interim Biogeographic Regionalisation of Australia
- Interim Biogeographic Regionalisation of Australia (subregion)
- 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

There is one non-perennial drainage line which intersects the northern extreme of the application area (GIS Database). This drainage line slopes from east to west and was previously mined between 1992 and 97, and has been subject to previous disturbance by pastoral activities (Iluka Resources, 2008).

The proposed clearing will result in the loss of approximately four hectares of floristic community type seven and a small proportion of floristic community type five, which are associated with the non-perennial drainage line (Woodman Environmental Consulting, 2008).

Over 76 hectares of floristic community type seven has been mapped over the Iluka Resources leases in Eneabba (Iluka Resources, 2008). The proposed clearing will result in a loss of less than five percent of the

mapped extent of this floristic community type.

The potential impacts on floristic community type five are expected to be very low (less than one percent). To date more than 695 hectares of this floristic community type has been mapped on the Iluka Resources leases in Eneabba (Iluka Resources, 2008).

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

Although the application area intersects a non-perennial drainage line, the vegetation communities associated with the drainage line are well represented on the Iluka Resources leases in Eneabba and most probably in surrounding bushland. Furthermore, the drainage line has been previously mined and has therefore suffered from previous disturbance.

Methodology Iluka Resources (2008)
Woodman Environmental Consulting (2008)
GIS Database:
- Hydrography, linear

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

Comments **Proposal is not likely to be at variance to this Principle**
At a regional scale, the Iluka Resources Eneabba mine site occurs in the inland Eneabba Plain (part of the Swan Coastal Plain) and the Arrowsmith Region (Iluka Resources, 2007). The Eneabba Plain is generally flat with elevations of approximately 80-100 metres above sea level (Iluka Resources, 2007).

At a local scale, soils of the Eneabba mine site are predominantly pale grey or yellow sands, although shallow gravels and deep sandy clay are present (Iluka Resources, 2007).

Due to the low relief of the surrounding area and the sandy soils with a high infiltration rate, water erosion is not common in rehabilitated areas. However, as a result of the strong prevailing winds and high wind speeds throughout most of the year, it is important that soils are stabilised against wind erosion (Iluka Resources, 2007).

Since 2007, to mitigate the potential for wind erosion, cereal crops have been sown in native vegetation rehabilitation blocks and sprayed out before seed sets to stabilise soils (Iluka Resources, 2007).

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

Methodology Iluka Resources (2007)

(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 nearest Department of Environment and Conservation managed area is the Class "C" South Eneabba Nature Reserve, located approximately 1.2 kilometres south of the application area (GIS Database).

The distance between the reserve and the application area is considered adequate for separation of these activities and it is unlikely that the proposed clearing will impact on the environmental values of the conservation reserve.

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

Methodology GIS Database:
-CALM Managed Lands and Waters

(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 is not located within a Public Drinking Water Source Area (PDWSA) (GIS Database).

There are no adjacent permanent surface water bodies that will be impacted by the proposed clearing. The Eneabba ground water table is below the pit basement levels mined for ore (pits are typically 15-20 metres deep in this locality) (Iluka Resources, 2008). Groundwater in the vicinity of the proposed clearing area is typically 30-40 metres below ground level, and will not be impacted by mining operations (Iluka Resources, 2008). The proposed clearing area will have suitable drainage mechanisms (such as collection sumps and diversion drains) in place during operations, and when rehabilitated (contour banks), to control surface water flows (Iluka Resources, 2008).

Groundwater within the application area contains between 500 - 1000 milligrams per litre of Total Dissolved Solids (TDS) (GIS Database). Given the size of the application area (91.6 hectares), and the large size of the Indoon Logue Catchment area (approximately 137,421 hectares) (GIS Database), the quality of the groundwater is unlikely to be impacted by the proposed clearing activity.

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

Methodology Iluka Resources (2008)
GIS Database:
- Ground Water Salinity Statewide
- Hydrographic Catchments
- Public Drinking Water Source Area

(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**
Geoscience Australia (2008) attributes four major factors which influence inland flooding. These include:

- Intensity and duration of rainfall over a catchment area;
- The capacity of the watercourses to network and convey runoff;
- The percentage of vegetation cover; and
- The topography.

Based on the four factors listed above, clearing within the application area is unlikely to exacerbate or increase the incidence or intensity of flooding for the following reasons:

- The application area has a climate with a winter predominant rainfall pattern averaging approximately 500 millimetres per annum (Bureau of Meteorology, 2008), and a high average annual evaporation rate exceeding the average annual rainfall by nearly five times (approximately 2,400 millimetres) (GIS Database);
- The Indoon Logue catchment area totals 137,421 hectares in size (GIS Database). Given the size (91.6 hectares) of the proposed clearing in relation to the large size of the catchment area, it is unlikely to result in an appreciable increase in runoff;
- Vegetation cover immediately surrounding the application area is high and is composed of rehabilitated and native vegetation (Iluka Resources, 2008), slowing water movements and increasing water infiltration and absorption: and
- The topography of the application area is slight with a slow descent from north-east to south-west (30 metre drop over 5.2 kilometres) (GIS Database). Water movements across land during significant rainfall events are expected to be slow allowing infiltration and reducing mass transition of water to lower areas.

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

Methodology Bureau of Meteorology (2008)
Geoscience Australia (2008)
Shepherd et al. (2001)
GIS Database:
- Evaporation Isopleths
- Hydrographic Catchments
- Rainfall, Mean Annual
- Topography Contours, Statewide

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

Comments

There is one native title claim over the application area (GIS Database). This claim (WC99_057) has been registered with the National Native Title Tribunal on behalf of the claimant group (GIS Database). However, the tenement 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 known sites of Aboriginal significance in the vicinity of the application area (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 and Conservation 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.

Methodology GIS Database:
- Aboriginal Sites of Significance
- Native Title Claims

4. Assessor's comments

Comment

The proposal has been assessed against the clearing principles and is at variance to Principle (f), may be at variance to Principles (a) and (c) and is not likely to be at variance to Principles (b), (d), (g), (h), (i), (j) and (e).

Should the permit be granted, it is recommended that conditions be imposed on the permit for the purposes of rehabilitation, weed and dieback management, record keeping and permit reporting.

5. References

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6. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government.
CALM	Department of Conservation and Land Management, Western Australia.
DAFWA	Department of Agriculture and Food, Western Australia.
DA	Department of Agriculture, Western Australia.
DEC	Department of Environment and Conservation
DEH	Department of Environment and Heritage (federal based in Canberra) previously Environment Australia
DEP	Department of Environment Protection (now DoE), Western Australia.
DIA	Department of Indigenous Affairs
DLI	Department of Land Information, Western Australia.
DoE	Department of Environment, Western Australia.
DoIR	Department of Industry and Resources, Western Australia.
DOLA	Department of Land Administration, Western Australia.
DoW	Department of Water
EP Act	Environment Protection Act 1986, Western Australia.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Federal Act)

GIS	Geographical Information System.
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	Rights in Water and Irrigation Act 1914, Western Australia.
s.17	Section 17 of the Environment Protection Act 1986, Western Australia.
TECs	Threatened Ecological Communities.

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.