

MODONG NATURE RESERVE AND ADJACENT BUSHLAND, OAKFORD

Boundary Definition: protected area/bushland (part taken to cadastre)/conservation wetland boundary (Areas of bushland within the boundaries of the Site are not accurately mapped. The boundary has been drawn to include any unmapped bushland; Areas of bushland within the boundaries of the Site have been recently cleared. The boundary has been drawn to include cleared bushland; Boundary adjusted after vegetation survey and negotiations with the land owner(s) in response to a submission to draft *Perth's Bushplan*.)

SECTION 1: LOCATION INFORMATION

Bush Forever Site no. 348

Area (ha): bushland 242.0

Map no. 65, 66

Map sheet series ref. no. 2033-I SE

Other Names: part of Jandakot Regional Park

Local Authorities (Suburb): Shire of Serpentine-Jarrahdale (Oakford)

Includes CALM Managed Land: Reserve 25886 (Conservation of Flora and Fauna)

System 6 (1983): M99 area of bushland goes beyond System area boundaries, all bushland described

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

Pinjarra Plain

Guildford Formation (Qpa: Sc)

Bassendean Dunes

Bassendean Sands (Qpb: S8)

Bassendean Dunes/Pinjarra Plain

Bassendean Sands over Guildford Formation (Qpb/Qpa: S10)

Wetlands (within the Bassendean Dunes/Pinjarra Plain)

Holocene Swamp Deposits (Qrw: Sp1)

VEGETATION AND FLORA

Vegetation Complexes

Bassendean Dunes

Bassendean Complex — Central and South

Floristic Community Types

Supergroup 2: Seasonal Wetlands

4 *Melaleuca preissiana* damplands

11 Wet forests and woodlands

Supergroup 3: Uplands centred on Bassendean Dunes and Dandaragan Plateau

21c Low-lying *Banksia attenuata* woodlands or shrublands

23a Central *Banksia attenuata* — *B. menziesii* woodlands

WETLANDS

Wetland Types: dampland, artificial channel

Natural Wetland Groups

Bassendean Dunes

Jandakot (B.3)

Wetland Management Objectives: Conservation (111.9ha)

Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: vegetated wetland, vegetated uplands

Vegetation and Flora: limited survey (part Site — Crook 1980 (Modong Nature Reserve, Keighery, GJ, 1996 (Modong Nature Reserve), Gibson *et al.* 1994 (Modo 01-06), DEP 1999)

Structural Units

Uplands: *Eucalyptus calophylla* Woodland; *Banksia attenuata* Low Woodland; *Banksia attenuata* and *B. ilicifolia* Low Open Forest

Wetlands: *Melaleuca preissiana* and *Banksia attenuata* Low Woodland; *Eucalyptus rudis* and *Melaleuca preissiana* Low Woodland; *Melaleuca preissiana* Low Open Woodland; *Kunzea glabrescens* Closed Tall Scrub; *Pericalymma ellipticum* and *Hypocalymma angustifolium* Open Heath

Vegetation Condition: >90% Excellent to Pristine, <10% Very Good to Good (Gibson *et al.* 1994, Trudgen 1990)

Total Flora: 197 native taxa (Keighery, GJ, 1996) (estimated <80% expected flora)

Significant Flora: *Stylidium mimeticum* (3); *Macarthuria apetala*, *Evandra pauciflora*, *Hensmania turbinata*, *Burchardia bairdii* (most southern population)

Fauna: limited survey for birds (AHC 2000 D), limited survey for mammals (2 species) (J. Dell pers. comm.), structured surveys for reptiles (25 species) and amphibians (3 species) (WA Society of Amateur Herpetologists, unpublished). Significant mammal species: Quenda (Friend 1996 D), Grey Kangaroo and Western Brush Wallaby. Significant reptile species: legless lizards (*Pletholax gracilis* and *Pygopus lepidopodus*), Lined Skink (*Lerista lineata*), Swamp Skink (*Acritoscincus trilineatum*), Black Monitor (*Varanus tristis*) and Rosenberg's Monitor (*V. rosenbergi*). Good assemblage of insectivorous and nectarivorous birds (J. Dell pers. comm.).

Linkage: adjacent bushland to the north and west; part of Greenway 97 (Tingay, Alan & Associates 1998a); part of a regionally significant fragmented bushland/wetland linkage (Part A, Map 7)

Other Special Attributes: majority included in Jandakot Botanic Park Proposal (MfP 1995); 'key site representing the vegetation and habitats typical of the Bassendean Dune System' (Crook 1980)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed, Indicative place (AHC 2000 D)

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Criteria: Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation

Recommendation: Part A: Site with Some Existing Protection; the care, control and management of this portion of this Site (Reserve 25886) for conservation purposes within Jandakot Regional Park is endorsed. Part B: Rural Complementary Mechanism (see Table 3, Volume 1).

MODONG NATURE RESERVE AND ADJACENT BUSHLAND, OAKFORD

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SECTION 1: CADASTRAL INFORMATION

(Lots, locations and derived information to be updated in the public submission period)

Bushplan Site no. 348 **Map no.** 82 **Map sheet series ref. no.** 2033-I SE
System 6 (1983): M99 area of bushland goes beyond System area boundaries, all bushland described

Other Names: not known

Area (ha): total 241.8; bushland 234.2

Local Authorities (Suburb)
 Shire of Serpentine-Jarrahdale (Oakford)

Zoning
MRS: Parks and Recreation, Rural, Rural-Water Protection, Important Regional Roads

TPS: Rural, Landscape

Ownership Categories

State Government, Private

Lot/Location/Reserve numbers (Purpose),

Street name

112, 1348 Thomas Rd; 795 Anketell Rd; 22, 23 Cumming Rd; 42 Orton Rd

Crown Reserve

Reserve 25886 (Conservation of Flora and Fauna)

CALM Managed Land

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WETLANDS

Wetland Types: dampland, artificial channel

Natural Wetland Groups

Bassendean Dunes

Jandakot (B.3)

Wetland Management Objectives: Conservation (113.8ha)

Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: vegetated wetland, vegetated uplands

Vegetation and Flora: limited survey (part Bushplan Site — Crook 1980, Keighery, GJ, 1996 (Modong Nature Reserve), Gibson *et al.* 1994 (Modo 01-06))

Structural Units

Uplands: *Eucalyptus calophylla* Woodland; *Banksia attenuata* Low Woodland; *Banksia attenuata* and *B. ilicifolia* Low Open Forest

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Fauna: structured surveys by WA Society of Amateur Herpetologists (unpublished) for reptiles (25) and amphibians (3). Significant reptile species: legless lizards (*Pletholax gracilis* and *Pygopus lepidopodus*), Lined Skink (*Lerista lineata*), Swamp Skink (*Acritoscincus trilineatum*), Black Monitor (*Varanus tristis*) and Rosenberg's Monitor (*V. rosenbergii*). Good assemblage of insectivorous and nectarivorous birds (J. Dell pers. comm.). Significant mammal species: Quenda (Friend 1996 D)

Linkage: adjacent bushland to the north, east and west; part of proposed Greenway 110 (Tingay, Alan & Associates 1997a); part of a regionally significant fragmented bushland/wetland linkage (Volume 2A, Map 8)

Other Special Attributes: majority included in Jandakot Botanic Park Proposal (MfP 1995); 'key site representing the vegetation and habitats typical of the Bassendean Dune System' (Crook 1980)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed, Indicative Place of Register of the National Estate

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Criteria: Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation

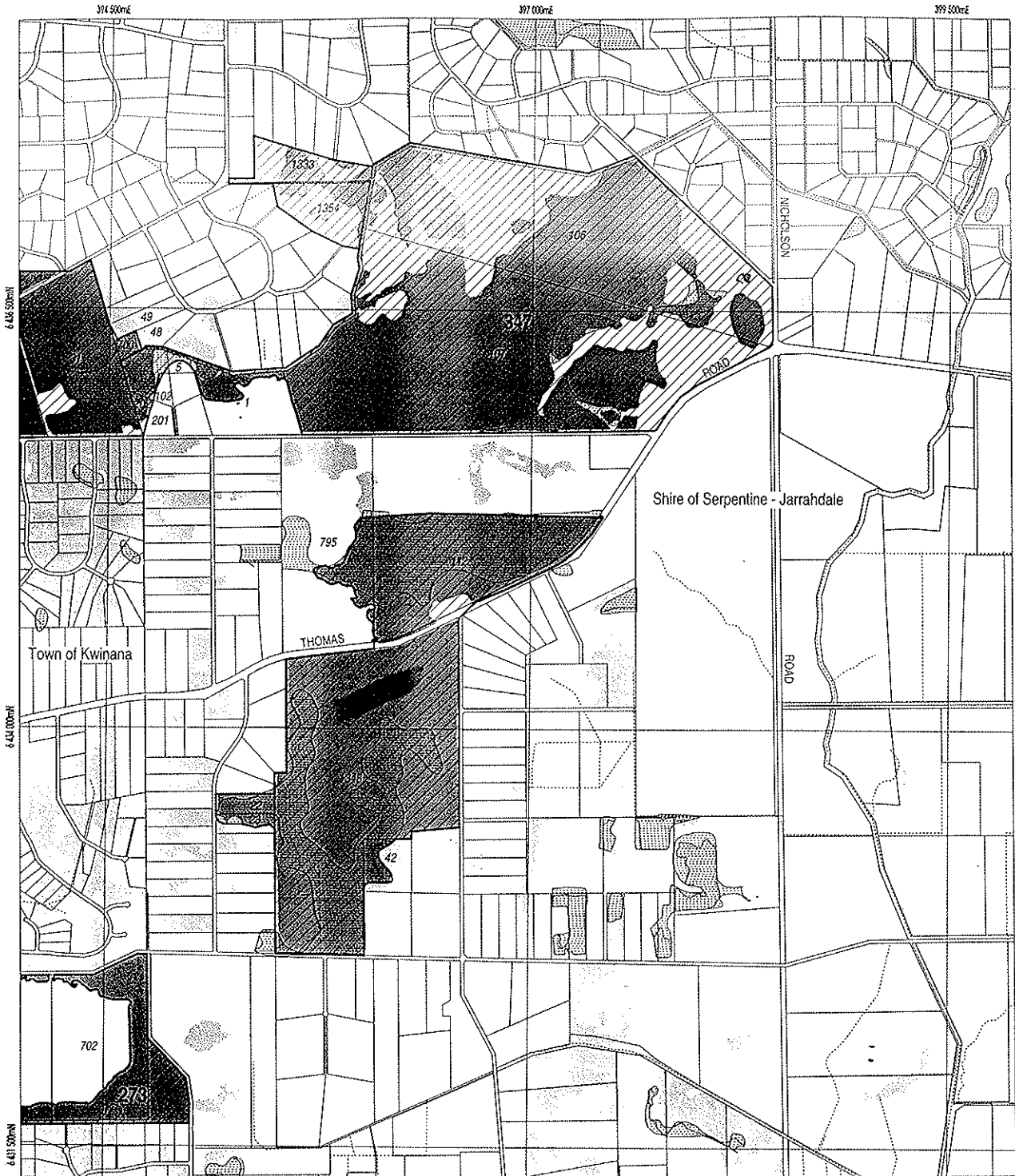
Opportunities and/or Constraints

Opportunities: Bushplan Site/part Bushplan Site subject to Peel-Harvey Estuary EPP/SPP; location of conservation category wetlands; under MRS Parks and Recreation Reservation and TPS Landscape Zoning, Crown Reserve


Constraints: private land; under MRD regional road requirements, General Mineral Resource Area (sand)


Recommendation: The care, control and management of this Bushplan Site (Reserve 25886) for conservation purposes within Jandakot Regional Park is endorsed.








LEGEND


 Bushplan Sites With Regionally Significant Bushland


 Other Native Vegetation

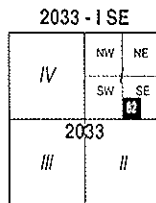
 Conservation Category Wetlands

 Bushplan Sites With Some Existing Protection

 Lot Number, Location Number

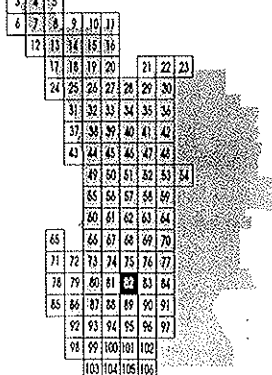
 Channel Wetlands

 Local Government Boundary



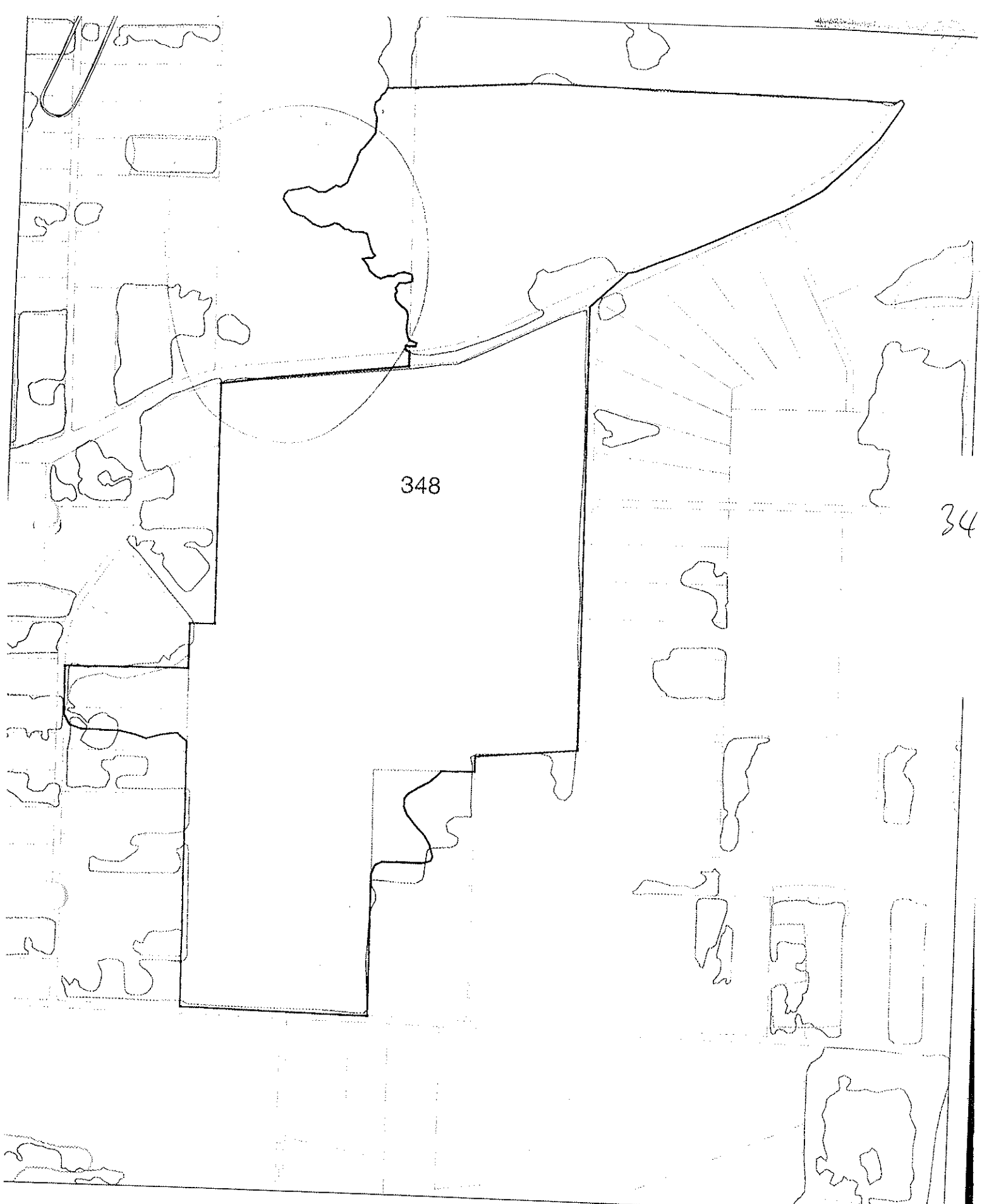
1 : 25 000 AMG Reference Grid showing Perth's Bushplan Map Sheet Breakdown

PERTH'S BUSHPLAN MAP INDEX



SCALE
0 500 1000
Metres

Produced by Project Mapping Section
Land Information Branch, Ministry for
Planning, Perth W.A. November 1998
ntw-map9/enviro/bushplan/bushv2_82.dgn
Cadastral Data supplied by Department
of Land Administration, W.A.
Wetlands Data supplied by
Water and Rivers Commission
Native Vegetation Extent for Study Area
supplied by Agriculture Western Australia



BUSHPLAN SITES CORRECTED

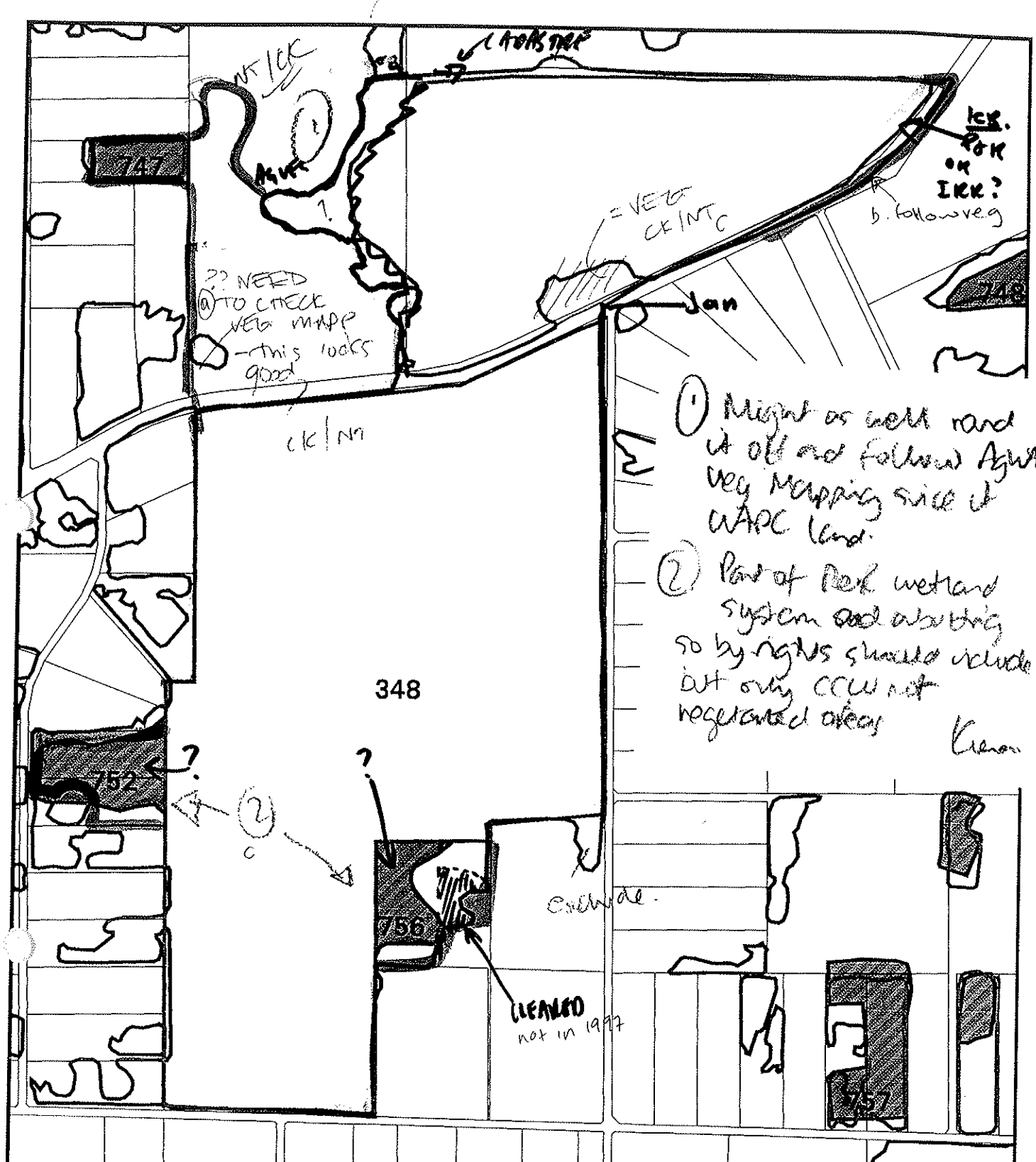


**WESTERN
AUSTRALIAN
PLANNING
COMMISSION**



**CUSTOMER
FOCUS**
WESTERN AUSTRALIA





- ① Might as well read it off and follow Agri Veg Mapping side of WAPC land.
 - ② Part of Park wetland system and also being so by rights should include but only CCW not vegetated areas
- Klenon

bp site 348

MFP INTERNAL USE ONLY
 Prepared By: Andrea Zappacosta
 Prepared For:
 Map Ident: plot980602_1
 Date: 02 Jun 98
 Scale 1:13463

- AG VEG 1998 BOUNDARY THEME
 - Cadastre
 - Bushplan sites refno 1-500 SCP BOUNDARY THEME
 - cons category wetlands
 - Verified CCWs
- ADJACENT CCW - PLANNING CONSTRAINTS.
- cc/nr 2019. ① extend written boundaries = vegetated
 b. include veg in all
 c include ccw w/ ad, veg where pass.



M99

M99

M99



11



4



Barbra 23a
downward



21c



AREA INFORMATION

System 6 Area (C or M) or Update Area (Update) *M99*

Conservation Area	
Nature Reserve	<i>(West of Byford) Modang NR</i>
Reserve No	<i>A25886</i>
National Park	
Reserve No	
Local Government	
Reserve No	
Other	
Proposed Conservation Areas	
Local Government	
Reserve No	
Other	

Conservation Area

Nature Reserve
Reserve No
National Park
Reserve No
Local Government
Reserve No
Other

TOTAL AREA

Bushland Area	<i>153.5</i>	hectares
Completely Degraded	<i>zero</i>	

AREA MAPPED FLORISTIC UNITS

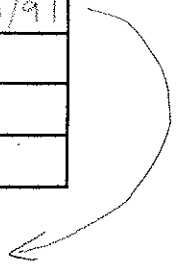
can boundaries same

Units	Site (Condition)	Code	Bound	Area (ha)
<i>4</i>	<i>01 (2)</i>	<i>06 (1)</i>	<i>B</i>	<i>16.125</i>
<i>11</i>	<i>03 (2.5)</i>		<i>B</i>	<i>8.25</i>
<i>21c</i>	<i>02 (2)</i>		<i>B</i>	<i>9.75</i>
<i>23a</i>	<i>04 (2.5)</i>	<i>05 (2)</i>	<i>B</i>	<i>119.375</i>

Boundaries determined by use of

aerial photograph	<i>Metro Street Directory run 10 5055 5/1/91</i>
orthophoto	<i>2033 1 SE Aug 1991</i>
vegetation map	
soil map	

OR Metro Regional Area run 11 5275 1992



Bushplan Site 361:

I recommend extension of this site to include Part Lot 21 and Part Lot 60 on the Norman Road Bushland.

Bushplan Site 395:

Wetland type bushland on the adjoining Lot 4 is threatened and should be included in that site.

Bushplan Site 249:

This site includes the Modong Nature Reserve at Oakford and I recommend that it be extended to include good quality bush on Lots 22 and 23.

Bushplan Site 270:

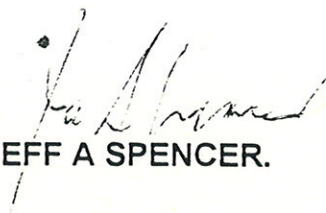
This site includes Sandy Lake and Bushland at Anketell. I particularly suggest inclusion of Lots 5, 12, 13 & 14 adjacent to this site (good quality Banksia Woodland).

Bushplan Site 304:

I recommend the inclusion of the vegetated north east corner of part lot 40 Taylor Road. Forrestdale (near the corner of Armadale and Taylor Roads).

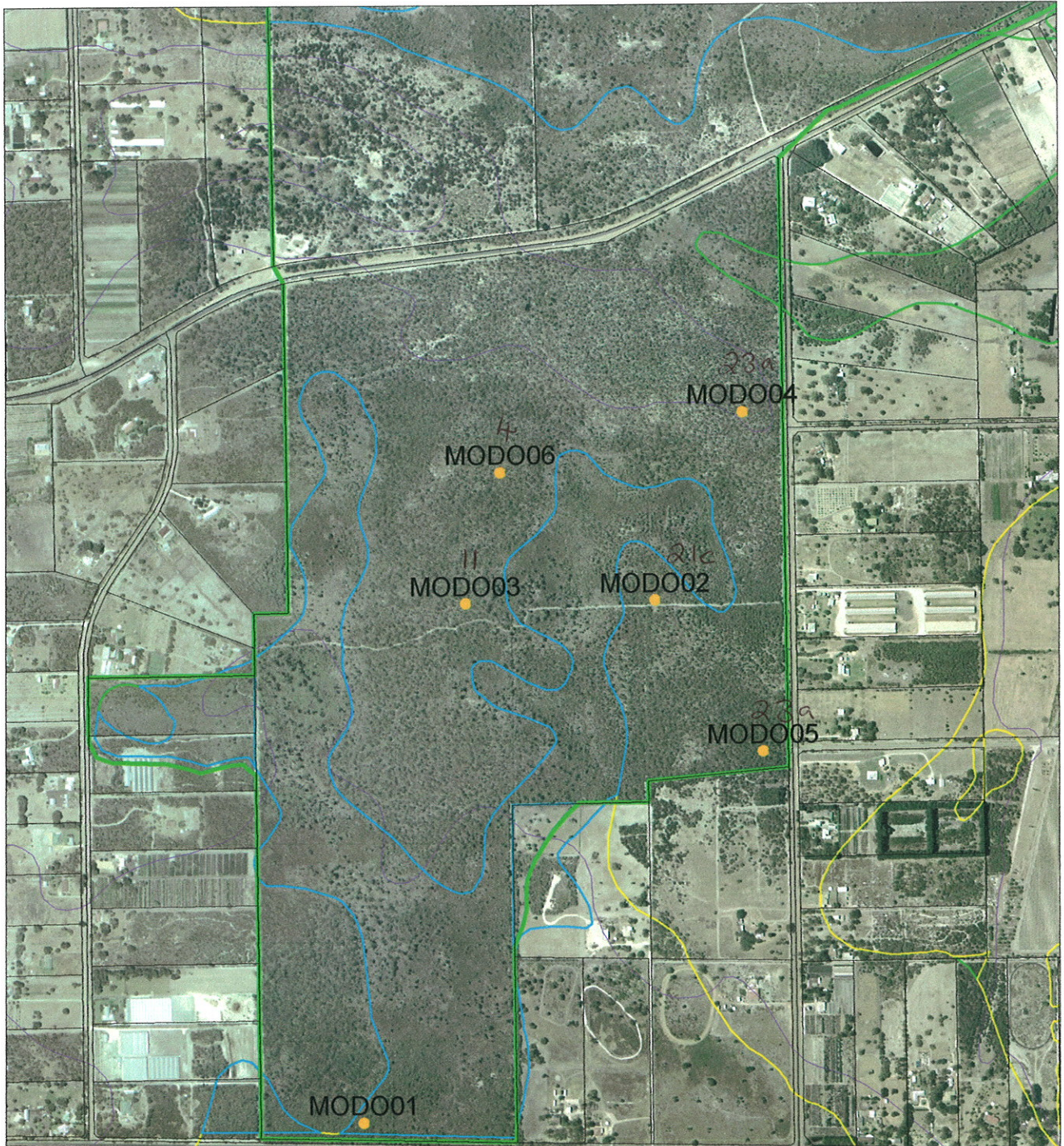
I thank you for the opportunity to comment on the Bushplan strategy.

Yours faithfully

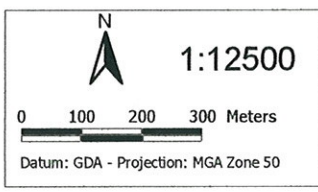


JEFF A SPENCER.

- to incorporating this area in the Shire's Conservation Zone Policy Area, through the Rural Strategy Review process. (Area 33.2 ha)
- xiii. Serpentine National Park & adjacent bushland Site 468 Vol 2 115-116 CALM managed land. Major need for weed control in National Park and adjacent state government lands.
- xiv. Kingsbury Drive Bushland Site 76 Vol 2 Pg 117 Council notes the importance of this vegetation and believes that protection and management of the site's vegetation is best achieved by working directly with the affected landowners. Consideration may be given to incorporating this area in the Shire's Conservation Zone Policy Area, through the Rural Strategy Review process. (Area 40.6 ha). One-to-one consultation with landowners is required.
- xv. Myara Brook Bushland Site 126 Vol 2 pg 118 -119, known locally as the Myara Brook Reserve; currently undergoing vesting change to be vested with Local Authority for the purposes of protection of Indigenous Flora and Fauna. Active management by local authority and community with support of federal and state government grants. Council supports retention of reserve, with assistance from State Government to fund management.
- xvi. Anketell Road Bushland Site 347, Vol 2 Pg 213-214; Shire supports inclusion of land within Jandakot Botanical Park, except for cleared areas which should be assessed for alternative or complementary uses. Council proposes to site the Oakford voluntary Fire Brigade and a small meeting place on a 4000 m2 lot on the Pony Way frontage. This site is surrounded by a clearing of over 20 ha. Usage of this small portion of the clearing for community uses is complementary to the protection of the remaining 558.1 ha.
- xvii. Modong Nature Reserve and adjacent bushland Site 348 Vol 2 pg 219 - Council notes the importance of this vegetation and the inclusion of private property.
- xviii. Duckpond Bushland Site 350 Vol 2 pg 222. Council notes the importance of this vegetation. Council believes that protection and management of the site's vegetation is best achieved by working directly with the affected landowners. Consideration may be given to incorporating this area in the Shire's Conservation Zone Policy Area, through the Rural Strategy Review process (area: 23.5 ha). One-to-one consultation with landowners is required.
- xix. Banksia Road Nature Reserve Site 353 Vol 2 pg 223-224. CALM estate.
- xx. Lowlands Bushland Site 358 & Site 359 Vol 2 pg 224-227. Council notes the inclusion of this site in Perth's Bushplan. These sites are two of three properties currently before the Ministry for Planning for rezoning to Conservation. It is important that the rezonings be finalized as a matter of priority, so that an example is set for the Perth Metropolitan Area.
- xxi. Henderson Road Bushland Site 360 Vol 2 pg 229-230. Council notes the importance of this vegetation. Assistance needs to be given to landowners to fence off vegetation from stock. Council believes that protection and management of the site's vegetation is best achieved by working directly with the affected landowners. Consideration may be given to incorporating this area in the Shire's Conservation Zone Policy Area, through the Rural Strategy Review process. One-to-one consultation with landowners is required.
- xxii. Yangedi Swamp and adjacent Bushland, Site 361, pg 230-231, Council notes the importance of this vegetation. Assistance needs to be given to landowners to fence off vegetation from stock. Consideration will be given to incorporating this area in the Shire's Conservation Zone Policy Area, through the Rural Strategy Review process. One-to-one consultation with landowners is required. The site also includes one property currently before the Ministry for Planning for rezoning to Conservation. It is important that the rezoning be finalized as a matter of priority, so that an example is set for the Perth Metropolitan Area and other landowners. One-to-one consultation with landowners is required.
- xxiii. Wungong Brook Site 266 Vol 2 pg 402-403 Council notes the importance of this vegetation. Protection of the vegetation should be achieved through its inclusion in the proposed public reserve.



- Bush Forever Sites
- Bush Forever, MRS Amendments
- Local Government Authority Boundaries
- Lakes EPP
- Geomorphic Wetlands Feb04 by Evaluation
- Conservation
- Resource Enhancement
- Multiple Use
- No longer a wetland
- Not Assessed
- Floristic Survey Sites of the Southern Swan Coastal Plain**
- GJKENV (Keighery 1996)
- GRIFFIN (Griffen 1994)
- SCP (Gibson et al 1994)
- SYS6ENV (DEP 1996 and Trudgen & Keighery 1995)
- SYS6ENV2 (DEP 1996 and Trudgen & Keighery 1995)
- CALM Threatened Ecological Communities 2002
- Roads - Perth Metropolitan



Bush Forever Site 348: Modong Nature Reserve and Adjacent Bushland, Oakford



Data Sources:
Cadastral DLI
Aerial Photography : Skyview DLI

Swan Coastal Plain Survey - SURVEY RECORDING SHEET Please use pencil

QUADRAT No. 1000 1 VEGETATION TYPE _____
 DATE FIRST TRIP 21/4/92 VOLUNTEERS _____
 DATE SECOND TRIP _____ VOLUNTEERS _____
 BOTANIST BJR, EJR

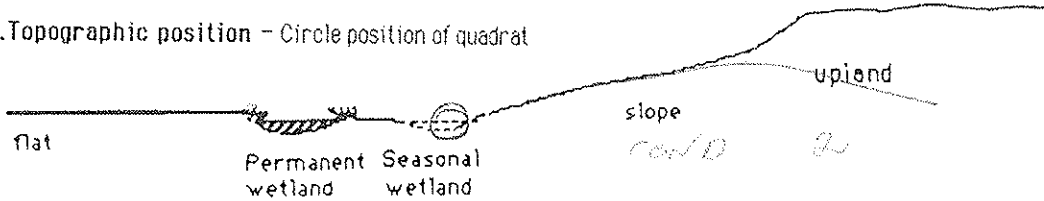
1000

1. LOCATION of the QUADRAT

a. Mud Map Draw a sketch of the location of the quadrat the back of this sheet →

b. Photograph Photographer's name _____

c. Topographic position - Circle position of quadrat



Keighery and Keighery, 1990
Adapted from Griffin and Keighery, 1989
MOORE RIVER to JURIE SANDPLAIN
SURVEY. WILDFLOWER SOCIETY of WA

2. SITE DATA - Circle the correct response

Slope flat gentle steep Aspect N NE E SE S SW W NW

% Bare ground 2-10% Drainage well mod poor Wet All year winter/spring

Litter (% cover) 55% Surface soil gray sand Sub-surface soil gray clay

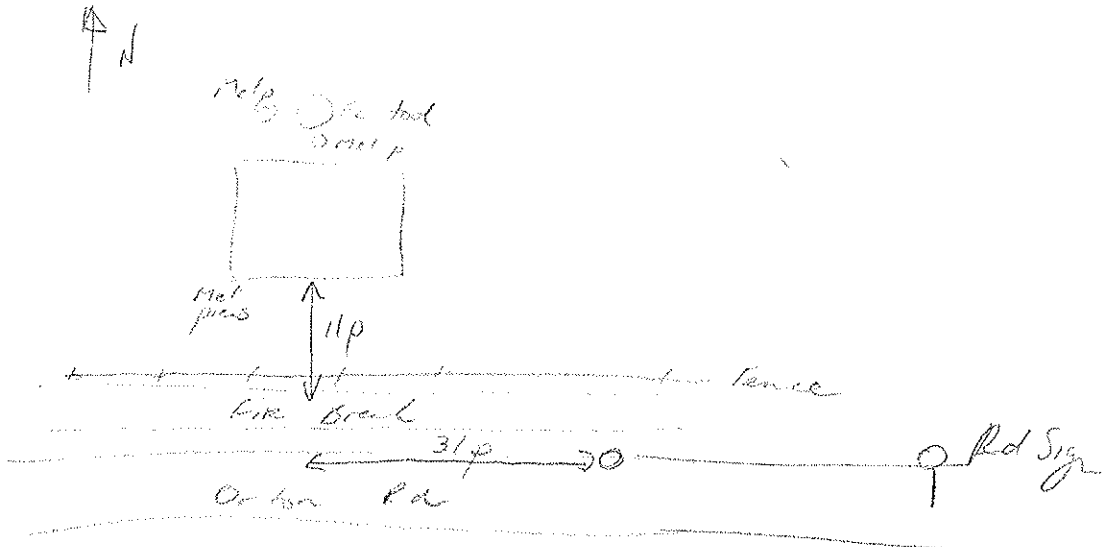
3. VEGETATION STRUCTURE AND COVER. Record appropriate cover class

Cover Class - percentage classes	over 70%	TREES				MALLEES				Height (metres)	
	50-70%	LIFE FORM				LIFE FORM					
	30-50%	COVER CLASS (%)				COVER CLASS (%)					
	20-30%	SHRUBS				SHRUBS					
	10-20%	LIFE FORM				LIFE FORM					
	2-10%	COVER CLASS (%)				COVER CLASS (%)					
	0%	BUNCH GRASSES				HERBS		SEDGES			
		LIFE FORM				LIFE FORM		LIFE FORM			
		COVER CLASS (%)				COVER CLASS (%)		COVER CLASS (%)			

Handwritten notes in table:
 - TREES: scattered, Hot trees, AUJ
 - MALLEES: MALLEE SHRUB less than 8m, MALLEE TREE 8m or more
 - SHRUBS: over 2m, 2.0-1.5m, 1.5-1.0m, 1.0m - 5m, under 5m
 - BUNCH GRASSES: under .5m
 - HERBS: under .5m (except creepers)
 - SEDGES: Hydrophilus (5), Evandrus (15), Lyg. ba. b (5), over .5m, Hydrophilus (5), Plat. sp. (1)

Scat. Euc tod
Net pres } down to
Nagt (ton } margins

Var pin
OVER as guard
lowest, base to no
rise,



Horse Pod.

Shor

SPECIES PRESENCE

- work systematically through the vegetation, start with the tallest stratum, i.e. trees
- within each stratum try to record the most common species first and the most uncommon last.
- as each species is collected label it with a numbered tag and use this number on your recording sheet
- indicate if the species is in flower

21/4/92
 QUADRAT No.
 MODO 1

Keighery and Keighery, 1990
 Adapted from Griffin and Keighery, 1989
 MOORE RIVER to JURIE SANDPLAIN
 SURVEY. WILDFLOWER SOCIETY of WA

Trees	No	ID	SHRUBS	No	ID	Herbs	No	ID
			4/11/92 <i>Solanum humile</i> <i>Stylid. min. fl. var.</i> <i>Stylid. min.</i> <i>Stylid. min.</i>					
Mallees			<i>Xanthorrhoea plumosa</i> <i>Acacia saligna</i> <i>Acacia saligna</i> <i>Urosyris sp.</i>					
SHRUBS			<i>Peuced. ellip. (pink)</i> <i>Acacia stenop.</i> <i>Erast. spicata</i> <i>Hypocaly. arcuat.</i> <i>Stylid. sp.</i> <i>Abutilon</i> VSP <i>Xanth. praevis (102)</i> <i>Ptilinoc. obsid.</i>					
			Bunch Grasses <i>Stylid. min.</i>					
			Herbs <i>Daisy brown</i> <i>Phob. citratus</i> <i>Daisy brown</i> <i>Stylid. repens</i> <i>Edmondia succulenta</i> <i>Stylid. brown</i> <i>Stylid. white</i> <i>Casid. microantha</i> <i>Stylid. min.</i> <i>Pakinsonia</i>			Sedges <i>Stylid. min.</i> <i>Stylid. min.</i> <i>Stylid. min.</i> <i>Stylid. min.</i> <i>Stylid. min.</i>		

MOOD-2

Klub 00

about football



Some pda with
in Hungary

QUADRAT No. M0003 VEGETATION TYPE _____
 DATE FIRST TRIP 29/9/92 VOLUNTEERS _____
 DATE SECOND TRIP _____ VOLUNTEERS _____
 BOTANIST NH & ML

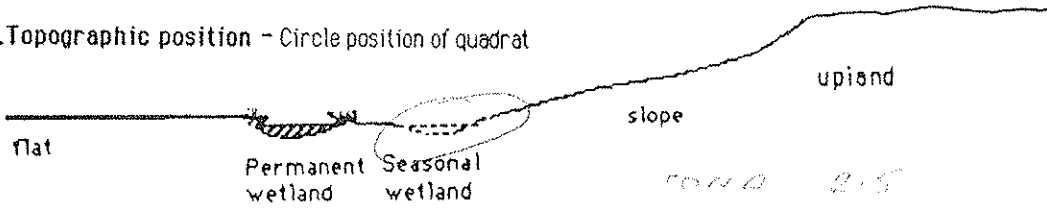
1. LOCATION of the QUADRAT

Photo 2

a. Mud Map Draw a sketch of the location of the quadrat the back of this sheet. →

b. Photograph Photographer's name N. Gibson

c. Topographic position - Circle position of quadrat



Keighery and Keighery, 1990
 Adapted from Griffin and Keighery, 1989
 MOORE RIVER to JURIE SANDPLAIN
 SURVEY. WILDFLOWER SOCIETY of WA

2. SITE DATA - Circle the correct response

Slope flat gentle steep Aspect N NE E SE S SW W NW

% Bare ground _____ Drainage well mod poor Wet All year winter/spring

Litter (% cover) 80 Surface soil Dark Brown Sub-surface soil _____

3. VEGETATION STRUCTURE AND COVER. Record appropriate cover class

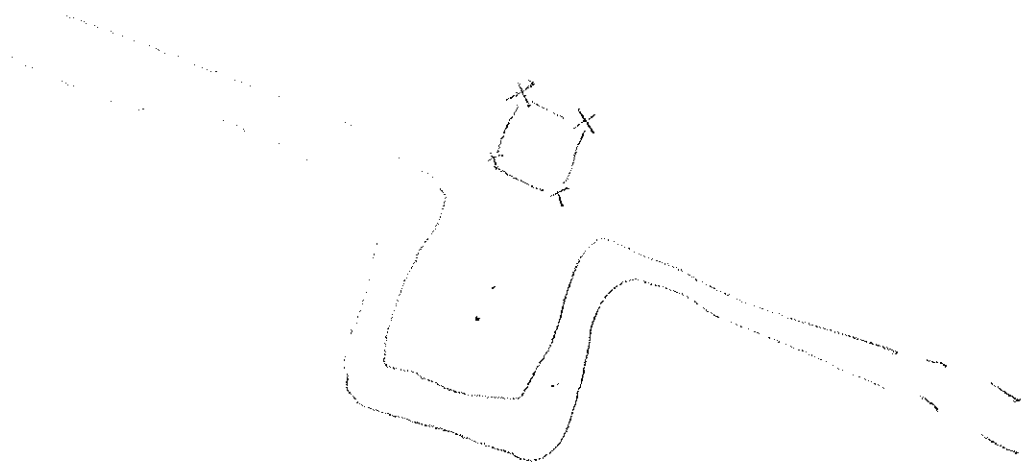
Cover Class - percentage classes	over 70%	TREES <u>G. rudis / Mel. pumila</u>				MALLEES		Height (metres)
	50-70%	> 15m 5-15m	Under 5m	MALLEE SHRUB less than 8m	MALLEE TREE 8m or more			
	30-50%	2-15m 5-15m	10-20%	10-20%	10-20%			
	20-30%	SHRUBS <u>Acacia aff. jamaicensis</u>						
	10-20%	over 2m		2.0-1.5m	1.5-1.0m	1.0m-.5m	under .5m	
	2-10%	30-50% 10-20%		10-20%	10-20%	10-20%	10-20%	
	0%	BUNCH GRASSES		HERBS	SEDGES <u>Lepidosperma</u>			
	under 2%	under .5m	under .5m (except creepers)	over .5m	under .5m			
	under 2%	10-20%		10-20%		10-20%		

Model 3

1

2

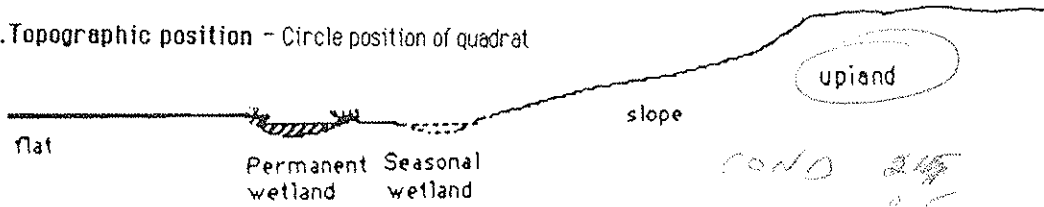
3



QUADRAT No. MO004 VEGETATION TYPE _____
 DATE FIRST TRIP 29/9/92 VOLUNTEERS _____
 DATE SECOND TRIP _____ VOLUNTEERS _____
 BOTANIST: NSJ/ml

1. LOCATION of the QUADRAT

- a. Mud Map Draw a sketch of the location of the quadrat the back of this sheet →
- b. Photograph Photographer's name NSJ
- c. Topographic position - Circle position of quadrat



Keighery and Keighery, 1990
 Adapted from Griffin and Keighery, 1989
 MOORE RIVER to JURIE SANDPLAIN
 SURVEY. WILDFLOWER SOCIETY OF WA

2. SITE DATA - Circle the correct response

Slope flat gentle steep Aspect N NE E SE S SW W NW

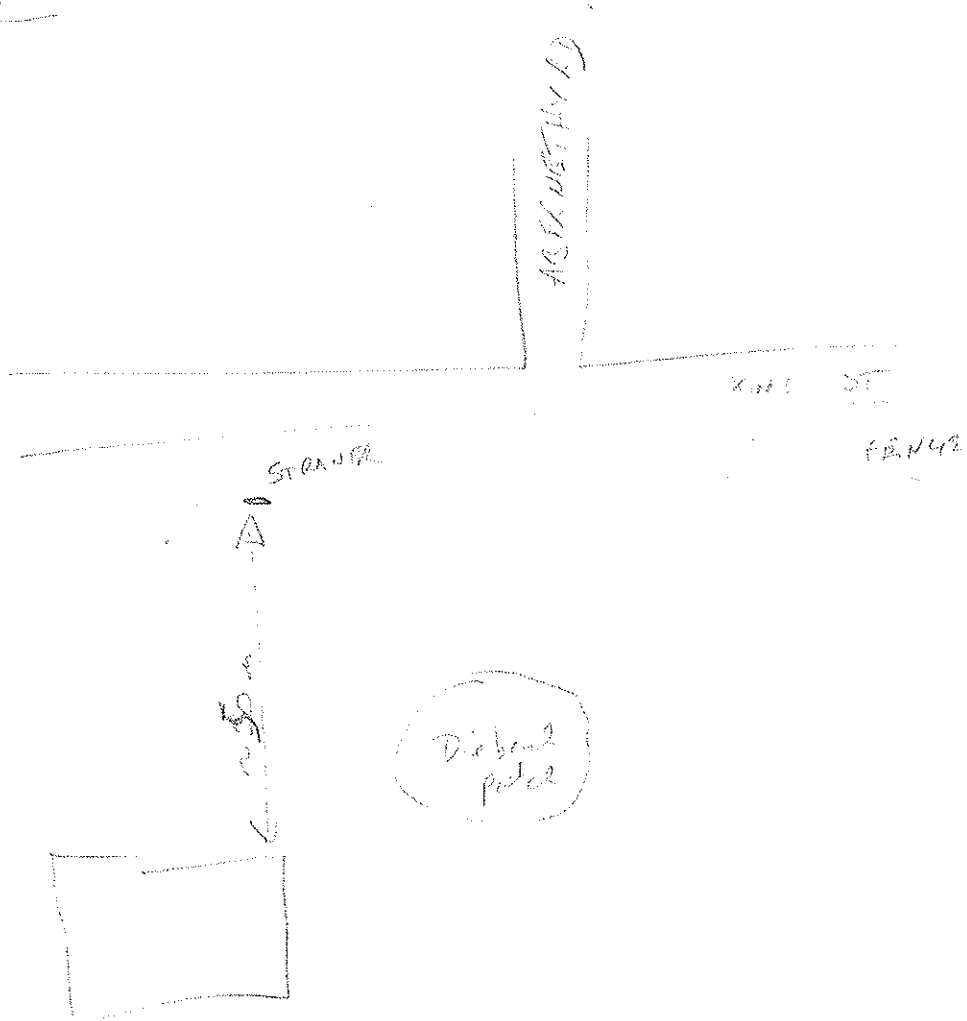
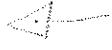
% Bare ground 20 Drainage well mod poor Wet All year winter/spring

Litter (% cover) 50 Surface soil GY SAND Sub-surface soil DITTO

3. VEGETATION STRUCTURE AND COVER Record appropriate cover class

Cover Class - percentage classes	over 70%	TREES <u>B. att</u>				MALLEES				Height (metres)	
	50-70%	LIFE FORM	> 15m or 5-15m	Under 5m	MALLEE SHRUBS less than 8m	MALLEE TREE 8m or more	15m	10m	5m		
	30-50%	COVER CLASS (%)	2-15m 5-15m 10-20	/	/	/	/	/	/		
	20-30%	SHRUBS		<u>Mel thymus</u>		<u>Hibb sp high</u>		<u>Bosc 10</u>			
	10-20%	LIFE FORM	Kangaroo will over 2m Hibb sp	2.0-1.5m	1.5-1.0m	1.0m - .5m	under 5m	3m	2m		1m
	2-10%	COVER CLASS (%)	/	2-10	/	20-30	/	/	/		
	0%	BUNCH GRASSES		HERBS		SEDGES		<u>high buds</u>			
	under 2%	LIFE FORM	under .5m	<u>Crocodylus - thal</u> <u>Bush</u> under .5m (except creepers)	over .5m	under .5m	2.0m	1.5m	1.0m		.5m
	under 2%	COVER CLASS (%)	/	10-20	/	10-20	/	/	/		

MOOO-4



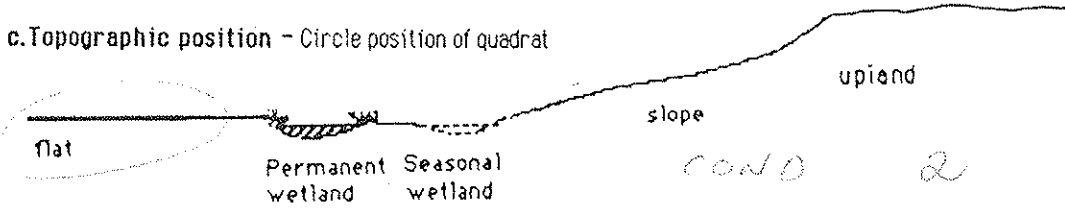
QUADRAT No. 10005 VEGETATION TYPE _____
 DATE FIRST TRIP 29/9/92 VOLUNTEERS _____
 DATE SECOND TRIP _____ VOLUNTEERS _____
 BOTANIST Ng & ML

1. LOCATION of the QUADRAT

a. Mud Map Draw a sketch of the location of the quadrat the back of this sheet

b. Photograph Photographer's name N. Gibson #4

c. Topographic position - Circle position of quadrat



Keighery and Keighery, 1990
 Adapted from Griffin and Keighery, 1989
 MOORE RIVER to JURJEN SANDPLAIN
 SURVEY. WILDFLOWER SOCIETY of W.A

2. SITE DATA - Circle the correct response

Slope flat gentle steep Aspect N NE E SE S SW W NW

% Bare ground 0 Drainage well mod poor Wet All year winter/spring

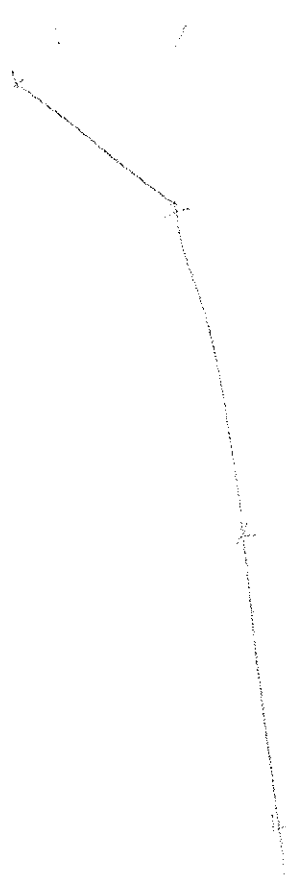
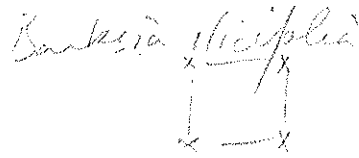
Litter (% cover) 770 Surface soil Green Sub-surface soil _____

3. VEGETATION STRUCTURE AND COVER Record appropriate cover class

Cover Class - percentage classes	over 70%	<table border="1"> <tr> <th>TREES</th> <td><i>Banksia thurleyana</i></td> <th>MALLEES</th> <td></td> </tr> <tr> <td>LIFE FORM</td> <td> <i>Banksia thurleyana</i> or > 15m 5-15m</td> <td> <i>Banksia thurleyana</i> under 5m</td> <td> <i>Banksia thurleyana</i> MALLEE SHRUB less than 8m</td> <td> <i>Banksia thurleyana</i> MALLEE TREE 8m or more</td> </tr> <tr> <td>COVER CLASS (%)</td> <td>> 15m 5-15m 30-50%</td> <td></td> <td></td> <td></td> </tr> </table>				TREES	<i>Banksia thurleyana</i>	MALLEES		LIFE FORM	<i>Banksia thurleyana</i> or > 15m 5-15m	<i>Banksia thurleyana</i> under 5m	<i>Banksia thurleyana</i> MALLEE SHRUB less than 8m	<i>Banksia thurleyana</i> MALLEE TREE 8m or more	COVER CLASS (%)	> 15m 5-15m 30-50%				Height (metres)				
	TREES	<i>Banksia thurleyana</i>	MALLEES																					
	LIFE FORM	<i>Banksia thurleyana</i> or > 15m 5-15m	<i>Banksia thurleyana</i> under 5m	<i>Banksia thurleyana</i> MALLEE SHRUB less than 8m	<i>Banksia thurleyana</i> MALLEE TREE 8m or more																			
	COVER CLASS (%)	> 15m 5-15m 30-50%																						
	50-70%																							
	30-50%																							
	20-30%	<table border="1"> <tr> <th>SHRUBS</th> <td colspan="5"><i>Anthochaeta thymoides, Kunzea olearifolia</i></td> </tr> <tr> <td>LIFE FORM</td> <td> over 2m</td> <td> 2.0-1.5m</td> <td> 1.5-1.0m</td> <td> 1.0m-.5m</td> <td> under 5m</td> </tr> <tr> <td>COVER CLASS (%)</td> <td>20-30%</td> <td>2-10%</td> <td></td> <td></td> <td></td> </tr> </table>				SHRUBS	<i>Anthochaeta thymoides, Kunzea olearifolia</i>					LIFE FORM	over 2m	2.0-1.5m	1.5-1.0m	1.0m-.5m	under 5m	COVER CLASS (%)	20-30%		2-10%			
	SHRUBS	<i>Anthochaeta thymoides, Kunzea olearifolia</i>																						
	LIFE FORM	over 2m	2.0-1.5m	1.5-1.0m	1.0m-.5m	under 5m																		
	COVER CLASS (%)	20-30%	2-10%																					
10-20%																								
2-10%																								
under 2%	<table border="1"> <tr> <th>BUNCH GRASSES</th> <th>HERBS</th> <th>SEDGES</th> <td></td> </tr> <tr> <td>LIFE FORM</td> <td> <i>Pteridium aquilinum</i> under .5m (except creepers)</td> <td> <i>Pteridium aquilinum</i> over .5m</td> <td> <i>Pteridium aquilinum</i> under .5m</td> </tr> <tr> <td>COVER CLASS (%)</td> <td>30-50</td> <td>2-10%</td> <td></td> </tr> </table>				BUNCH GRASSES	HERBS	SEDGES		LIFE FORM	<i>Pteridium aquilinum</i> under .5m (except creepers)	<i>Pteridium aquilinum</i> over .5m	<i>Pteridium aquilinum</i> under .5m	COVER CLASS (%)	30-50	2-10%									
BUNCH GRASSES	HERBS	SEDGES																						
LIFE FORM	<i>Pteridium aquilinum</i> under .5m (except creepers)	<i>Pteridium aquilinum</i> over .5m	<i>Pteridium aquilinum</i> under .5m																					
COVER CLASS (%)	30-50	2-10%																						
0%																								



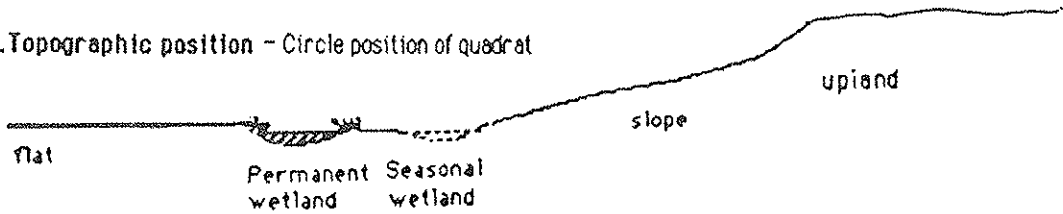
6
Fault Firebreak



QUADRAT No. MO20 06 VEGETATION TYPE _____
 DATE FIRST TRIP 30/10/92 VOLUNTEERS _____
 DATE SECOND TRIP _____ VOLUNTEERS _____
 BOTANIST NJML

1. LOCATION of the QUADRAT

- a. Mud Map Draw a sketch of the location of the quadrat the back of this sheet →
- b. Photograph Photographer's name _____
- c. Topographic position - Circle position of quadrat



Keighery and Keighery, 1990
 Adapted from Griffin and Keighery, 1989
 MOORE RIVER to JURRIEN SANDPLAIN
 SURVEY. WILDFLOWER SOCIETY of WA

2. SITE DATA - Circle the correct response

Slope flat gentle steep Aspect N NE E SE S SW W NW

% Bare ground _____ Drainage well mod poor Wet All year winter/spring

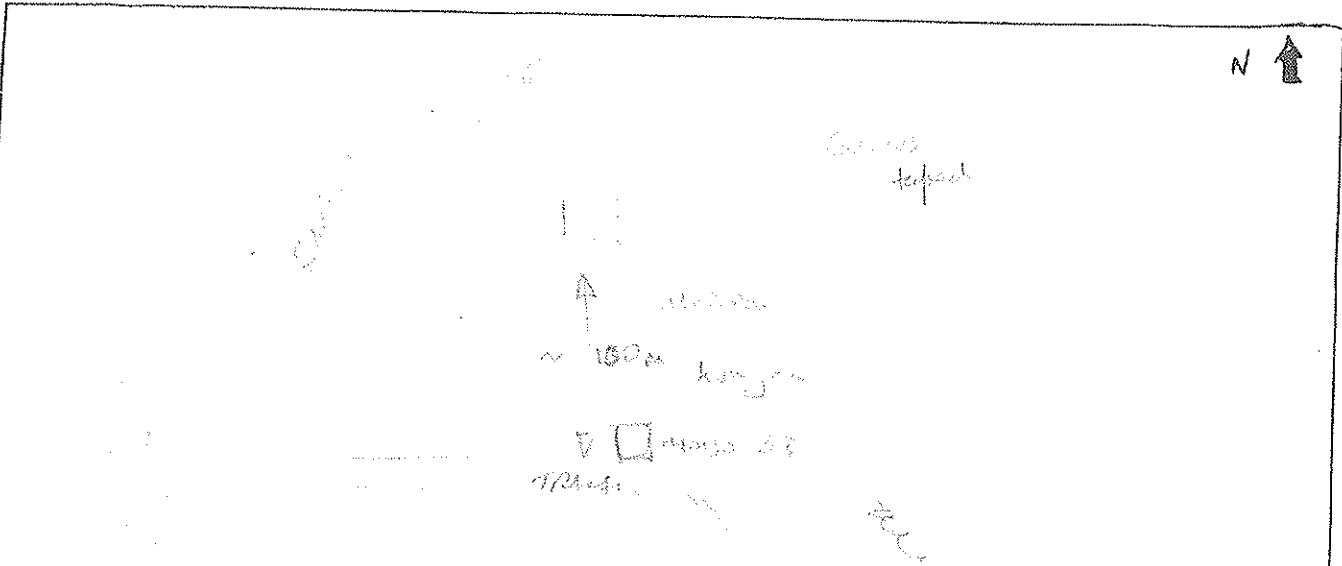
Litter (% cover) _____ Surface soil _____ Sub-surface soil _____

3. VEGETATION STRUCTURE AND COVER. Record appropriate cover class

Cover Class - percentage classes	over 70%	TREES <u>Mcd Iron</u>		MALLEES		Height (metres)		
	50-70%	LIFE FORM	<u>5-15m</u> 	<u>Under 5m</u> 	MALLEE SHRUB <u>less than 8m</u> 		MALLEE TREE <u>8m or more</u> 	
	30-50%	COVER CLASS (%)	<u>7-15m</u> <u>5-15m 2:10</u>					
	20-30%	SHRUBS <u>King soil</u>		<u>dry soil</u>		Height (metres)		
	10-20%	LIFE FORM	<u>over 2m</u> 	<u>2.0-1.5m</u> 	<u>1.5-1.0m</u> 		<u>1.0m - .5m</u> 	<u>under 5m</u>
	2-10%	COVER CLASS (%)					<u>30-50</u>	
	0%	BUNCH GRASSES		HERBS	SEDGES	<u>dry soil</u>	Height (metres)	
	under 2%	LIFE FORM	<u>under .5m</u> 	<u>under .5m (except creepers)</u> 	<u>over .5m</u> 	<u>under .5m</u> 		
	under 2%	COVER CLASS (%)				<u>50-70</u>		

a. Mud Map Draw a sketch of the location of the quadrat

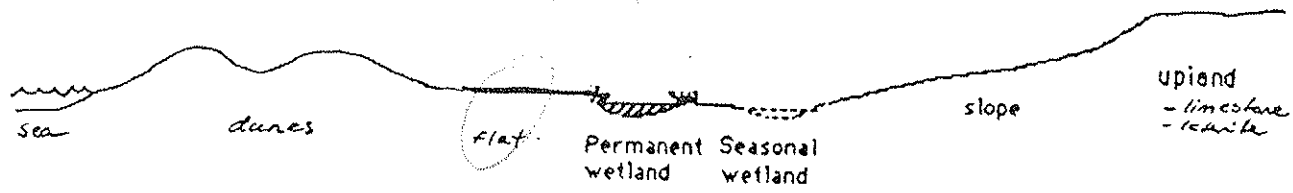
MOBO-6



b Road Location	c. Latitude	Longitude
	32 13 33.9	115 50 54.3

d. Photograph	Photographer's name <u>NK</u>	Photo No. <u>AR1-438</u>
		<u>20 ± 10</u>

e. Topographic position - Circle position of quadrat



2. SITE DATA - Circle the correct response
Slope flat gentle steep

Aspect

N	NE	E	SE	S	SW	W	NW
---	----	---	----	---	----	---	----

Surface soil grey sand

Sub-surface soil grey sand

Drainage well mod poor

Wet All year winter/spring

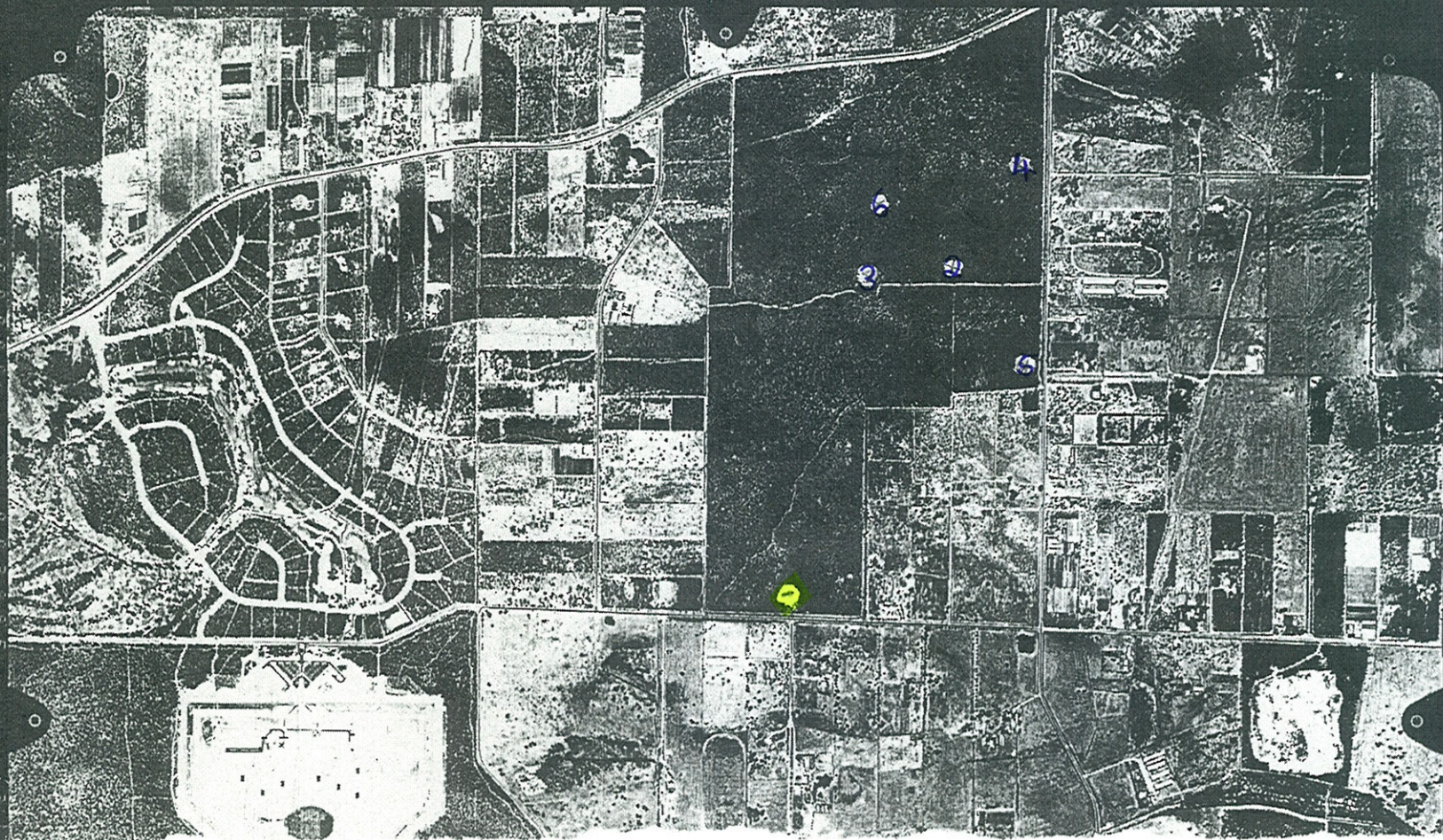
Litter (% cover) 20

% Bare ground 10

4. VEGETATION CONDITION

EXCELLANT	<input checked="" type="checkbox"/>	Comments
VERY GOOD	<input type="checkbox"/>	
GOOD	<input type="checkbox"/>	
POOR	<input type="checkbox"/>	
VERY POOR	<input type="checkbox"/>	

5055 WA 2942(C) METRO STREET DIRECTORY & EXT. RUN 10 (5001-5099) 1:20000 5.1.91 910400



MODO 1
2
3
4
5
6

5022-1-58 262-58 10

(159)

BUSHPLAN SITE LOT SURVEY SHEET 1: BOUNDARY / VEGETATION UNIT VERIFICATION

Use a **Survey Sheet 1** for each Lot inspected.

BUSHPLAN SITE 348 (Moodang)

LOT INSPECTED 42

DATE TRIP 5/3/99 RECORDERS BJK.

VEGETATION UNITS (Compare units observed with Bushplan Site description units. Circle/complete appropriate response)

MATCHES DESCRIBED UNITS THAT IS:

- Morri SW corner W boundary Mel prec over
Ast. fascic, Kunz'eric, Rostb Sphenoclytus
other sedges
- Kunzea ericifolia Miret

_____ ADDITIONAL VEGETATION UNITS DESCRIBED (SEE RECORDING SHEET 2)

BOUNDARY (Compare boundary observed with mapped boundary. Circle/complete appropriate response)

MATCHES CURRENT BOUNDARY

? CHANGES RECOMMENDED (OUTLINE EACH CHANGE BELOW AND NUMBER AND DRAW EACH CHANGE ON THE MAP) see comments under Change 1 / General

General Changes	Lots	Photo No
Rationale for change		
◦ <u>Credal path N boundary</u>		
◦ <u>Area cleared post bid (\$2,000) contractor cleared Euc tot, Euc mery, Bank det B.lli, Bme & Stipa compressa over whole area (this area within mapped bushland 1997)</u>		
◦ <u>House pad, adjacent Mel precis.</u>		
◦		

Change 1	Photo No
Rationale for change	
<u>? Reduce area of Kunz'eric? subject to check det: Rostwith only Kunzea ericifolia</u>	
<u>See contours / prior photos to look at bushland</u>	



M99 Reserve A25886, West of Byford
Modong Nature Reserve

Friends Advocate Management

Other Names:

Specific Study/studies

Miscellaneous studies

Flora

Vegetation Map 1 2 3

Flora list 1 2 3 4

Significant Taxa done / suitable / doubtful

Fauna

Mammals 1 2
Birds 1 2 RAOU
Reptiles and Amphibia 1 2
Invertebrates 1 2

Vegetation Condition Map Sites Comment

Disturbance Factors Comment Management

Swan Coastal Plain Floristic Survey

AHC: National Estate- Listed / Interim / Nominated / Notified NT (WA): Heritage Classification

Notes

CONTACT DR N. GIBSON CALM WOODVALE for further information.

Flora list for M99 Reserve A25886, west of Byford (extracted from Swan Coastal Plain database, 121 taxa, Modo 1-6,4/5/1995).

Department of Environmental Protection System 6 Update: Site Based Flora List M99 Reserve A25886, west of Byford

(extracted from the CALM Swan Coastal Plain database, 121 taxa, Modo 1-6, 4/5/95)

Anthericaceae

Arnocrinum preissii
Caesia occidentalis
Chamaescilla corymbosa
Hensmania turbinata
Laxmannia squarrosa
Thysanotus arbuscula
Thysanotus dichotomus
Thysanotus multiflorus
Tricoryne elatior
Tricoryne tenella

Apiaceae

Homalosciadium homalocarpum
Trachymene pilosa
Xanthosia huegelii

Asteraceae

* Conyza albida
* Hypochaeris glabra
Siloxerus humifusus
* Ursinia anthemoides
Waitzia suaveolens

Casuarinaceae

Allocasuarina fraseriana

Centrolepidaceae

Aphelia cyperoides
Centrolepis aristata
Centrolepis drummondiana

Colchicaceae

Burchardia umbellata

Cyperaceae

Evandra pauciflora
* Isolepis marginata
Isolepis stellata
Lepidosperma angustatum
Lepidosperma longitudinale
Schoenus curvifolius
Schoenus rodwayanus
Schoenus subbulbosus

Dasypogonaceae

Dasypogon bromeliifolius
Lomandra hermaphrodita
Lomandra nigricans
Lomandra preissii
Lomandra sericea
Lomandra suaveolens

CONTACT DR N. GIBSON CALM WOODVALE for further information.

Flora list for M99 Reserve A25886, west of Byford (extracted from Swan Coastal Plain database, 121 taxa, Modo 1-6,4/5/1995).

Dilleniaceae

Hibbertia hypericoides
Hibbertia racemosa
Hibbertia subvaginata
Hibbertia vaginata

Droseraceae

Drosera erythrorhiza
Drosera gigantea
Drosera glanduligera
Drosera macrantha
Drosera menziesii
Drosera paleacea scps subsp. paleacea
Drosera sp. scps

Epacridaceae

Conostephium pendulum
Leucopogon conostephioides

Euphorbiaceae

Poranthera microphylla

Goodeniaceae

Dampiera linearis

Haemodoraceae

Conostylis aculeata
Conostylis juncea
Phlebocarya ciliata

Iridaceae

Patersonia occidentalis

Lauraceae

Cassytha micrantha
Cassytha racemosa

Loranthaceae

Nuytsia floribunda

Mimosaceae

Acacia stenoptera
Acacia willdenowiana

Myrtaceae

Astartea aff. fascicularis sthest
Calothamnus lateralis
Calytrix flavescens
Calytrix fraseri
Eucalyptus rudis
Hypocalymma angustifolium
Kunzea ericifolia
Melaleuca preissiana
Melaleuca thymoides
Pericalymma ellipticum

CONTACT DR N. GIBSON CALM WOODVALE for further information.

Flora list for M99 Reserve A25886, west of Byford (extracted from Swan Coastal Plain database, 121 taxa, Modo 1-6,4/5/1995).

Scholtzia involucrata

Orchidaceae

Caladenia flava
Elythranthera brunonis
Leporella fimbriata
Lyperanthus nigricans
Pterostylis aff. nana scps
Pterostylis aff. sanguinea scps
Pterostylis aff. vittata scps
Pterostylis recurva
Thelymitra aff. holmesii scps
Thelymitra campanulata

Papilionaceae

Aotus gracillima
Bossiaea eriocarpa
Euchilopsis linearis
Gompholobium tomentosum
Hovea trisperma var. *trisperma*
Jacksonia aff. sericea "swamp form" scps
Jacksonia furcellata
Kennedia prostrata

Poaceae

* *Aira caryophyllea*
* *Aira* sp. scps
Amphipogon turbinatus
* *Briza maxima*
* *Briza minor*
Danthonia occidentalis
* *Ehrharta calycina*
* *Holcus setiger*
Stipa compressa

Polygalaceae

Comesperma calymega

Proteaceae

Adenanthos cygnorum
Adenanthos obovatus
Banksia attenuata
Banksia ilicifolia
Banksia menziesii
Persoonia saccata
Petrophile linearis

Restionaceae

Hypolaena exsulca
Loxocarya flexuosa
Lyginia barbata
Restio sinus scps ms

Rutaceae

Eriostemon spicatus

CONTACT DR N. GIBSON CALM WOODVALE for further information.

Flora list for M99 Reserve A25886, west of Byford (extracted from Swan Coastal Plain database, 121 taxa, Modo 1-6,4/5/1995).

Santalaceae

Leptomeria spinosa

Stylidiaceae

Stylidium brunonianum

Stylidium carnosum

Stylidium divaricatum

Stylidium mimeticum

Stylidium piliferum

Stylidium repens

Stylidium schoenoides

Xanthorrhoeaceae

Xanthorrhoea preissii

Mod...
fact

BF 11 348 (159)

VEGETATION AND SIGNIFICANT FLORA
IN
THE OAKFORD PROJECT AREA
SHIRE OF SERPENTINE - JARRAHDALÉ

Prepared for

G.R.Crimp & Partners
Town Planning Consultants
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WEST PERTH WA 6005
(09) 321 5426

By

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Consulting Botanist
8 Pitt Street
ST. JAMES WA 6102
(09) 458 9738

March 1990

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FIGURE

- 1 Vegetation and Survey Sites of the Project Area

TABLES

- 1 Native Vegetation of the Oakford Project Area
- 2 Native Vegetation Sites in the Oakford Project Area
- 3 Gazetted Rare Flora (DRF) of the Metropolitan Region
- 4 Gazetted Rare Flora (Government Gazette, WA, of 14 July 1989, pp.2159, 2160)
- 5 Priority One, Two and Three Species of the Metropolitan Region (September 1989; from WAWRC)

PLATE

- 1 Vegetation of the Oakford Project Area

SUMMARY

A botanical survey of the Oakford Project Area was carried out by car and on foot in mid- and late December, 1989, to describe the vegetation, its condition and its suitability as habitat for rare species of flora.

The majority of the Project Area has been cleared and is being used for agricultural and residential purposes. Types of native vegetation identified in the Project Area include Banksia Low Woodland to Open Forest, Marri Woodland, Flooded Gum Woodland, Moonah Paperbark Low Forest, Swamp Paperbark Low Forest, *Kunzea vestita* Tall Thickets, Seasonal Swamp Thickets, Heathlands and Low Sedgelands.

An estimated 70% or more of the native vegetation of the Project Area is *Banksia attenuata* - *B. menziesii* low woodland, often with tall, dense *Kunzea vestita* more common than the banksias. Most of the woodland appears not to have been burnt for at least five years, and most of that has sparse understoreys, probably due in large part to grazing and trampling by livestock. The other native vegetation is mainly ephemeral wetlands and heaths in low-lying areas.

Types of Banksia woodlands and wetlands are discussed.

No declared rare flora (DRF) species was found during the survey, nor was habitat likely to have them identified. It is possible, however, that a DRF orchid does occur there but would not be apparent until after an appropriate burn.

Three Priority Three species and their habitats were common in the Project Area. These three species are *Jacksonia sericea*, *Restio stenostachyus* and *Cartonema philydroides*.

It is possible that at least one Priority One, Two or Three species other than the three identified was missed, although the botanical survey done was reasonably thorough and representative. The majority of Priority species which might occur in the Project Area are not in flower in December and therefore could easily be missed.

1.0 INTRODUCTION

A botanical survey, particularly a description of the vegetation and a search for rare and priority flora, of Oakford Lots 106 and 107, was undertaken and reported upon during spring 1989 (Weston 1989). In December 1989, at the request of Mike Allen, of G. R. Crimp & Partners Town Planning Consultants, the survey was extended to cover the parts of the Oakford area not described in the earlier report (Figure 1). Because most species, including all rare flora and the majority of priority species which might be expected to occur in the area, had finished flowering by the time the survey was carried out, the emphasis of the survey was to identify areas which have habitats in which rare flora and priority species might occur.

In a letter to G. R. Crimp & Partners from the Department of Conservation and Land Management (Lyndon Mutter, Ref. 0.5.12, 29 August 1989), six declared rare flora (DRF) were described as possibly occurring in the area. These six species are all ephemeral herbaceous plants. They and their flowering times are:

<i>Caladenia</i> sp. (coastal plain)	Flowers September - October
<i>Diuris purdiei</i> [flowers following previous summer burn]	Flowers mid-Sept.- late Oct.
<i>Diuris</i> sp. (Kwinana)	Flowers August - September
<i>Drakaea jeanensis</i>	Flowers Sept. - November
<i>Drakaea</i> sp. (south west)	Flowers October
<i>Drosera occidentalis</i>	Flowers late Oct. - November

There are, in addition, Priority species which have been recorded in the area and others which might be expected to occur there. Priority One, Two and Three species recorded in the Metropolitan Region, within which the Project Area lies, are listed in Table 5.

This report presents the results of the botanical surveys of the Oakford Project Area and discusses gazetted (DRF), priority, rare, geographically restricted, threatened, vulnerable and poorly collected species, with particular reference to such species within the ranges of which the Project Area is located.

2.0 PHYSICAL ENVIRONMENT

The climate of the Project Area is temperate mediterranean, with warm, dry summers and mild, wet winters. Perth's long-term average annual rainfall is 870mm, with approximately 90% falling in the period between April and October. Approximate mean monthly temperatures range from a minimum of 10°C, in July, to 25°C, in February.

The Armadale environmental geology map sheet (Jordan 1986) correlates geology, soils, geomorphology and other features of the Project Area at scales of 1:50,000 and 1:100,000. The sheet's 1:100,000 geomorphology map shows the Project Area as being largely on Bassendean Dune eolian surfaces (Ed), with eolian deflation hollows (Eh), on slopes of 0° to 3° (to 10°). The eastern part of the Project Area covers the western edge of the alluvial plain (Fp) which extends to the slope at the base of the Darling scarp.

The sheet's 1:50,000 scale environmental geology map shows the Project Area as being largely Bassendean sands: white to pale grey sand over yellow sand of eolian origin (S8, Qpb) and over Guildford Formation sandy-clay to clayey-sand, also of eolian origin (S10, Qpb/Qpa). There are smaller areas of Guildford Formation clayey-sand (Sc, Qpa) in the northern part of the Project Area and a large area of Guildford Formation sandy-clay (Cs, Qpa) on the east side of the Project Area. There are also relatively small areas of peaty-sand (Sp1) and peat-rich sand (Sp2) swamp deposits (Qrw) among the Bassendean sands.

Characteristic types of vegetation and, to a lesser extent, land use are associated with the environmental geology units. For instance, the Cs-Fp sandy-clay alluvial plain is pasture, with

remnant flooded gum and moonah paperbark trees and, at the very east of the Project Area, she-oaks. Uncleared upland Bassendean sands have banksia woodlands, and uncleared low-lying Bassendean sands and depressions have seasonal swamps and paperbarks.

3.0 VEGETATION AND FLORA

3.1 Regional Vegetation

Beard (1979) and Heddle *et al.* (1980) map the native vegetation potential (i.e. what native vegetation would be there if it had not been cleared) of the region including the Project Area at a scale of 1:250,000. Beard (1980) also maps it a scale of 1:1,000,000, and calls it original natural vegetation (Beard 1984). A large proportion of the region has, however, been cleared and no longer supports unaltered native vegetation.

Beard's 1:250,000 scale map shows the native vegetation potential of most of the Project Area as being banksia low woodland with scattered jarrah and she-oak (e2Mb.cbLi). The eastern belt of the Project Area is shown as marri woodland (e3Mi) with patches of banksia low woodland (bLi).

Heddle *et al.* show the native vegetation potential of all of the area, except the easternmost, Guildford Formation part, as being in the Bassendean Complex - Central and South (44). This Bassendean Complex vegetation ranges from the characteristic woodland of *Eucalyptus marginata* (jarrah) - *Allocasuarina fraseriana* (she-oak) - *Banksia* species on sand dunes to low woodland of *Melaleuca* species and sedgelands on the moister sites. It also includes a transitional area of *E. marginata* and *E. todtiana* (prickly-bark) in the vicinity of Perth and the associated species: *Kunzea ericifolia*, *Hypocalymma angustifolium*, *Adenanthos obovatus* and *Verticordia* spp.

3.2 Vegetation of the Project Area

The following descriptions and the map (Figure 1) of the Project Area's vegetation are based upon field observations and aerial photo interpretation. The photographs used are 1:20,000 and 1:11,000 scale colour aerial photographs flown in March and April 1989 and a 1:10,000 scale mosaic of colour aerial photographs. Figure 1 shows native vegetation sample site locations and, with two exceptions, boundaries of native vegetation communities. The two exceptions are Lot 106/107 and the trapezoidal area between Lot 106/107 and Nicholson Road. There is a map of the vegetation of Lot 106/107 in Weston (1989). The vegetation in the trapezoid is a complex which is presently being cleared or partially cleared for housing. The trapezoid is covered with vegetation sample sites.

The majority of the Project Area has been cleared and now supports pasture with remnant trees, shrubs and groves and thickets of *Melaleuca preissiana* (moonah paperbark), other species of *Melaleuca*, *Astartea ? fascicularis* and *Pericalymma ellipticum*. The area between Nicholson Road and the drain south of Thomas Road has been totally cleared and pastured, with the exception of a few flooded gums and fewer moonah paperbark trees which have been left. These trees are most abundant near the drain and in an area shown in Figure 1. The drain more or less separates the flooded gum pastures from the she-oak pastures lying east of the drain. Green, wetter parts of the flooded gum pastures in the north are covered with a species of *Juncus*, which also occurs in the green, wetter, pasture areas between southern Nicholson Road and Thomas Road.

Seasonal lakes or ponds are scattered through the Project Area, but water was seen in only one of them: a very small, probably man-made pool in Site 40. Although most of the vegetation surrounding these ponds has been cleared or severely degraded by cutting and grazing, vegetation surrounding a few seasonal ponds is still in good condition. This vegetation is dominated by paperbarks, as low forest.

The remaining native vegetation of the Project Area is predominantly banksia woodland of slopes and flats, with seasonal swamps vegetated with thickets of *Astartea ? fascicularis* and *Pericalymma ellipticum* and with swamp forests of moonah paperbark trees (*Melaleuca preissiana*), sometimes with swamp paperbark trees (*M. raphiophylla*). Tall thickets of *Kunzea vestita* lie between some of

the seasonal swamps and banksia woodlands and intergrade with the latter.

There are also a few remnants of flooded gum woodland in the Project Area.

The locations of forty native vegetation sites recorded during the surveys are shown in Figure 1, and their types of vegetation are indicated in Tables 1 and 2. All of these sites are in the new Project Area. For sites, and vegetation mapping and descriptions, of Lots 106 and 107, refer to Weston (1989).

The types of native vegetation found in the Project Area are listed in Tables 1 and 2 and are described briefly below, with additional details in the captions to the plates. The first bracketed letters following the section headings refer to the symbols used in Table 2 and Figure 1.

3.2.1 Banksia Low Woodland to Open Forest (B) (Plate 1F)

An estimated 70% or more of the native vegetation of the Project Area is *Banksia attenuata* - *B. menziesii* low woodland, often with tall, dense *Kunzea vestita* more common than the banksias. Most of the woodland appears not to have been burnt for at least five years, and most of that has sparse understoreys, probably due in large part to grazing and trampling by livestock. The low woodland varies in structure through the Project Area. Its density in some places warrants it being called low open forest, in others: low woodland. There often is no clear-cut boundary between the two, and there is variation in species composition.

There are, broadly considered, two types of banksia woodland in the Project Area:

o Banksia woodland in low-lying areas (Bl) (Plate 1F)

Banksia woodland which is low in the landscape commonly has *Banksia ilicifolia* as one of the dominant species and commonly has understoreys dominated by monocotyledonous plants with grasslike leaves (Bg), particularly *Dasypogon bromeliifolius*, *Phlebocarya ciliata* and *Xanthorrhoea preissii*. Frequently *Kunzea vestita* is common (Bk), and there are occasionally moonah paperbark and marri trees.

o Banksia woodland on higher ground (Bh)

Banksia woodland which is higher in the landscape and presumably further from the water table has a shrubby understorey commonly dominated by *Eremaea pauciflora*.

Kunzea thickets (K) and grass-like 'understoreys' (G) are also found without banksias.

The low-lying types of banksia woodland are the most wide-spread and common in the Project Area.

3.2.2 Marri Woodland (M) (Plate 1H)

The marri (*Eucalyptus calophylla*) woodland that was probably well-represented in the Project Area prior to clearing now exists only as isolated trees in pastures and a few small groves around the margins of paperbark forests and woodlands.

3.2.3 Flooded Gum Woodland (F)

Flooded gum (*Eucalyptus rudis*) occurs as remnant woodlands and open forests around the margins of some seasonal ponds and in some swamps, such as the Site 38 swamp and Magenup Swamp (Lot 106/107), and as isolated trees dotted over the Guildford Formation alluvial plains at the eastern side of the Project Area. Some flooded gum woodland also has bracken (*Pteridium esculentum*) in its understorey and dense thickets of *Kunzea vestita*, species of *Melaleuca* and other plants. Moonah paperbark is a common associated tree.

3.2.4 Moonah Paperbark Low Forest (P, in part; Pm) (Plates 1C, 1G)

Moonah paperbark (*Melaleuca preissiana*) trees occur both in cleared, pasture areas as scattered individuals, some of massive proportions, and in dense belts to over 8m tall around swamps and thickets. Understoreys vary from almost bare, to dense *Lepidosperma longitudinale* sedgeland and

0.5-2m tall thickets. The thickets generally comprise *Hypocalymma angustifolium*, *Pericalymma ellipticum* or *Astartea ? fascicularis* with occasional occurrences of other shrubs.

Melaleuca teretifolia shrubs are associated with moonah paperbark trees in some shrublands and swamps. Elsewhere *Kunzea vestita* is a common associate.

The restionaceous sedge *Restio stenostachyus*, a Priority Three species, is associated with some of the moonah paperbark stands in the Project Area.

3.2.5 Swamp Paperbark Low Forest (P, in part; Ps)

Swamp paperbark (*Melaleuca raphiophylla*) forest occurs in and around a few seasonal lakes and as isolated tall shrubs or small trees in some of the eastern pasture areas. Where the forest is not inundated the ground is commonly littered with debris and almost bare of understorey, or the forest has a ground layer of grasses or *Lepidosperma longitudinale* or other sedges.

3.2.6 Seasonal Swamp Thickets (T) (Plate 1D)

Swamp thickets occupy most low-lying, at least occasionally winter-wet, depressions in the Project Area that are not totally cleared or forested. The thickets are generally almost monospecific stands of either *Pericalymma ellipticum* or *Astartea fascicularis*, seldom both, and are often associated with the sedge *Lepidosperma longitudinale*. The most extensive such stand is in the Site 35-38 area, where part of the stand is aged and dead, part is cleared and part is regenerating after a fire burnt it in the last year or two.

3.2.7 Heathlands (H) (Plates 1A, 1E)

In the Project Area, heathlands generally occur as understorey in banksia woodlands, but in a few areas, as at low-lying Site 1, they occur with trees present only as scattered emergents. Site 1 and areas near it have a variety of low shrubs, Christmas trees and three Priority Three species: *Jacksonia sericea*, *Restio stenostachyus* and *Cartonema philydroides*.

3.2.8 Low Sedgelands (L)

In parts of the Project Area there are treeless, shrubless areas covered in mats of restionaceous sedges, predominantly the Priority Three species *Restio stenostachyus*. There are also other, unrelated mats of *Carpobrotus edulis*.

3.3 Flora

There are no detailed descriptions or listing of the flora of the Project Area in this report, but some details are given in the captions to the plates.

The Priority Species discussed in Section 5 and prickly-bark (*Eucalyptus todtiana*) are of particular interest. The Project Area is close to the southern limit of distribution of prickly-bark (see Marchant *et al.* 1987), which was found at several sites in the Project Area and in reserves nearby.

3.4 'Dieback' Disease

There have been many deaths of banksia trees in the banksia woodlands, most noticeably at and near the interfaces of the woodland with pasture areas. Because the areas of dead trees are localised and include all of the mature banksia trees in the locality, it seems likely that the deaths are not due to old age but rather to changed water tables, increased salinity or, probably, *Phytophthora cinnamomi* dieback disease. Dieback disease has recently been identified in the Lot 106/107 area (Hart pers. comm.).

4.0 GAZETTED, PRIORITY AND SIGNIFICANT SPECIES

In 1975 Western Australia's Fauna Conservation Act was retitled as the Wildlife Conservation Act, and in 1979 the Act was amended to provide protection for specified species of flora as well as of fauna. The first plant species to be declared by the Minister as protected rare flora under the Act were listed in the Government Gazette, WA, of 14 November 1980. Periodically, the Minister publishes notices in the Government Gazette deleting and adding species to the list of protected flora. While a species, or other taxon, is gazetted as protected no-one is allowed to "gather, pluck, cut, pull up, destroy, dig up, remove or injure" a plant belonging to a wild population of that species without special written consent of the Minister (Rye and Hopper 1981). Fines may be imposed for breaching provisions of the Act.

The first list of gazetted flora comprises 100 species, including a variety of one of the species. The current list, printed in the Government Gazette, WA, of 14 July 1989, comprises 238 species. Some of the species first gazetted in 1980 are absent from the current list (Table 4), presumably because they have been found to be more abundant or wide-ranging than previously indicated by collections and records or because they appear to be well-protected in nature reserves and national parks.

In general, species are gazetted or declared as rare flora (DRF) not only because they are rare (i.e. because fewer than a few thousand reproductively mature plants of the species are known to exist in the wild) or are geographically restricted, but also because their continued, long-term survival in the wild is believed to be threatened.

Gazetted rare species are not the only Western Australian plants that are rare, geographically restricted, threatened or vulnerable. In fact, they probably constitute only a small proportion of such species. For example, Marchant and Keighery (1979) listed more than 2,000 species that were rare or poorly collected or were geographically restricted to a range of less than 160 kilometres. This section discusses such species, particularly ones that are gazetted as declared rare flora (DRF), are given priority numbers and have been recorded in the Perth Metropolitan Region.

4.1 Published Lists of Rare, Restricted and Poorly Collected Species

Australia-wide treatments of rare, geographically restricted and endangered species by Specht, Roe and Boughton (1974), Hartley and Leigh (1979), Leigh, Briggs and Hartley (1981) and Briggs and Leigh (1988) also contain Western Australian lists, which are based upon publications or other information provided by botanists in the various states. They cover presumably rare or threatened plants but do not deal with the adequacy of collection of any species.

"Extinct and Endangered Plants of Australia", by Leigh, Boden and Briggs (1984), lists endangered and presumably extinct species and the presumed threats to their survival. The book also describes and illustrates many endangered and extinct species, discusses the inconsistent use of terms to indicate various degrees of threat and rarity, and describes the binary system developed by Hartley and Leigh (1979) to classify rare, restricted and threatened species.

The first Western Australian publication on rare and restricted flora, by Marchant and Keighery (1979), is based upon the numbers of specimens of each native Western Australian species lodged in the Western Australian Herbarium and the geographical range of the collections for each species. Marchant and Keighery classify most of their 2,022 listed species as geographically restricted, presumably rare or poorly collected.

Four reports dealing with rare, restricted and threatened species have been published by the Department of Fisheries and Wildlife. One, by Rye (1982), lists geographically restricted south-western plants, and another, by Rye, Hopper and Watson (1980), is concerned with the

distribution and conservation status of commercially exploited native plants. The first two lists of gazetted rare Western Australian flora are presented and the listed species are described and illustrated in Rye and Hopper (1981) and Patrick and Hopper (1982). An expanded, updated version of the Rye and Hopper bulletin is in preparation (Hopper pers. comm.).

4.2 'Significant' Species

The term 'significant species' as used in this report refers to species that are:

- o rare, geographically restricted or apparently rare or restricted because they are poorly collected or recorded,
- o at the limits of their ranges or in areas outside their normal ranges or habitats,
- o particularly susceptible or vulnerable to environmental changes, especially ones caused by humans, either directly or indirectly,
- o diminishing significantly in abundance or geographical range due to clearing and other environmental changes associated with agriculture, mining, recreation, urbanisation and provision of services, or
- o poorly represented in secure conservation reserves.

The term 'significant' is used in this report instead of 'vulnerable', 'threatened', 'depleted' or 'endangered' because these terms either are too limited in their scope or implications or, as Leigh, Boden and Briggs (1984) put it, "have become highly emotive through popular usage, making it difficult to develop objective criteria for use in ascribing species to various categories". Leigh, Boden and Briggs discuss appropriate terminology in more detail.

All of the species in the lists referred to in Section 4.1 are significant species. Some significant species are gazetted as rare species; most are not.

The completeness and accuracy of most lists of significant Western Australian species are limited by the fact that they do not contain varieties, subspecies or undescribed species, some of which are also rare, and in that the intensity, uniformity and seasonal coverage of collecting and systematic surveying have been insufficient to distinguish between genuinely rare (and restricted) species and species which only appear to be rare (or restricted) because they have been poorly collected. Systematic surveying and collecting by Western Australian Wildlife Research Centre (WAWRC) botanists, and others, are slowly correcting this deficiency.

In some cases, significant species are found in areas where they were not previously known to occur. For instance, *Villarsia submersa*, a small water-lily type plant, was believed to be restricted to a few small seasonal ponds between Bunbury and Busselton until recent years, when it was found near Denmark, west of Manjimup and, in 1989, in a few ponds in the Metropolitan Region. *Synaphea pinnata* is a plant species previously gazetted as rare (Government Gazette, WA, of 14 November 1980) which has since been found to be more common or widespread or better conserved than previously believed and is no longer gazetted.

In other cases, species are no longer found in areas where they have been previously recorded, often due to habitat destruction or alteration. However, there are many species which emerge and flower for only one or a few years after fire, then disappear until after the next burn. For example, a population of the gazetted orchid *Drakaea jeanensis* recorded in the Metropolitan Area a few years ago has not been found recently.

Other sources of incompleteness and ambiguity in distribution and abundance information are:

- o insufficient locality information given on the labels which accompany herbarium specimens,
- o inaccurate identification of specimens, and
- o treatment of groups of species as single species.

So little is known about the abundance, distribution and taxonomy of nonvascular plants that few, if any, such species are gazetted as rare flora or are included in lists of rare species, although many of them may also be rare or geographically restricted.

4.3 Gazetted Rare Species (DRF)

The first list of declared rare flora, gazetted in 1980, was based upon assessment of the Marchant and Keighery (1979) list, addition of newly described species and local botanists' knowledge of species distributions and abundance. Gazettement of a species is now generally preceded by relatively detailed searches made in the field to locate populations of the species proposed as rare.

The gazetted list of flora does not include all, or probably even a majority of, rare species. The current list (14 July 1989), reproduced here as Table 4, concentrates on the south-western part of Western Australia and particular groups of species, which have, in general, been studied in greater detail than others. For example, members of the families Proteaceae, Myrtaceae, Leguminosae and Orchidaceae account for more than 150, well over half, of the gazetted species on the July 1989 list. It is likely that in the south-west alone there are many more ungazetted rare and restricted species than gazetted ones.

The two lists of gazetted rare flora in Rye and Hopper (1981) and Patrick and Hopper (1982) comprise fewer than 150 species, and the 1989 list contains fewer than 250 species, probably only a small proportion of Western Australian plants that could be considered as rare. Another list, in Rye (1982), contains 527 species of southern Western Australian flowering plants that are geographically restricted and includes most, if not all, of the species gazetted at that time as rare. The Rye list is based upon investigation of collections upon which the Marchant and Keighery (1979) list was based, taxonomic publications and rare plant records of the WAWRC.

Since the early 1980s WAWRC botanists have been compiling lists, descriptions, illustrations and records of significant species on a regional basis throughout Western Australia. The lists were originally compiled from herbarium records of the species listed in Rye (1982) and Marchant and Keighery (1979) and from taxonomic literature. These lists and records, along with relevant taxonomic studies, provide the basis for the lists of species proposed for gazettement and being considered for gazettement.

The WAWRC now has continuing programmes of research and, in addition to the list of gazetted species, has five unofficial priority lists of rare and restricted species for each of the eleven management regions into which CALM has divided the state:

- o Priority One Species - species known from only a few localities, which are on lands under immediate threat, and are in urgent need of further survey work,
- o Priority Two Species - species known from only a few localities, which are on lands not under immediate threat, and are in urgent need of further survey work,
- o Priority Three Species - species known from several localities, some of which are on lands not under immediate threat, and are in need of further survey work,
- o Priority Four Species - species presumed to be extinct, and
- o Priority Five Species - species considered to have been adequately surveyed and are not endangered or in need of special protection but could be if circumstances change.

These lists are modified and updated as relevant information and results of survey work become available. Priority One, Two and Three species are under consideration for declaration as rare flora, pending the outcome of further survey work.

The Priority One, Two and Three species of the Metropolitan Region are listed in Table 5.

5.0 SIGNIFICANT PLANT SPECIES AND HABITATS OF THE PROJECT AREA

5.1 Background

The species searched for during the botanical survey of the Project Area are those on two sets of unpublished lists, plus others highlighted during discussions with WAWRC botanists. The lists are:

- o Gazetted Rare Flora (Government Gazette, WA, of 14 July 1989, pp. 2159, 2160), particularly those listed in Section 1 and Table 4 of this report, and
- o Priority One, Two and Three Species of the Metropolitan Region (Table 5: provided by the WAWRC).

During the Project Area survey an emphasis was placed on finding the six Metropolitan Region DRF species listed in Section 1 and Table 3. Photographs of ~~the~~ these and the two other Metropolitan Region DRF species are in plates in Weston (1989), and information about the species is given in the captions to the plates and in Rye and Hopper (1981), Patrick and Hopper (1982), Hoffman and Brown (1984), Jones (1988) and the Perth Regional Flora (Marchant *et al.* 1987). The eight species are all herbaceous plants which flower in the period between August and November. Most are species of low-lying areas and seasonal wetlands.

5.2 Significant Plant Species found in the Project Area

No DRF species was found in the Project Area, but other significant species were found during the survey. Three of the species in the Priority Three list for the Metropolitan Region (Table 5) were found during the survey. These species, *Restio stenostachyus*, *Jacksonia sericea* (= *J. gracilis*) and *Cartonema philydroides*, are Priority Three species which are poorly collected or recorded and are apparently geographically restricted.

Restio stenostachyus, *Jacksonia sericea* and *Cartonema philydroides* are described below, in Sections 5.2.1 to 5.2.3. The descriptions are based upon my notes, field records and observations and upon information in Marchant *et al.* (1987). Sites in which they were found are indicated in Table 2. There are colour photographs of the first two species in Weston (1989) and of the third species in Plate 2 of this report.

5.2.1 Restio stenostachyus

Restio stenostachyus is a rhizomatous restionaceous sedge which has been recorded only in the Perth Flora Region, on the coastal plain between Gingin and Serpentine River. The plant forms dense mats up to 0.6m tall, but where it survives in pastures it is grazed and is much shorter. It is found on sandy soil in depressions and low areas that are wet, often with standing or flowing water, during the winter, and which often have moonah paperbarks.

The best stand of *Restio stenostachyus* seen in the Project Area, in fact the most extensive, healthiest stand seen by me anywhere, is in Site 29, where it forms an extensive carpet among marri and moonah paperbark trees. It is also common, however, in some Project Area former pasture areas, such as Sites 8 and 9.

5.2.2 Jacksonia sericea (= Jacksonia gracilis)

Jacksonia sericea is apparently restricted to calcareous and sandy soils on the coastal plain between Pinjarra and Perth. I have seen it near the Serpentine River in the Lowlands System 6 Recommendation area, in Kings Park and next to Bold Park, which is the furthest north I have found it. The species has, however, been collected further north, in Edgewater above the shore of Lake Joondalup.

Jacksonia sericea is not common anywhere in the Project Area, but occasional plants of the species were found on many sites.

5.2.3 Cartonema philydroides

Two forms of *Cartonema philydroides* have been recorded in the southwest, one from Kalbarri, the other from between Guildford and Capel on the coastal plain. The few plants found during the survey had recently finished flowering.

5.3 Significant Habitats in the Project Area

Most of the species sought during the survey of the Project Area occur in a limited range of wetland habitats which have a restricted occurrence, such as the clay-based seasonally inundated swamps represented in the Cannington and Kenwick areas.

The *Caladenia* and the two species of *Drakaea* on the gazetted list are recorded from woodland habitats but apparently not of the types found in the Project Area.

6.0 DISCUSSION

The vegetation of the Oakford Project Area includes two types of plant associations that are of particular concern due to the extent they have been cleared and polluted (Trudgen pers. comm., Jennings pers. comm.). The first is Banksia low woodland. The second is wetlands.

6.1 Banksia Low Woodland

Some indication of the extent of clearing of Banksia low woodland which has occurred in the southwest since European settlement is given by Beard and Sprenger (1984), in their Table 11. Their table lists proportions of forty-four 1:1,000,000 scale native vegetation units in the South-west Botanical Province which have been cleared.

Two of the 44 native vegetation units are Banksia low woodlands. One type, e₂bLi, occurs north of the Metropolitan Region, while the other, eMr.bLi, occurs in the Metropolitan Region, including the Oakford Project Area (Beard 1980). The second type also occurs further south, as part of a mosaic. These woodlands, their vegetation unit numbers, mapping symbols and percentages of clearing are:

- o Unit 23 Banksia and jarrah-Banksia low woodland e₂bLi 61% cleared
- o Unit 30 Banksia low woodland with scattered eucalypts eMr.bLi 100% cleared

The proportions, and other figures in Beard and Sprenger's Table 11, are based upon comparisons of the 1:1,000,000 scale map of the potential or original native vegetation of the South-west Botanical Province (Beard 1980) with maps in Jarvis (1979) showing alienated land. Consequently, the proportions in Beard and Sprenger's Table 11 are of "now alienated land where the vegetation is presumed cleared" (Beard 1989), not of vegetation that has actually been cleared.

Using 1:250,000 scale satellite imagery, Burbidge and Rolfe determined the area of the Swan Coastal Plain occupied by Banksia woodland communities in 1986 and compared that with the area originally occupied (Hopper and Burbidge 1989). They calculated that 55% of Banksia woodland complexes on Bassendean and Spearwood dune systems between Lancelin and Capel had been totally cleared of native vegetation.

Field observations indicate that there are more than two types of Banksia woodland, the number of types depending upon the parameters used to define them. For instance, Speck (1952: Beard 1989) recognised three basic substrate types, and Havel (1968) divided Banksia woodlands near Yanchep into 11 types based upon groups of species in their understoreys. Section 3.2.1 of this report

recognises four types in the Project Area - Bh, Bl, Bk and Bg - based upon floristic composition of the overstorey and physiognomic structure of the understorey. There are no extensive stands of any of these types in the Project Area, but there are in Lot 106/107 and nearby (Weston 1989), as well as elsewhere south of Perth.

In the early 1970s, Western Australian botanists listed *Banksia menziesii* - *B. attenuata* - *Casuarina fraserana* - *Eucalyptus todtiana* Low Woodland (9) and Low Open-woodland (25) as two of the state's important plant alliance-formations and estimated the conservation status of each (Specht, Roe and Boughton 1974). No other *Banksia menziesii* - *B. attenuata* alliance or formation was listed. The botanists estimated the adequacy of conservation of Banksia low woodland to be reasonable, of Banksia low open-woodland to be moderate. The low woodland was represented in eight reserves, three of them with areas of 4,000ha to more than 40,000ha. The low open-woodland was represented in three reserves having areas of between 4,000ha and 40,000ha.

The conservation status of Swan Coastal Plain Banksia woodlands can still only be estimated. By the late 1980s, much more was known and recorded about them, but the relevant reports and studies need to be brought together, analysed and compared. They need to be supplemented with aerial photo interpretation and systematic field work throughout the ranges of *Banksia menziesii* - *B. attenuata* woodlands before the true, current conservation status and condition of the woodlands can be estimated. A uniform, easily useable classification of woodland types based upon floristic indicators and, perhaps, upon structural differences and habitat factors, like the classification developed and applied to coastal plain wetlands by Semeniuk (Semeniuk 1987; Le Provost, Semeniuk & Chalmer 1987), needs to be developed and used during the field work. Such a project should be undertaken and completed as a matter of urgency.

6.1 Wetlands

The term 'wetlands' is generally defined by wetness parameters rather than by any vegetation features although vegetation is a characteristic component of at least parts of most wetlands and can be used to identify wetlands even when they are dry. The definition by Paijmans *et al* (1985) does consider vegetation, and water birds, but is more restrictive than the Wetlands Advisory Committee (1977) definition and depends upon how the term 'hydrophilic' is defined. The Wetlands Advisory Committee definition of wetlands is sufficiently broad to cover areas in the Oakford Project Area, and their vegetation, which are not inundated, or even waterlogged, every year. The committee's definition is:

Areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries.

LeProvost, Semeniuk & Chalmer (1987) divided coastal plain wetlands as defined above into seven basic types - lake, sumpland, dampland, river, creek, floodplain and palusplain, mapped their distribution as consanguineous wetland suites and identified wetlands of regional to international environmental significance. The Project Area wetlands are mostly damplands and a few sumplands, all of which belong to the Jandakot Suite (Bassendean Dunes: B3). None is mapped as being of regional to international environmental significance.

The natural wetlands of the Project Area and of Lot 106/107 are relatively small and vary in condition from severely degraded to slightly degraded, either directly or indirectly, by human activity. Four are worth particular mention.

The most extensive natural wetland is the dampland north of Thomas Road and King Road, the location of Sites 34, 36 and 38. The dampland supports Moonah paperbark low forest and seasonal swamp thickets, with a few, small flooded gums and, around the margins, Banksia low woodlands. Its average condition rating is 3 to 4 out of 5.

Lot 106/107 have the wetlands in best condition, 4+ out of 5. These are two small damplands at Sites 8 and 15 (Weston 1989).

Magenup Swamp and Magenup Bulrush Swamp are the only two named wetlands in the Project Area and Lot 106/107 (on Fremantle SE Australia 1:25,000 Survey map). Magenup Swamp is a

large, severely degraded wetland with a condition rating of about 1 out of 5. A drain runs through the middle of the swamp, and all of its vegetation, except for a few thickets and a few paperbark and flooded gum trees and small groves, has been replaced by alien grasses, clovers and other herbaceous plants. Magenup Bulrush Swamp is a much smaller swamp, which is also degraded but with a condition rating of between 2 and 3 out of 5; it or a neighbouring swamp has a few bulrushes but not in the Project Area. It has a small pool of water, in a depression that was probably man-made.

6.3 Significant Flora

No declared rare flora (DRF) species was found in the Project Area, nor was any habitat likely to have them identified. It is possible, however, that a DRF orchid does occur there but would not be apparent until after an appropriate burn, perhaps, for instance, in Site 20. Hopper and Burbidge (1989) note that *Banksia* woodlands appear to contain few rare localized endemic species but that three DRF orchids occur mainly in them and three other DRF species occur in ephemeral wetlands associated with the woodlands.

It is also possible that at least one Priority One, Two or Three species other than the three identified was missed, although the botanical survey done was reasonably thorough and representative.

7.0 ACKNOWLEDGEMENTS

Botanists employed by the Department of Conservation and Land Management have provided advice, information and other assistance with the project. Robert Saffrey helped with the field work.

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FIGURE

TABLES

Table 1

Native Vegetation of the Oakford Project Area

<u>Vegetation Type</u>		<u>Sites Recorded</u>
<u>Banksia Low Woodland to Open Forest</u>	(B)	1,,6c,7,13,16,16a,17,18,21, 22,23,25,27,30,39
banksia woodland in low-lying areas	(Bl)	1,,6c,7,13,16,16a,17,18,21,23, 30
with <i>Kunzea vestita</i> ,	(Bk),(K)	1,4,5,6a,9,13,14,15,16, 16a,17,18, 19,20,23,30,40
with grass-like plants	(Bg),(G)	1,6c,7,12(X.p.),16,19,21,23,25, 26
banksia woodland on higher ground	(Bh)	25,27(w. E.m. & E.t.),39
<u>Marri Woodland</u>	(M)	19,28,29
<u>Flooded Gum Woodland</u>	(F)	38
<u>Moonah Paperbark Low Forest</u>	(Pm)	5,6b,19,20,28,29,31,32,33,34,36, 38, 40
<u>Swamp Paperbark Low Forest</u>	(Ps)	40
<u>Seasonal Swamp Thickets</u>	(T)	2(P.e.),6b(P.e.),9(A.f.),15,20,24, 26,38
<u>Heathlands</u>	(H)	1,6c
<u>Low Sedgeland</u> s	(L)	3(C.e.),8(R.s.),9(R.s.),11(C.e.)

Table 2

Native Vegetation Sites Recorded in the Oakford Project Area

Site	Vegetation	Photos	Priority Three Species:		
			<u>Jac.ser.</u>	<u>Res.sten.</u>	<u>Cart.phil.</u>
1	Blkg, H	0,1	x	x	
2	T(P.e.)				
3	L(C.e.)				
4	K	2	x		
5	K	3		x	
6a	K	4,5			x
6b	Pm, L(R.s.)			x	
6c	Blkg, H		x		
7	Blg	6,7	x		
8	L(R.s.)	8		x	
9	L(R.s.)			x	
10	weedy pasture & C.e.				
11	L(C.e.)				
12	G(X.p.)		x		
13	Blk				x
14	K			x	
15	K, T(P.e.)		x		
16	Blkg				
16a	Blk w. a few tall jarrah trees				
17	Blk				
18	Blk				
19	G, M, Pm	9	x	x	
20	Pm, T, w. <u>Actinostrobus</u> (Swamp Cypress) to north in eastern road verge				
21	Blg				
22	B				
23	Blkg				
24	T	10			
25	Bh				
26	T, G	11			
27	Bh w. jarrah and prickly-bark				
28	M, Pm		x	x	
29	M, Pm	14	x	x	x
30	Blk	12	x	x	
31	Pm	13			
32	Pm				
33	Pm				
34	Pm				
35	Mixed; mostly swamp & pasture, but with she-oak and prickly-bark				
36	<u>Baumea articulata</u> w. <u>Pelargonium capitatum</u> & <u>Paspalum dilatatum</u> in road verge ditch				
37	<u>Juncus</u> at edge of now dry pool				
38	Pm, T, F	x			
39	Bh	x			
40	Pm, Ps, K, Cl, w. <u>Baumea articulata</u> , <u>Paspalum dilatatum</u> , <u>Centella</u> and water				

Table 3
Gazetted Rare Flora (DRF) of the Metropolitan Region

<u>Flowering Species and Family</u>	<u>Localities and Distribution</u>	<u>Habitat</u>	<u>Times</u>
<i>Aponogeton hexatepalus</i> APONOGETONACEAE	17: Kenwick-Darradup-Augusta	Shallow winter pools on clayey soils	Aug-Sept
<i>Caladenia</i> sp. A (coastal plain) S. D. Hopper 3400 ORCHIDACEAE	11: Gnangara-Yallingup -Margaret River	Sandy soils in banksia and eucalypt woodlands, often with <i>Allocasuarina fraseriana</i> and usually low on the landscape	Sept-Oct
<i>Diuris purdiei</i> ORCHIDACEAE	9: Perth area-Harvey	Seasonal semi-swamp on sand-over-clay soils, usually in <i>Regelia</i> and <i>Pericalymma</i> shrublands; flowers in habitats which were burnt the previous dry season	Sept-Nov
<i>Diuris</i> sp. (Kwinana) aff. <i>laxiflora</i> A. P. Brown 10/9/84 ORCHIDACEAE	2: Kwinana	Small shallow winter-wet swamps amongst short sedgeland, predominantly of <i>Lepidosperma ? longitudinale</i> , on sandy-clayey soils	Aug-Sept
<i>Drakaea jeanensis</i> ORCHIDACEAE	8: Canning Vale-Busselton	Sandy soils, often firm and very white, in <i>Kunzea ericifolia</i> tall shrubland and banksia woodland, low on the landscape	Sept-Nov
<i>Drakaea</i> sp. (south west) S. D. Hopper 3566 ORCHIDACEAE	5: Canning Vale, Yarloop, Mowen, Bakers Junction	Sandy soils in scrub and woodlands low in the landscape, often near swamps	Sept-Oct
<i>Drosera occidentalis</i> DROSERACEAE	9: Malaga-Karnup	With short Centrolepidaceae sedges on sandy soils which are winter-inundated, usually shallowly, in swampy areas	Oct-Nov
<i>Hydrocotyle lemnoides</i> APIACEAE	3: Upper Swan-Kenwick	Shallow winter pools on clayey soils	Sept-Oct

The information in this table was compiled from Rye and Hopper (1981), Hoffman and Brown (1984), Marchant *et al.* (1987), information provided by L. Mutter and botanists of the Western Australian Herbarium and the WAWRC, and field work by A. S. Weston during September and October 1989. There may be a few more localities for some of the orchids than the number given in the table, but some of the species are no longer found in some of the localities where they were previously recorded

Table 4
Gazetted Rare Flora
(Government Gazette, WA of 14 July 1989)

Most of the named species in the current list of gazetted rare species are listed in the Census of the Vascular Plants of Western Australia (Green 1985). The Flora of the Perth Region (Marchant *et al.* 1987) describes 12 of these species as occurring in the Perth Region.

WILDLIFE CONSERVATION ACT 1950

019882F3701.

PURSUANT to the provisions of subsection (2) of section 23F of the Wildlife Conservation Act 1950, I hereby declare that protected flora of the taxa listed in the schedule to this Notice growing in its original state and not in its domesticated or cultivated state are rare flora throughout the whole of the State.

The previous notice relating to rare flora published in the *Government Gazette* on 15 July 1988 is hereby cancelled.

IAN TAYLOR,
Minister for Conservation
and Land Management.

Declared Rare Flora Schedule
1989

- Acacia anomala*
Acacia aphylla
Acacia argutifolia
Acacia denticulosa
Acacia depressa
Acacia forrestiana
Acacia guinetii
Acacia lanuginosa
Acacia merrickae
Acacia pharangites
Acacia semicircularis
Acacia simulans
Acacia vassalii
Acacia sp. (Chiddareeping) J. Brown 59 & A. Williams
Acacia sp. (Dandaragan) S. van Leeuwen 269
Acacia sp. (Wongan Hills) K. F. Kennally 7496
Adenanthus cunninghamii
Adenanthus dobagii
Adenanthus ellipticus
Adenanthus eyrei
Adenanthus ileticus
Adenanthus pungens
Adenanthus velutinus
Allocasuarina fibrosa
Allocasuarina sp. (Lake King) M. Graham 1127
Anigozanthus bicolor subsp. *minor*
Anigozanthus humilis subsp. *chrysanthus*
Anigozanthus viridis subsp. *terraspectans*
Apium prostratum subsp. (*Parangurups*) G. J. Keighery 8873
Aponogeton hexatepalus
Asplenium obtusatum
Asterolasia drummondii
Asterolasia grandiflora
Asterolasia nivea
Baeckea arbuscula
Banksia brownii
Banksia cuneata
Banksia goodii
Banksia uliginosa
Banksia sphaerocarpa var. *dulichostyla*
Banksia tricuspis
Banksia verticillata
Billardiera mollis
Boronia adamsiana
Boronia revoluta
Caladenia bryceana
Caladenia cristata
Caladenia dorricanii
Caladenia integra
Caladenia wanosa
Caladenia sp. (Cape Naturaliste) S. D. Hopper 4518
Caladenia sp. (coastal plain) S. D. Hopper 3400
Caladenia sp. (Dunsborough) S. D. Hopper 5520b
Caladenia sp. (Esperance) D. R. Voigt 36
Caladenia sp. (Lecuwini-Naturaliste) S. D. Hopper 4670
Caladenia sp. (Moresby Range) G. J. Keighery 3328
Caladenia sp. (Muir) S. D. Hopper 3521
Caladenia sp. (Murchison) S. D. Hopper 3270
Caladenia sp. (Northampton) S. D. Hopper 3347
Caladenia sp. (salt lakes) S. D. Hopper 4162
Caladenia sp. (southern forest) S. D. Hopper 3553
Chamelaucium sp. (Busselton) G. J. Keighery 3655
Chamelaucium sp. (Catalby) G. J. Keighery 11009
Chamelaucium sp. (S coastal plain) R. D. Royce 4872
Conospermum toddii
Conostylis drummondii
Conostylis lepidospermoides
Conostylis micrantha
Conostylis misera
Conostylis rogeri
Conostylis searsiflora subsp. *trichophylla*
Conostylis wonganensis
Cooperia georgei
Corybas sp. (Albany) L. Byrne 10
Darwinia acerosa
Darwinia apiculata
Darwinia carnea
Darwinia collina
Darwinia macrostegia
Darwinia masonii
Darwinia meeboldii
Darwinia oxylepis
Darwinia squarrosa
Darwinia wittwerarum
Darwinia sp. (Scott River) G. J. Keighery 3582
Darwinia sp. (Stirling Range) G. J. Keighery 5732
Daviesia euphorbioides
Daviesia purpurascens
Daviesia spiralis
Daviesia sp. (central wheatbelt) M. D. Crisp 6612
Daviesia sp. (Encabba) S. D. Hopper 4829
Daviesia sp. (Norseman) M. D. Crisp 5943
Daviesia sp. (Ravensthorpe) M. D. Crisp 6065
Daviesia sp. (Stirling Range) K. R. Newbey 5113
Daviesia sp. (Three Springs) M. D. Crisp 6480
Diuris drummondii
Diuris purdiei
Diuris sp. (Kwinana) A. P. Brown 10/9/84
Diuris sp. (Northampton) A. P. Brown 203
Drakaea jeanensis
Drakaea sp. (Great Southern) S. D. Hopper 3461
Drakaea sp. (Kalbarri) A. P. Brown 8.82
Drakaea sp. (south west) S. D. Hopper 3566
Drosera fimbriata
Drosera occidentalis
Drummondita ericoides
Drummondita hassellii var. *longifolia*
Dryandra serratuloides
Dryandra sp. (Kamballup) M. Pieroni 20/9/88
Dryandra sp. (Stirling Range) F. Lullfitz 3379
Eremophila denticulata
Eremophila inflata
Eremophila merrallii
Eremophila microtheca
Eremophila nivea
Eremophila racemosa
Eremophila resinosa
Eremophila serpens
Eremophila ternifolia
Eremophila verticillata
Eremophila virens
Eremophila viscida
Eremophila sp. (Lake King) S. D. Hopper 1807
Eremophila sp. (Newdegate—Kondinin) L. Haegi 1087
Eriostemon wonganensis
Eucalyptus beardiana
Eucalyptus bennettiae

Table 5

Priority One, Two and Three Species of the Metropolitan Region
(pers. comm. WAWRC, October 1989)

PLATE



A



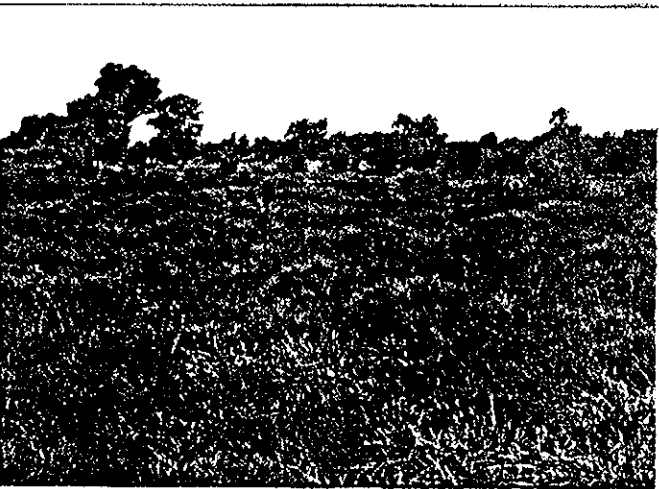
B



C



D



E



F

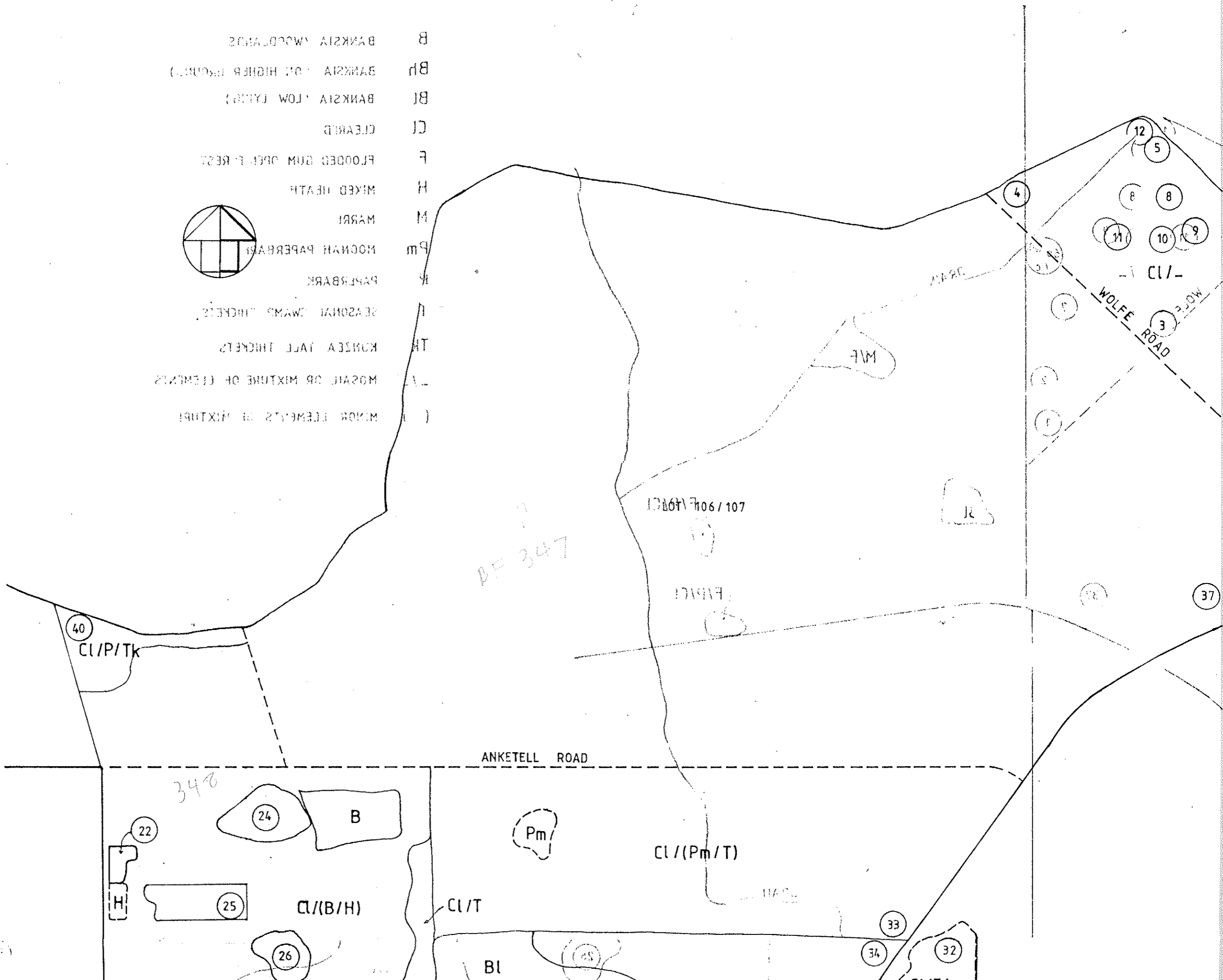
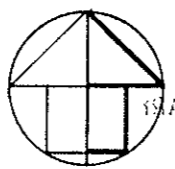


G

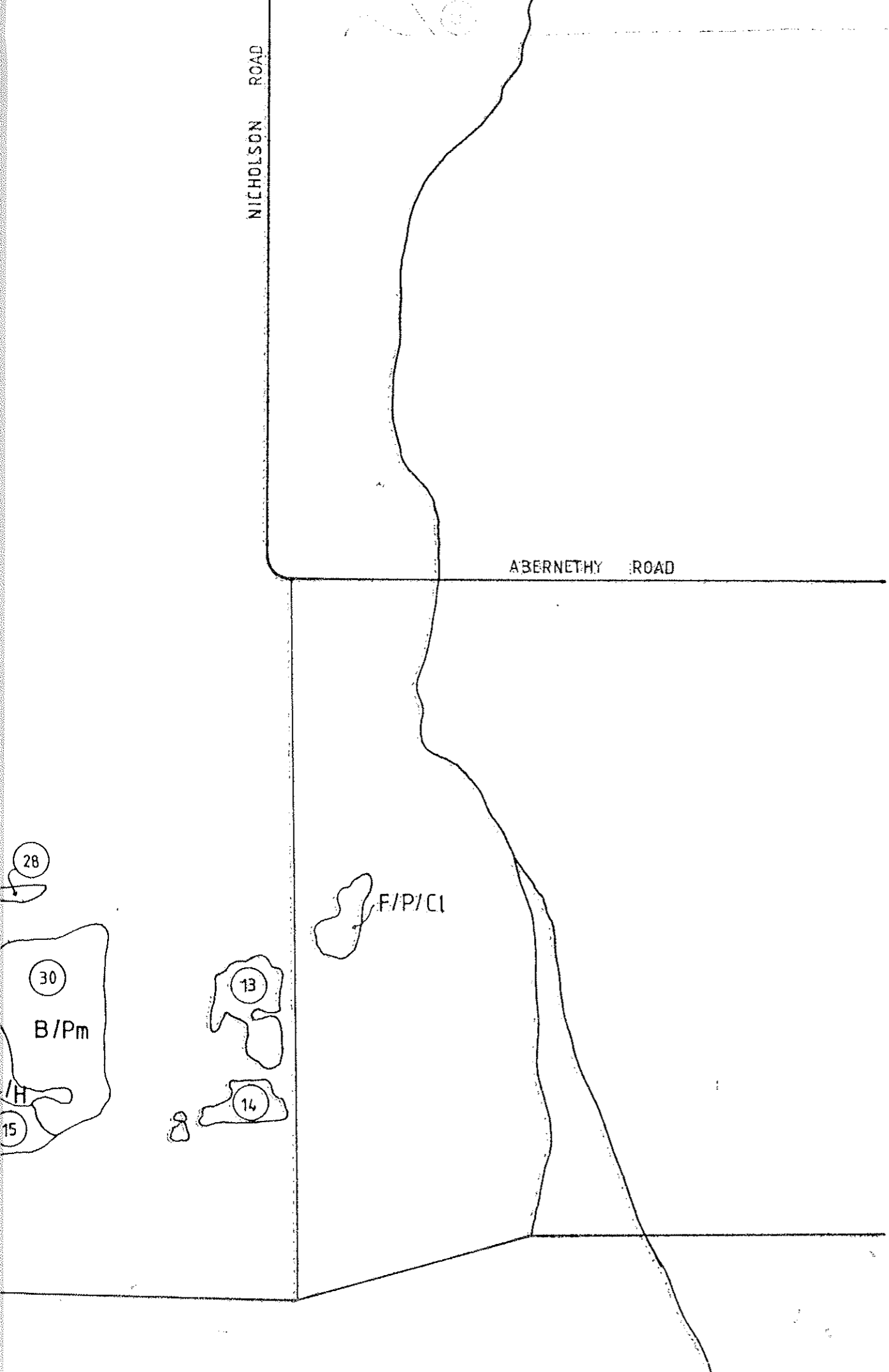


H

B BANKSIA WOODLANDS
 Bp BANKSIA (ON HIGHER PLAINS)
 Bl BANKSIA (LOW LYING)
 Cl CLEARED
 F FLOODED SUN OPEN FOREST
 H MIXED HEATH
 M MARRI
 Pm MOONAH PAPERBARK
 P PAPERBARK
 T TERNATE SWAMP THICKETS
 TH KUNzea TALL THICKETS
 LA MOSAIC OR MIXTURE OF ELEMENTS
 I MINOR ELEMENTS OR MIXTURE



100 No
 100 No

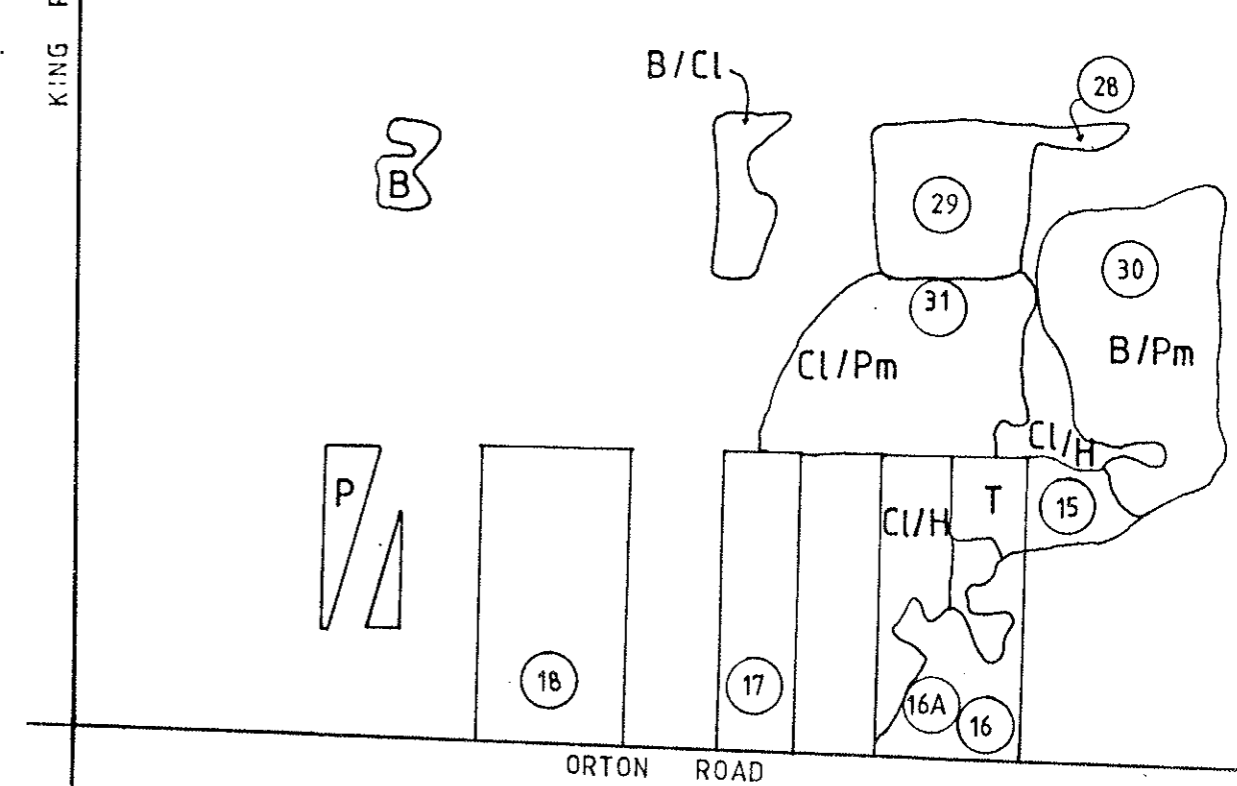
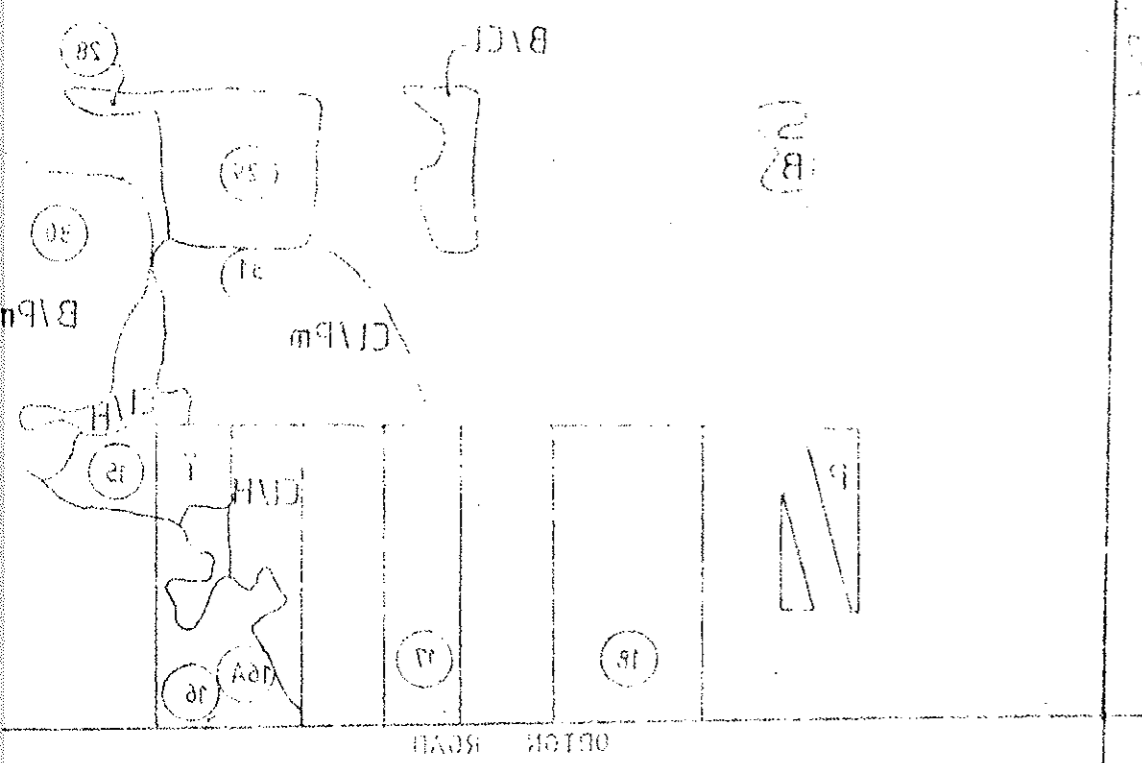
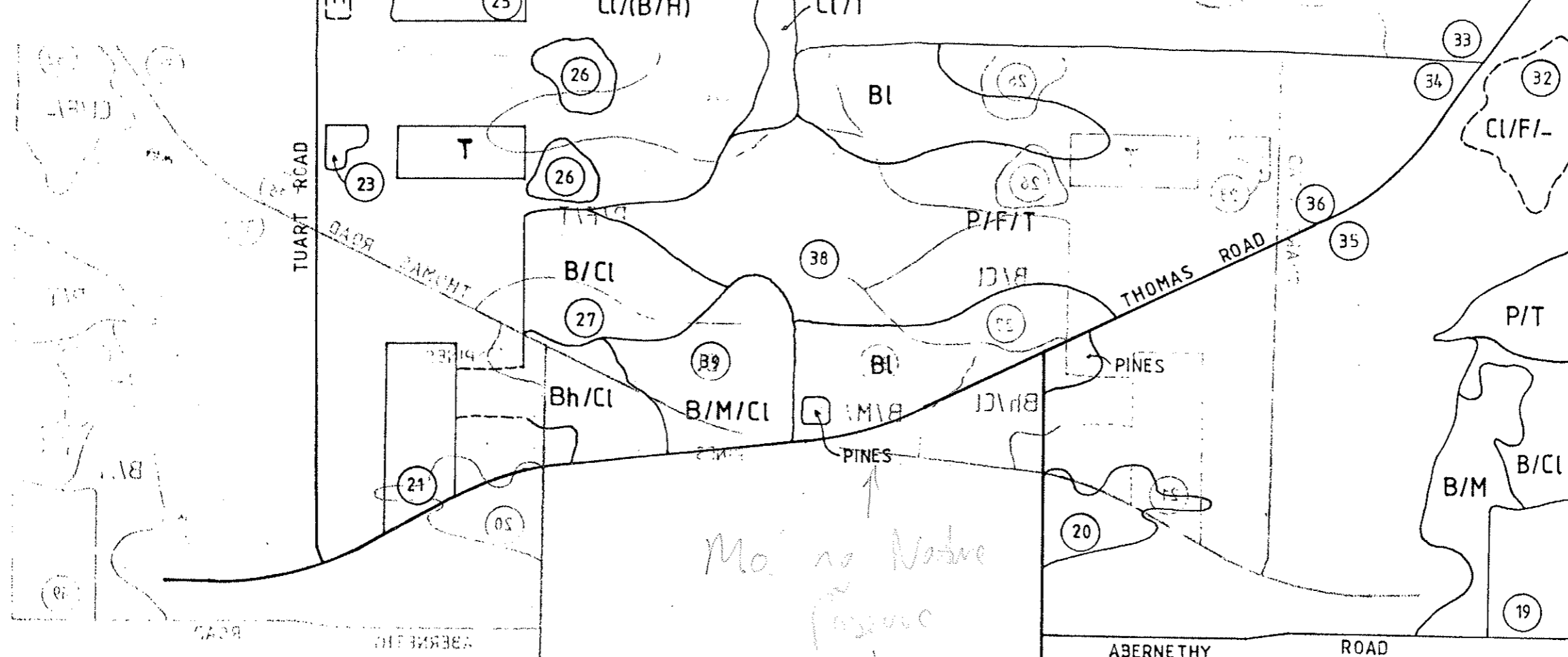


- ① SURVEY SITE
- VEGETATION UNIT BOUNDARY
- B: VEGETATION UNIT

VEGETATION AND SURVEY SITES IN OAKFORD PROJECT AREA
 (SEE TEXT FOR DETAILS AND EXPLANATION)

1:10,000

FIGURE 1



BS 348 BOCSS S

PROPOSED JANDAKOT BOTANICAL PARK
AN ASSESSMENT OF THE CONSERVATION
VALUES OF VEGETATION FLORA AND
WETLANDS BETWEEN JANDAKOT AND WELLARD

February 1990

BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

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smaller more colourful flowers. Grows in winter wet depressions.

Diuris purdei. Found in densely vegetated winter wet depressions on the Coastal Plain. Flowers from September to October after fires.

Drakea elastica (syn. Drakea jeanensis). Found in sandy soils near swamps, often in Banksia woodland on the Coastal Plain from Perth south to Capel but also recorded from the Murchison River. Flowers from September to October.

Drakea micrantha (M.S.). An undescribed species. Grows in open sandy patches on the sandy rises near swamps in Allocasuarina woodland. In the study area it is at the northern limit of its range. Flowers from September to October.

Drosera occidentalis. Found in damp soils on the margins of swamps and in winter wet depressions (in peaty sand). Flowering occurs from November to December. Lowrie (1989) considers it to be "rather common and easy to locate, given knowledge of its growth cycle and habitat."

3.4.2 Priority Three Species Currently Known for the Study Area

Restio stenostachyus. Found in winter wet depressions and along watercourses. Although Marchant et al (1987) suggest this species could be endemic to the Perth region it is also known from the northern forest region.

Cartonema philydroides. A poorly known and poorly collected species occurring on the Coastal Plain from Guildford south to Capel with an occurrence at Kalbari (probably a separate species). This species may more common than was previously thought (G. J. Kieghery pers. comm.).

Thysanotus arbuscula. One of the fringe lilies, found in Banksia low forest, Jarrah-Marri forest and sandplain low scrub. Grows from 160 km north of Perth to c. 260 km south-east of Perth. Flowers from September to January.

Phlebocarya filifolia. Found in Banksia woodland on sandy soils from south Eneabba to south of Busselton (G. J. Kieghry pers. comm.). A poorly collected species now recognised to be more common than previously thought (Jandakot was previously thought to be the most southerly location for this species).

Jacksonia sericea. Apparently endemic to the Perth Region, found on calcareous and sandy soils of the Coastal Plain from Perth to Pinjarra. Flowers from December to February.

Gonocarpos pithyoides. Found in sandy soils on the Coastal Plain, extending north to Gingin in Banksia woodland. It appears to be poorly collected rather than uncommon.

3.4.3 Priority Two Species Currently Known for the Study Area

Lysinema elegans. This species has been collected from the Jandakot area in the past but has not been recollected there despite some searches. A population was recently found in the Moore River National Park (Griffin and B. Kieghery 1989) and may be the only extant population.

3.4.4 Priority Five Species Currently Known for the Study Area

Dodonaea hacketiana. This taxon is endemic to the Perth region (Marchant et al. 1987), growing from Perth to south of Jandakot.

3.4.5 Other Significant Flora

Evandra pauciflora. This species occurs sporadically (in suitable wetland habitat) from the Perth area south to Albany. Probably should be on the reserve list but uncommon but probably not rare.

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MAP ONE: Significant Remnants of Native Vegetation

Sheet two : Southern Section of Study Area

KEY TO VEGETATION UNITS

Bassendean Complex-Central and Southern

Bd: Low woodland to low open forest of Banksia attenuata-Banksia menziesii with occasional Banksia ilicifolia, Allocasuarina fraseriana, Eucalyptus marginata and Nuytsia floribunda.

Bl: Low open forest of Banksia menziesii-Banksia ilicifolia-Eucalyptus marginata with occasional Banksia attenuata.

Bw: Low open woodland to closed heath dominated by species of Myrtaceae. The tree species are predominantly Melaleuca preissiana or Banksia ilicifolia. The understorey include Hypocalymma angustifolium, Pericalymma ellipticum and Astartea fascicularis.

Sw: Woodland of Melaleuca preissiana-Melaleuca raphiophylla with occasional Eucalyptus rudis and Banksia ilicifolia. With sedgelands of Baumea and Leptocarpus species and closed heaths dominated by Myrtaceae species.

L: Woodlands of Melaleuca raphiophylla-Eucalyptus rudis with the occasional Melaleuca preissiana and Banksia littoralis. The woodlands are interspersed with sedgelands of Baumea, Leptocarpus and Typha and areas of open water.

Karrakatta Complex-Central and South

K: Woodlands of Eucalyptus gomphocephala-Eucalyptus calophylla-Eucalyptus marginata with admixtures of Banksia attenuata-Banksia menziesii and Allocasuarina fraseriana.

KEY TO CONDITION RATING

E = Excellent

VG = Very Good

G = Good

P = Poor.

VP = Very Poor

C = Cleared

(See text for definitions)

SCALE: Approx. 1: 20,000

SOIL: Sp = Spearwood Sand; Gu = Guildford Formation

(All other areas Bassendean Sands)

MAP ONE: Significant Remnants of Native Vegetation

Sheet one : Northern Section of Study Area

KEY TO VEGETATION UNITS

Bassendean Complex-Central and Southern

Bd: Low woodland to low open forest of Banksia attenuata-Banksia menziesii with occasional Banksia ilicifolia, Allocasuarina fraseriana, Eucalyptus marginata and Nuytsia floribunda.

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SPECTACLES

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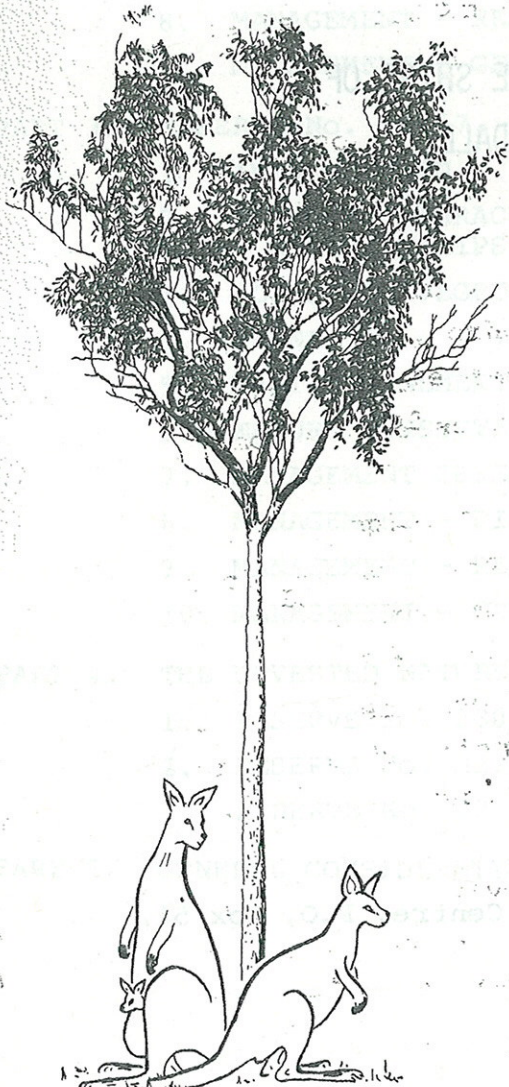
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