

Gwindinup

Vegetation Assessment

Prepared for :

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CONTENTS

- 1.0 General Site Description
- 2.0 Vegetation and Flora Assessment
- 3.0 The Vegetation of the Study Area
- 4.0 Flora of the Project Area
- 5.0 Vegetation Condition
- 6.0 Threatened Flora
- 7.0 Conservation Aspects of the Vegetation and Flora of the Project Area
- 8.0 REFERENCES

Figures

Tables

1.0 General Site Description

The project area is situated on sloping scarp and Swan Coastal Plain landforms on the western edge of the Blackwater Plateau at Gwindinup. The site is mostly comprised of the lower slopes of an escarpment of relatively low relief, however the terrain becomes steeply dissected at some sites where seasonal drainage channels occur. The C.A.L.M. Forest area contains most of the upland scarp and plateau terrain, while the private land-holding that abutts the escarpment is generally comprised of lower colluvial slopes and sandplain.

Within the C.A.L.M. Forest areas in the vicinity of the project area, land usage has included considerable quarrying activity and timber extraction. The proximity of this section of the scarp to settlements, together with good local road access has probably increased the level of these activities in relation to other areas of the forest. The farmland contained within the project area has been used for livestock grazing and timber plantation.

Landscape features of the project area are shown in **figure 1**.

2.0 Vegetation and Flora Assessment

The vegetation of the project area was inspected during June and October 1997 and floristic observations and collections were made. Species representation within four locations which represented the principal vegetation types of the project area were documented, and the distribution of identified vegetation types were mapped with the aid of 1:10,000 colour aerial

photography. A fuel reduction burn carried out by C.A.L.M. during September 1997 limited the documentation of spring ephemeral flora in these areas

3.0 The Vegetation of the Study Area

The vegetation of the lease area reflects the ecotonal position it occupies in the landscape between the escarpment vegetation and the sandplain. On the upland plateau on sandy lateritic gravel soils the vegetation is a forest with *Eucalyptus marginata* dominant, with *Corymbia calophylla* scattered in the overstorey. On the escarpment slopes, surface soils are sandy gravels with localized lateritic outcropping and the overstorey becomes mixed with *Allocasuarina fraseriana*, *Corymbia haemotoxylon* and *Xylomelum occidentale* also becoming important co-dominants.

Further downslope the surface soils have developed deeper sandy profiles and the upper strata includes *Banksia attenuata*, *Nyctasia floribunda*, *Xylomelum occidentale*, *Persoonia longifolia* in addition to an open woodland of *Eucalyptus marginata* and *Corymbia calophylla*.

This vegetation is recognised as part of the Kingia (lateritic uplands) and Cartis (scarp) Vegetation Complexes of the Blackwater Plateau described in the Department of Conservation and Environment. 1:250,000 mapping series (1980). This mapping has been further defined at the same scale (Heddle and Havel, 1998), and the vegetation complexes of the project area were mapped according to the following categories;

1. **Whicher Scarp (WC)** open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla* on escarpment with some *Corymbia haematoxylon*, *Banksia attenuata*, and *Xylomelum occidentale* in humid zone.
2. **Whicher Scarp (WCv)** open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla* on valleys dissecting escarpment with some *Xylomelum occidentale* in humid zone.
3. **Cartis (CSs)** low open forest to open forest of *Eucalyptus marginata*, subsp. *marginata*-*Corymbia calophylla* -*Corymbia haematoxylon* with some *Banksia attenuata* and *Xylomelum occidentale* on slopes of escarpment in humid zone.
4. **Kingia (KI)** open forest of *Eucalyptus marginata* subsp. *marginata*-*Corymbia calophylla*-*Allocasuarina fraseriana*-*Banksia grandis*-*Xylomelum occidentale* on lateritic uplands in humid zone.
5. **Rosa (RO)** woodland to open forest of *Corymbia calophylla*-*Eucalyptus marginata* subsp. *marginata*-*Xylomelum occidentale* on slopes and tall shrubland of *Agonis linearifolia* in valley floors in humid zone.

The distribution of these vegetation categories is shown for the project area (**figure 1.0**), adapted to suit a 1:50,000 scale of mapping. The most extensive vegetation on the private land and in the vicinity of the mineralized zone are the WC, WCv, and RO categories. The vegetation on the C.A.L.M. Forest land to the south and east of the project area predominantly consists of WC, RO and KI categories. Most of the CS vegetation in the vicinity of the project area has been cleared for pasture.

4.0 Flora of the Project Area

Although the project area is relatively small, the heterogeneity of the landscape and vegetation is reflected in the occurrence of a diverse flora. The distribution of species reflects the coenocline between the upland and sandplain elements of the landscape, with some species occurring in several vegetation categories. The distribution of species observed in the various vegetation categories of the study area is shown in **table 1.0**. Species which may be characteristic of the important vegetation-landform categories of the project area are listed in **table 2.0**. Important plant families include *Proteaceae*, *Papilionaceae*, *Myrtaceae* and *Epacridaceae*.

5.0 Vegetation Condition

The remnant vegetation on the farmland is generally in good condition on the upland sites, however there has been some reduction of vegetation cover and species richness at its' interface with the pastured areas. There is some exotic weed establishment at these sites. The overstorey of adjacent forestry land has been reduced by logging and firewood gathering activities, and there are several quarry sites scattered near the boundary of the C.A.L.M. land. There are several areas of dieback infection scattered throughout the escarpment and on the private land. Some areas of infection are advanced, with considerable overstorey and understorey deaths. Generally, the vegetation is in good condition with a diverse understorey.

6.0 Threatened Flora

The project area was assessed for threatened and conservation priority flora during winter and spring, 1997. As the vegetation on crown land had been burnt during early spring, observations were confined to vegetation on the private property. Threatened and priority species that may be expected to occur on the landforms and soils of the project area were reviewed from C.A.L.M. and Western Australian Herbarium database records. The taxa derived from these records are shown in table 3.0. Two of these species, *Acacia mooreana* and *Grevillea prominens* were observed to occur on the private property near its southern boundary adjacent to C.A.L.M. land.

7.0 Conservation Aspects of the Vegetation and Flora in the Project Area.

The conservation value of vegetation generally relates to relative extent of its occurrence in the surrounding landscape, combined with the uniqueness of its component flora and the degree to which the vegetation type and flora are secured in reserves. The *Kingia* vegetation complex is associated with the uplands of the Blackwater plateau which are extensive between Bunbury and the Scott Coastal Plain. The escarpment comprises a much smaller component of the landscape, therefore the vegetation types associated with the various landforms of the escarpment are accordingly restricted in distribution. Mapping by Matiske and Havel (1998) indicated that approximately 526 ha of Whicher Scarp (WC) vegetation occurs in existing or proposed reserves, while 1831 ha occurs in crown land. Whicher Scarp (WCv) vegetation which occurs in dissected scarp valleys is particularly restricted, with only 40 ha occurring in informal reserves

and 175 ha on crown land. The Rosa woodland complex (RO) which occurs in valley floors is relatively extensively represented in the landscape, with 3,295 ha occurring in proposed and informal reserves, and an additional 8,365 ha on crown land.

In the project area, most of the occurrence of WC and Wcv vegetation occurs on private property. The observed populations of conservation priority taxa *Acacia mooreana* and *Grevillea prominens* occurred near the boundary of KI and WC vegetation also located on private property. Recent burning of the adjacent C.A.L.M. land restricted effective flora searches being undertaken in those areas during spring 1997, and further observations may reveal populations of these species in KI and WC vegetation further upslope on the escarpment.

8.0 References

Department of Conservation and Environment, 1980.
The Atlas of the Natural Resources of the Darling Range System, W.A.
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Mattiske, E.M. and Havel, J.J. 1998
Vegetation Mapping in the South West of Western Australia.
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TABLE: 1.0 Plant Species Observed at Sites Located in the Principal Vegetation Types Occurring in the Vicinity of the Project Area

Vegetation Type: Kingia (KI)

<i>Acacia extensa</i>	<i>Lomandra sonderi</i>
<i>Acacia pulchella</i> var.	<i>Lomandra sericea</i>
<i>Acacia mooreana</i>	<i>Loxocarya cinerea</i>
<i>Acacia latericola</i>	<i>Mesomelaena tetragona</i>
<i>Adenanthos barbigerous</i>	<i>Nuytsia floribunda</i>
<i>Astroloma compactum</i>	<i>Opercularia apiciflora</i>
<i>Banksia grandis</i>	<i>Patersonia umbrosa</i>
<i>Boronia spathulata</i>	<i>Persoonia elliptica</i>
<i>Boronia crenulata</i> var. <i>gracilis</i>	<i>Pultenaea ericifolia</i>
<i>Bossiaea ornata</i>	<i>Scaevola striata</i>
<i>Burchardia umbellata</i>	<i>Stylidium piliferum</i>
<i>Caladenia flava</i>	<i>Styphelia tenuiflora</i>
<i>Calathamnus sanguineus</i>	<i>Synaphea petiolaris</i> ssp. <i>petiolaris</i>
<i>Conostylis serrulata</i>	<i>Tetratheca hirsuta</i>
<i>Corymbia calophylla</i>	<i>Tripterococcus brunonis</i>
<i>Corymbia haemotoxylon</i>	<i>Xanthorrhoea gracilis</i>
<i>Dasypogon bromeliifolius</i>	<i>Xanthorrhoea preissii</i>
<i>Dasypogon hookerii</i>	
<i>Davesia preissii</i>	
<i>Drosera micrantha</i>	
<i>Dryandra nivea</i>	
<i>Eucalyptus marginata</i>	
<i>Gompholobium conferta</i>	
<i>Grevillea promines</i>	
<i>Hakea amplexicaulis</i>	
<i>Hibbertia hypericoides</i>	
<i>Hibbertia amplexicaulis</i>	
<i>Hibbertia acerosa</i>	
<i>Hibbertia glomerata</i>	
<i>Hovea chorizemifolia</i>	
<i>Hovea trisperma</i>	
<i>Hypocalymma robusta</i>	
<i>Hypolaena exsulca</i>	
<i>Isopogon sphaerocephalus</i>	

Vegetation Type: Whicher (WC)

Table 1.0 cont.

<i>Acacia extensa</i>	<i>Phlebocarya ciliata</i>
<i>Acacia pulchella</i>	<i>Pimelia rosea</i>
<i>Adenanthos meisneri</i>	<i>Podocarpus drounyianus</i>
<i>Adenanthos obovatus</i>	<i>Pultenaea ericifolia</i>
<i>Agrostocrinum scabrum</i>	<i>Stirlingia latifolia</i>
<i>Allocasuarina humilis</i>	<i>Styphelia tenuifolia</i>
<i>Anarthra scabra</i>	<i>Synaphea petiolaris</i>
<i>Anarthria prolifera</i>	<i>Xanthorrhoea gracilis</i>
<i>Andersonia caerulea</i>	<i>Xylomelum occidentale</i>
<i>Banksia grandis</i>	
<i>Banksia sphaerocarpa</i>	
<i>Bossiaea eriocarpa</i>	
<i>Burchardia umbellata</i>	
<i>Calathamnus sanguineus</i>	
<i>Calytrix flavescens</i>	
<i>Conostephium pendulum</i>	
<i>Conostylis aculeata</i>	
<i>Corymbia haemotoxylon</i>	
<i>Dampiera linearis</i>	
<i>Dasypogon hookeri</i>	
<i>Daviesia pectinata</i>	
<i>Dryandra nivea</i>	
<i>Elythranthera emarginata</i>	
<i>Eriostemon spicatus</i>	
<i>Eucalyptus marginata</i>	
<i>Gompholobium tomentosum</i>	
<i>Hemiandra pungens</i>	
<i>Hibbertia hypericoides</i>	
<i>Hibbertia vaginata</i>	
<i>Hypocalymma robusta</i>	
<i>Kunzea recurva</i>	
<i>Lycinema ciliatum</i>	
<i>Lyginia barbata</i>	
<i>Melaleuca thymoides</i>	
<i>Mesomelaena stygia</i>	
<i>Nuystia floribunda</i>	
<i>Patersonia juncea</i>	
<i>Pericalymma elliptica</i>	
<i>Persoonia longifolia</i>	
<i>Petrophile linearis</i>	

Vegetation Type: Whicher - valleys (WCv)

Table 1.0 cont.

Acacia pulchella
Acacia extensa
Actinotus glomeratus
Adenanthos obovatus
Allocasuarina fraseriana
Allocasuarina humilis
Anarthria prolifera
Astroloma pallidum
Banksia attenuata
Banksia grandis
Bossiaea eriocarpa
Burchardia umbellata
Calytrix fraseri
Dasypogon bromeliifolius
Daviesia decurrens
Dryandra nivea
Eriostemon spicatus
Hakea ruscifolia
Hemiandra pungens
Hibbertia hypericoides
Hibbertia vaginata
Hibbertia acerosa
Hibbertia lasiopus
Hypocalymma robusta
Hypolaena exulca
Jacksonia furcella
Jacksonia sternbergiana
Johnsonia acaulis
Leucopogon capitellatis
Lycinema ciliatum
Melaleuca thymoides
Persoonia ellipticum
Petrophile linearis
Phlebocarya ciliata
Pimelia sylvestris
Pimelia rosea
Stirlingia latifolia
Tetratheca pilifera
Xanthorrhoea gracilis
Xanthorrhoea preissii
Xylomelum occidentale

Vegetation Type: Rosa (RO)

Table 1.0 cont.

Acacia extensa
Acacia drummondii
Adenanthos barbigerous
Allocasuarina fraseriana
Banksia grandis
Conostylis aurea
Corymbia calophylla
Dasyogon hookeri
Davesia preissii
Daviesia nudiflora
Dryandra nivea
Eucalyptus marginata
Gompholobium conferta
Grevillea quercifolia
Grevillea drummondii
Grevillea pulchella ssp. *ascendens*
Hakea amplexicaulis
Hakea ruscifolia
Hibbertia hypericoides
Hibbertia acerosa
Hibbertia lasiopus
Hypocalymma robusta
Hypolaena exsulca
Johnsonia lupulina
Labichea punctata
Leucopogon propinquus
Melaleuca thymoides
Persoonia longifolia
Persoonia ellipticum
Pultenaea ericifolia
Sphaerolobium medium
Sphaerolobium vimineum
Stirlingia latifolia
Synaphea petiolaris ssp. *petiolaris*
Tetratheca hirsuta
Thelymitria crinata
Xanthorrhoea gracilis
Xylomelum occidentale

TABLE: 2.0 Plant Species Characteristic of the Important Vegetation Categories of the Project Area.

Vegetation Type: Kingia (KI)

Acacia latericola
Astroloma compactum
Boronia crenulata var. *gracilis*
Boronia spathulata
Bossiaea ornata
Hovea chorizemifolia
Hovea trisperma
Isopogon sphaerocephalus

Vegetation Type: Whicher (WC)

Adenanthos meisneri
Agrostocrinum scabrum
Andersonia caerulea
Banksia sphaerocephala
Calytrix flavescens
Conostephium pendulum
Conostylis aculeata
Kunzea recurva
Pericalymma elliptica
Petrophile linearis

Vegetation Type: Whicher Valleys (WCv)

Actinotus glomeratus
Calytrix frazeri
Johnsonia acaulis
Leucopogon capitellatus
Lycinema ciliatum

Vegetation Type: Rosa (RO)

Acacia drummondii
Davesia nudiflora
Grevillea quercifolia
Grevillea drummondii
Grevillea pulchella ssp. *ascendens*

TABLE: 3 Plant species of Conservation Significance Which Occur on Soils and landforms Similar to the Project Area Derived from C.A.L.M. Threatened and Priority Flora Lists and Western Australian Herbarium Database Records.

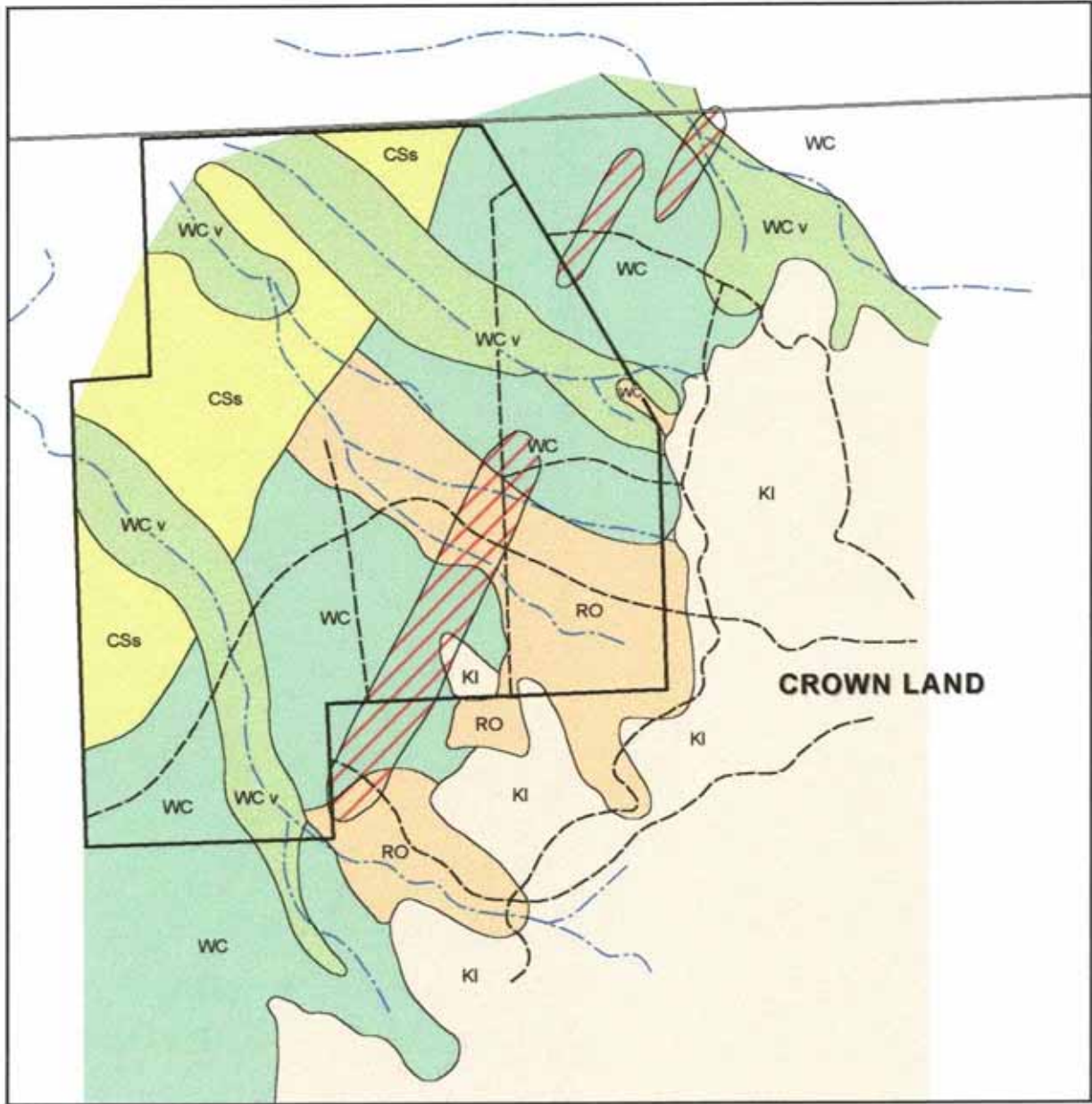
SPECIES	CONSERVATION CODE
<i>Acacia flagelliformis</i>	4
<i>Acacia mooreana</i>	2
<i>Acacia semitrullata</i>	3
<i>Actinotus wichera</i> m.s	2
<i>Boronia humifusa</i> m.s.	1
<i>Calathamnus pallidifolius</i>	3
<i>Grevillea prominens</i>	2
<i>Jacksonia sparsa</i> m.s.	3
<i>Synaphea wicherensis</i>	3

APPENDIX 1: PLANT SPECIES LIST, GWINDINUP PROJECT AREA.

FAMILY	SPECIES
ADIANTACEAE	<i>Cheilanthes tenuifolia</i> (Burm.F.) Sw.
ZAMIACEAE	<i>Macrozamia reidleyi</i> (Fisch. ex Gaud.) C.A. Gardner.
PODOCARPACEAE	<i>Podocarpus drouynianus</i> F. Muel.
POACEAE	<i>Danthonia caespitosa</i> Gaud.
CYPERACEAE	<i>Lepidosperma leptostachyum</i> Benth. <i>Lepidosperma</i> sp. <i>Mesomelaena tetragona</i> (R. Br.) Benth.
RESTIONACEAE	<i>Anarthria prolifera</i> (R.Br.) Benth. <i>Anarthria scabra</i> R. Br. <i>Hypolaena exsulca</i> R. Br. <i>Loxocarya cinerea</i> R. Br. <i>Lyginea barbata</i> R. Br.
DASYPOGONACEAE	<i>Dasyogon bromeliifolius</i> R. Br. <i>Dasyogon hookeri</i> J. Drumm. <i>Lomandra sericea</i> (Endl.) Ewart. <i>Lomandra sonderi</i> (F. Muel.) Ewart.
XANTHORRHOEACEAE	<i>Xanthorrhoea gracilis</i> Endl. <i>Xanthorrhoea preissii</i> Endl.
ANTHERICACEAE	<i>Agrostocrinum scabrum</i> R. Br. <i>Johnsonia acaulis</i> Endl. in Lehm. <i>Thysanotus multiflorus</i> R. Br.
COLCHICACEAE	<i>Burchardia multiflora</i> Lindl.
HAEMODORACEAE	<i>Conostylus aurea</i> Lindley. <i>Conostylus aculeata</i> R. Br. <i>Conostylus serrulata</i> R. Br. <i>Haemodorum</i> ? <i>Spicata</i> R. Br. <i>Phlebocarya ciliata</i> R. Br.
IRIDACEAE	<i>Patersonia occidentalis</i> R. Br. <i>Patersonia umbrosa</i> Endl. in Lehm.
ORCHIDACEAE	<i>Caladenia flava</i> R. Br. <i>Elythranthera emarginata</i> (Lindley) A.S. George. <i>Thelmitria crinata</i> Lindley.
CASUARINACEAE	<i>Allocasuarina fraseriana</i> (miq.) L. Johnson. <i>Allocasuarina humilis</i> (Otto & Dietr.) L. Johnson.
PROTEACEAE	<i>Adenanthus barbigerus</i> Lindley. <i>Adenanthos meisneri</i> Lehm. <i>Adenanthos obovatus</i> Labill.

FAMILY	SPECIES	Cont.
	<i>Banksia attenuata</i> R. Br. <i>Banksia grandis</i> Willd. <i>Banksia ilicifolia</i> R. Br. <i>Banksia sphaerocarpa</i> R. Br. <i>Dryandra nivea</i> (Labill.) R. Br. <i>Grevillea pulchella</i> ssp. ascendens <i>Grevillea trifida</i> (R. Br.) Meisn. <i>Grevillea quercifolia</i> R. Br. <i>Hakea amplexicaulis</i> R. Br. <i>Hakea ruscifolia</i> Labill. <i>Isopogon sphaerocephalus</i> Lindl. <i>Stirlingia latifolia</i> (R. Br.) Steudel. <i>Synaphea petiolaris</i> R. Br. ssp. <i>petiolaris</i> <i>Persoonia elliptica</i> R. Br. <i>Persoonia longifolia</i> R. Br. <i>Petrophile linearis</i> R. Br. <i>Xylomelum occidentale</i> R. Br.	
LORANTHACEAE	<i>Nuytsia floribunda</i> (Labill.) R. Br.	
DROSERACEAE	<i>Drosera erythorhiza</i> Lindl. <i>Drosera macrantha</i> Endl. in Endl.	
MIMOSACEAE	<i>Acacia drummondii</i> Lindl. <i>Acacia extensa</i> Lindl. <i>Acacia pulchella</i> R. Br. <i>Acacia mooreana</i> W. Fitzg. <i>Acacia latericola</i> Maslin.	
CAESALPINIACEAE	<i>Labichea punctata</i> Benth.	
PAPILIONACEAE	<i>Bossiaea eriocarpa</i> Benth. <i>Bossiaea ornata</i> (Lindl.) Benth. <i>Chorizema ilicifolium</i> Labill. <i>Davesia preissii</i> Meisn. <i>Davesia decurrens</i> Meisn. <i>Davesia incrassata</i> Smith <i>Gompholobium conferta</i> DC <i>Gompholobium tomentosum</i> Labill. <i>Hovea chorizemifolia</i> (Sweet) DC. <i>Hovea trisperma</i> Benth. <i>Jacksonia furcellata</i> (Bonpl.) DC. <i>Jacksonia sternbergiana</i> Heugel. <i>Pultenaea ericifolia</i> Benth. <i>Sphaerolobium medium</i> R. Br. <i>Sphaerolobium ? vimineum</i> Smith.	
RUTACEAE	<i>Boronia defoliata</i> F. Muel. <i>Eristoemon spicatus</i> A. Rich. <i>Boronia spathulata</i> Lindley.	

FAMILY	SPECIES	Cont.
TREMANDRACEAE	<i>Platytheca galiodes</i> Steetz. <i>Tetratheca hirsuta</i> Lindl.	
STACKHOUSIACEAE	<i>Tripterococcus brunonis</i> Endl.	
EUPHORBIACEAE	<i>Phyllanthus calycinus</i> Labill.	
DILLENAIACEAE	<i>Hibbertia acerosa</i> (R. Br.) Benth. ✓ <i>Hibbertia commutata</i> Steudel. ✓ <i>Hibbertia hypericoides</i> Benth. ✓ <i>Hibbertia racemosa</i> (Endl.) Gilg. <i>Hibbertia vaginata</i> (Benth.) F. Muell.	
THYMELAEACEAE	<i>Pimelia rosea</i> R. Br.	
MYRTACEAE	<i>Calathamnus sanguineus</i> Labill. <i>Corymbia calophylla</i> Lindley. <i>Corymbia haemotoxylon</i> <i>Calytrix fraseri</i> Cunn. <i>Darwinea</i> aff. <i>vestita</i> <i>Eucalyptus marginata</i> Donn. ex Smith. <i>Hypocalymma robustum</i> Endl. <i>Melaleuca thymoides</i> Labill. <i>Pericalymma ellipticum</i> (Endl.) Schauer	
APIACEAE	<i>Actinotus glomeratus</i> Benth.	
EPACRIDACEAE	<i>Andersonia caerulea</i> R. Br. <i>Conostephium pendulum</i> Benth. <i>Leucopogon australis</i> R. Br. <i>Leucopogon capitellatus</i> DC. <i>Leucopogon obovatus</i> (Labill.) R. Br. <i>Leucopogon pulchellus</i> Sonder in Lehm. <i>Leucopogon verticellatus</i> R. Br. <i>Lycinema ciliatum</i> R. Br. <i>Styphelia tenuiflora</i> Lindl.	
LAMIACEAE	<i>Hemiandra pungens</i> R. Br.	
RUBIACEAE	<i>Opercularia apiciflora</i> Labill.	
GOODENIACEAE	<i>Dampiera linearis</i> R. Br. ? <i>Scaevola striata</i> R. Br. — ;	
STYLIDIACEAE	<i>Stylidium piliferum</i> R. Br.	

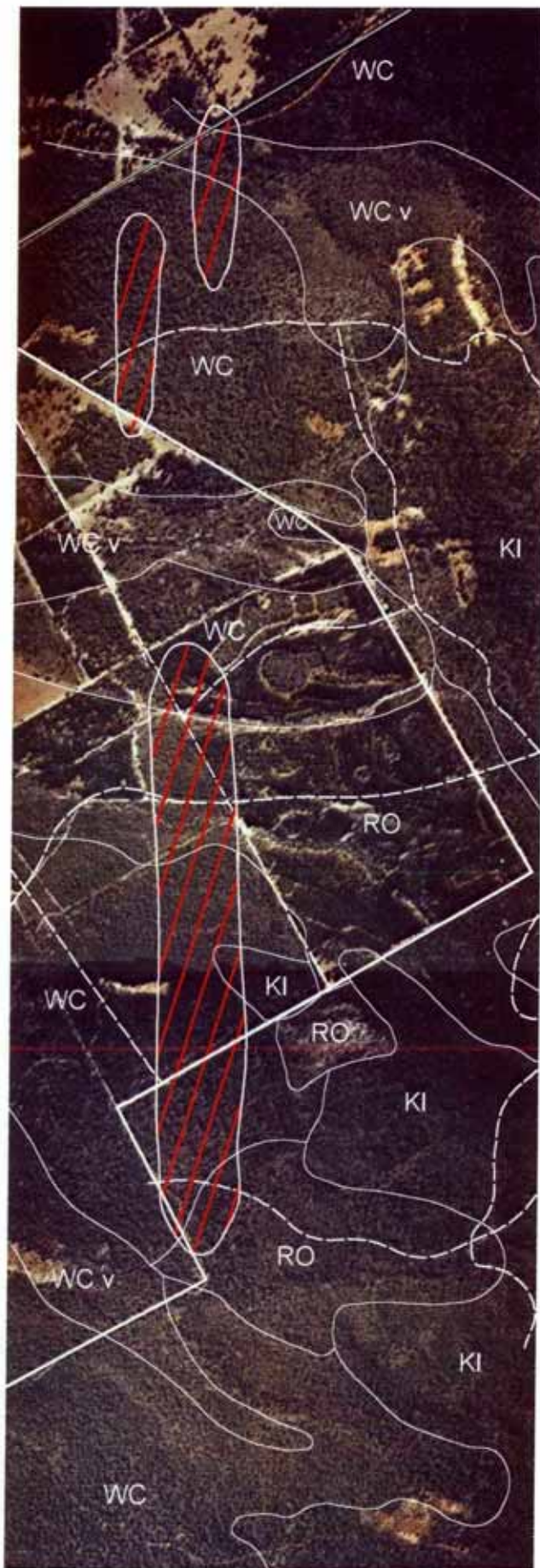


**LEGEND
VEGETATION TYPES**

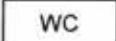

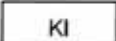
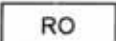
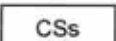

WC Whicher Scarp	/ / / / Mineralised zone
WC v Whicher Scarp (valleys)	 Private Land Boundary
KI Kingia (uplands)	 Creek
RO Rosa	 Road
CSs Cartis	 Track



**FIGURE 1
GWINDINUP PROJECT
VEGETATION MAP**



**LEGEND
VEGETATION TYPES**

- | | |
|--|-------------------------|
|  | Whicher Scarp |
|  | Whicher Scarp (valleys) |
|  | Kingia (uplands) |
|  | Rosa |
|  | Cartis |
|  | Mineralised zone |
| | Private Land Boundary |
| | Creek |
| | Road |
| | Track |



**FIGURE 2
GWINDINUP PROJECT
VEGETATION OF THE PROJECT
AREA
IN THE VICINITY OF THE
MINERALISED ZONE**