FLORA AND VEGETATION SURVEY

PROPOSED MINERAL SANDS MINE

GINGIN

Prepared for:
URS

Prepared by:
Mattiske Consulting Pty Ltd

October 2001

MATTISKE CONSULTING PTY LTD

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1. SUMMARY

Mattiske Consulting Pty Ltd was commissioned by URS to undertake a flora and vegetation assessment of an area approximately 2000m x 1500m north of the Gingin Roadhouse, proposed for mineral sands mining by Iluka Resources Ltd. Two Botanists surveyed the area on 21 September 2001.

No Declared Rare or Priority Flora species, pursuant to Subsection 2 of Section 23F of the Wildlife Conservation Act (1950) and listed by the Department of Conservation and Land Management (2000) were located during the survey. No endangered or vulnerable species, pursuant to s178 of the Environmental Protection and Biodiversity Conservation Act (1999) were located during the survey.

Six plant communities were defined in the survey area. No threatened ecological communities pursuant to Schedule 2 of the Environmental Protection Biodiversity Conservation Act (1999) were located. A comparison was also made with the threatened ecological communities listed in English and Blyth (1997) and Gibson *et al*. (1994). However no regionally of locally significant communities were identified as the area has been largely cleared and grazed, the communities are not significant as only the occasional native tree and understorey species still persist in the area.

No weed species classified as Declared Plants, by the Agricultural Department of Western Australia, were located in the survey area.

The fungus *Phytophthora cinnamomi* (Jarrah dieback disease) is more than likely present in the soil throughout the survey area as the area is relatively low-lying and nearby areas of native vegetation are known to support this species. In view of the degree of disturbance of the vegetation, a more specific survey appears unwarranted and so too does the need for vehicle hygiene to limit the spread of dieback and introduced species.

2. INTRODUCTION

Mattiske Consulting Pty Ltd was commissioned by URS Ltd to undertake a flora and vegetation assessment of an area approximately 2,000m x 1,500m north and east of the Gingin Roadhouse and Caravan Park, proposed for mineral sands mining by Iluka Resources Ltd (Figure 1).

The survey area lies within the Gingin System, which is in the natural region known as the Drummond Subdistrict of the Southwest Botanical Province, as defined by Beard (1990). The Gingin System is typified by *Corymbia calophylla* which seems the dominant canopy tree in the immediate Gingin area, intermittent with *Banksia* woodlands (Beard, 1981).

The climate for this district is described as the humid zone of the southwest, as part of the Dry Mediterranean climatic zone, with five to six dry months per year (Beard, 1981).

Species of flora are defined as rare or priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Conservation and Land Management (CALM) recognises these threats of extinction and consequently applies regulations towards population protection and species conservation.

Declared Rare Flora species are gazetted under subsection 2 of section 23F of the Wildlife Conservation Act (1950) and therefore it is an offence to "take" or damage rare flora without Ministerial approval. Section 23F of the Wildlife Conservation Act (1950) defines "to take" as "… to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora to cause or permit the same to be done by any means".

Unlike Declared Rare Flora, however, it is not an offence "to take" flora classified as being Priority Taxa. Nonetheless, it is encouraged that caution still be exercised, given that Priority Flora are under consideration for declaration as 'rare flora', but are in urgent need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). Definitions of Declared Rare and Priority ratings under the Wildlife Conservation Act (1950) as extracted from Department of Conservation and Land Management (2000) are presented in Table 1. Definitions of the categories of threatened species under the EPBC Act (1999) are presented in Table 2.

Table 1: Definition of Rare and Priority Flora Species (Department of Conservation and Land Management, 2000)

Conservation Code	Category
R	Declared Rare Flora – Extant Taxa. "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."
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. 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 urgently need further survey."
P3	Priority Three – Poorly Known Taxa "Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but need 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."

Table 2: Categories of Threatened Flora Species (Environmental Protection and Biodiversity Conservation Act, 1999)

Category Code	Category
CE	Critically Endangered Taxa which 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.
E	Endangered Taxa which is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	Vulnerable Taxa which is not endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Ex	Extinct Taxa which is known only to survive in cultivation, in captivity or as a naturalized population well outside its past range; or 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.

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered", or "vulnerable" (English and Blyth, 1997). Threatened ecological communities are classified under Schedule 2 of the EPBC Act (1999). Threatened ecological communities occurring in Western Australia are listed in English and Blyth (1997) and this reference should be used in conjunction with Gibson *et al.* (1994).

Plant communities are referred to as Regionally or Locally Significant because they support populations of Declared Rare or Priority Taxa or taxa exhibiting a range extension, are a poorly represented community type, or are limited to a particular landform type.

Declared Plants are defined as "Pest plants targeted for legislative control…which have, or could have, serious economic, environmental or social impact (Agriculture Department Western Australia, 2000). It follows that only certain species of plants are classed as Declared Plants and are only Declared Plants in certain areas. For example, blackberry exists as a Declared Plant in some southwest regions of Western Australia but not anywhere else in the State.

Dieback is a plant disease caused by the invasion of the fungus *Phytophthora cinnamomi* on the roots of certain native plants, including Eucalypts and Proteaceae species. Dieback kills plants it infects by inhibiting the uptake of water and soil nutrients by their root systems. The fungus resides in the soil and is easily transported from one place to another by wind, water or other mobile means such as vehicle tyres, creating the need for hygienic mining and farming practices, including vehicle wash–downs.

3. OBJECTIVES

The specific objectives of this study were:

- To assess the conservation value of all vascular plant species recorded in the survey area on the basis of the CALM Declared Rare and Priority Flora database (2000) and the experience of the team.
- Undertake a database search of CALM's database on rare and endangered flora species and threatened ecological communities for the survey area and nearby related areas.
- Describe and map all plant communities present, with vegetation maps in the project area.
- Review the local and regional significance of the plant communities recorded.
- Identify weed species within the survey area and assess the status of such species in relation to Agriculture Western Australia's list of Declared Plants.
- Identify any dieback areas within the survey area.

4. METHODS

Prior to fieldwork, a database search was undertaken of records held by CALM for Declared Rare and Priority Flora species likely to occur in the vicinity of the survey area. Relevant species were examined at the Western Australian State Herbarium prior to the field survey being undertaken.

Two staff members from Mattiske Consulting Pty Ltd undertook the flora and vegetation assessment on 21 September 2001. An area approximately 2,000m x 1,500m north and east of the Gingin Roadhouse and Caravan Park was surveyed. Native and introduced plant species occurring within the survey area were identified in terms of the species present at each location. In addition to this, weed species growing throughout the survey area were collected and identified. Finally, each remnant was examined for dieback, based on the apparent health of the native species present.

All plant specimens collected during the field survey were dried and fumigated in accordance with the requirements of the Western Australian Herbarium. The plant species were identified and then compared with pressed specimens housed at the Western Australian Herbarium. Nomenclature of the species recorded follows Green (1985) and updates from the database of the Western Australian Herbarium.

5. RESULTS

No Declared Rare or Priority Flora species, pursuant to Subsection 2 of Section 23F of the Wildlife Conservation Act (1950) and listed by CALM (2000) were located during the survey. No endangered or vulnerable species, pursuant to s178 of the EPBC Act (1999) were located during the survey.

Six vegetation communities were defined during the survey:

Note: * Denotes introduced species

Eucalyptus Woodlands

1 Disturbed Woodland of *Corymbia calophylla* over **Ehrharta* spp., **Arctotheca calendula* and **Lupinus cosentinii* with other pastoral grasses and weed species on sands.

2 Disturbed Woodland of *Corymbia calophylla* over *Xanthorrhoea preissii*, *Grevillea vestita* subsp. *vestita, Hakea prostrata, Mesomelaena pseudostygia, *Ehrharta calycina, *Lupinus cosentinii, *Ursinia anthemoides* and **Hypochaeris glabra* on sands.

3 Disturbed Woodland of *Corymbia calophylla* over *Hakea prostrata*, **Ehrharta calycina* and **Arctotheca calendula* on sands.

4 Disturbed Woodland of *Eucalyptus rudis* and *Corymbia calophylla* over **Ehrharta* spp., **Lupinus cosentinii* and **Arctotheca calendula* on sandy clay, in association with water courses.

5 Disturbed Woodland of *Eucalyptus rudis* and some occasional *Melaleuca preissiana* over **Juncus articulatus*, **Ehrharta* spp., **Lupinus cosentinii*, **Romulea rosea* var. *australis*, **Poa annua* and **Arctotheca calendula* on seasonally inundated sandy clay.

Melaleuca Woodlands

6 Disturbed Woodland of *Melaleuca rhaphiophylla* with emergent *Corymbia calophylla* over **Ehrharta* spp., **Lupinus cosentinii*, **Hordeum leporinum* and **Arctotheca calendula* on sands, in association with water courses.

The spatial distribution of the six plant communities within the survey area is illustrated in Figure 1.

No threatened ecological communities pursuant to Schedule 2 of the EPBC (1999) were located. A comparison was made with the communities listed in English and Blyth (1997) and Gibson *et al*. (1994), however as the area has been largely cleared and grazed for the communities have little value left as only the occasional tree and understorey species still persist in the area.

None of the weed species identified during the survey are Declared Plants in the Gingin area. **Solanum linneanum* (Apple of Sodom) is classified as a Declared Plant in the District of Jerramungup and in the Albany, Busselton, Manjimup and Harvey regions. **Zantadeschia aethiopica* (Arum Lily) exists as a Declared Plant in the Albany, Busselton, Manjimup and Harvey Regions.

The low number of native plants and the high density of weed species within the survey area limited any assessment of dieback extent and severity. There are therefore no results associated with dieback presence or severity.

6. DISCUSSION AND CONCLUSIONS

No Declared Rare or Priority Flora species, pursuant to Subsection 2 of Section 23F of the Wildlife Conservation Act 1950 and listed by the CALM (2000) were located during the survey. No endangered or vulnerable species, pursuant to s178 of the EPBC Act (1999) were located during the survey.

Six remnant plant communities were identified during the survey (Figure 1). These communities may not have varied a great deal in their natural state and are currently are distinguished primarily by variations in the tree species and the different array of weed species present.

No threatened ecological communities pursuant to Schedule 2 of the EPBC Act (1999) were located and none of the plant communities identified during the survey are classified as either Regionally or Locally Significant (EPBC Act, 1999). With few native species remaining within the survey area, the vegetation holds little ecological value except perhaps as remnants in an agricultural setting, providing habitat for a limited number of bird species and other vertebrate fauna and invertebrate species.

None of the weed species identified during the survey are Declared Plants in the Gingin area. Two of the weed species found, *Solanum linneanum* (Apple of Sodom) and *Zantadeschia aethiopica* (Arum Lily), exist as Declared Plants in southern areas of the State, but not in the vicinity of Gingin. However, the fact that they are Declared Plants in other areas suggests that they have the potential to be a “problem” in any area they are able to grow.

The low number of native plants and the high density of weed species within the survey area limited any assessment of dieback extent and severity. This is because without specialist equipment, the only means of assessing the extent and severity of dieback infection is by examination of the health of plants which era susceptible to the disease, such as Eucalypts and Proteaceae species. *Phytophthora cinnamomi* (Jarrah dieback disease) is more than likely present in the soil throughout the survey area as the area is relatively low-lying and nearby areas of native vegetation are known to support this species. In view of the degree of disturbance of the vegetation, a more specific survey appears unwarranted and so too does the need for vehicle hygiene to limit the spread of dieback and introduced species. The very high number of introduced species already present eliminates any need to reduce further spread. The lack of native species remaining in the survey area means that there is a very limited opportunity for dieback to have any more of an adverse effect.

It is recommended that clearing of vegetation, particularly large trees is avoided where possible, in order to maintain some grazing value after mining.

7. LIST OF PERSONNEL

The following personnel of Mattiske Consulting Pty Ltd were involved in this project:

Principle Ecologist
- Dr E.M. Mattiske

Botanists
- Ms Kellie Honczar
- Mr Andrew Paton

8. REFERENCES

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Swan Location 569

Lot 3 on
Diagram 17098

6536000mN

Swan Location 368

Swan Location 357

6535000mN

Swan Location 292

Brand Highway

Lot 4 on
Diagram 24150

Lot 5 on
Diagram 25590

6534000mN

Lot 2 on
Diagram 2985

Lot 2 on
Diagram 15769

Lot 1 on
Diagram 5393

Lot 9 on
Diagram 53616

Swan Location
973

Swan
Location 506

Lot 5 on
Diagram 24150

Swan
Location 628

Lot 70 on
Diagram 66263
(Golf Course)

Lot 8 on
Diagram 28894

6533000mN

Swan
Location 1045

Dewar Road

Swan
Location 627

Lot 499 on
Diagram 97022

6532000mN

392000mE

393000mE

394000mE

LEGEND

Eucalyptus Woodlands

Disturbed Woodland of *Corymbia calophylla* over introduced species - *Ehrharta* spp., *Arctotheca calendula* and *Lupinus cosentinii* on sands.

Disturbed Woodland of *Corymbia calophylla* over *Xanthorrhoea preissii*, *Grevillea vestita* subsp. *vestita, Hakea prostrata, Mesomelaena pseudostygia* and a range of introduced species - *Ehrharta calycina, Lupinus cosentinii, Ursinia anthemoides,* and *Hypochaeris glabra* on sands.

Disturbed Woodland of *Corymbia calophylla* over *Hakea prostrata* and the introduced species - *Ehrharta calycina* and *Arctotheca calendula* on sands.

Disturbed Woodland of *Eucalyptus rudis* and *Corymbia calophylla* over the introduced species - *Ehrharta* spp., *Lupinus cosentinii* and *Arctotheca calendula* on sandy clay, in association with water-courses.

Disturbed Woodland of *Eucalyptus rudis* and some occasional *Melaleuca preissiana* over the introduced species - *Juncus articulatus*, *Ehrharta* spp., *Lupinus cosentinii*, *Romulea rosea* var. *australis*, *Poa annua* and *Arctotheca calendula* on seasonally inundated sandy clay.

Melaleuca Woodlands

Disturbed Woodland of *Melaleuca rhaphiophylla* - *Corymbia calophylla* over introduced species - *Ehrharta* spp., *Lupinus cosentinii*, *Hordeum leporinum* and *Arctotheca calendula* on sands, in association with water-courses.

Open Pasture

Completely cleared open pasture, containing no native vegetation.

Survey Boundary

Infrastructure and Pit Limits

NOTES

This figure is to be read in conjunction with Mattiske Consulting Pty Ltd Report No: URS0106/88/01.

Horizontal Datum: MGA94 (Zone 50)

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Gingin Project

VEGETATION

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CAD Ref: g748veg.dgn	Date: Mar 2002	Rev: **B** **A3**