ANSTEY/KEANE DAMPLAND AND ADJACENT BUSHLAND, FORRESTDALE

Boundary Definition: protected area/bushland (part taken to cadastre) (Areas of bushland within the boundaries of the Site are not accurately mapped. The boundary has been drawn to include any unmapped 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. 342
Area (ha): bushland 311.6 (Proposed boundary circumscribes 296.4ha bushland.)
Map no. 60 **Map sheet series ref. no.** 2033–I NE, 2033–I SE
Other Names: Hale Rd Bushland, Part Submission Areas 13 and 246 combined, part of Jandakot Regional Park
Local Authorities (Suburb): City of Armadale (Forrestdale)

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS
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, Sp2)

VEGETATION AND FLORA
Vegetation Complexes
Combinations of Bassendean Dunes/Pinjarra Plain
Southern River Complex
Floristic Community Types: *not sampled, types inferred
Supergroup 2: Seasonal Wetlands
*4 *Melaleuca preissiana* damplands
*5 Mixed shrub damplands
*8 Herb-rich shrublands in clay pans
*10a Shrublands on dry clay flats
*S2 Northern *Pericalymma ellipticum* dense low shrublands
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: sumpland, dampland, artificial channel
Natural Wetland Groups
Bassendean—Pinjarra transition OR Bassendean with fluvial features
Bennett Brook (B/P.4)
Wetland Management Objectives: Conservation (203.5ha), Resource Enhancement
Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES
Not assessed, Not determined, Endangered (floristic community type 10a), Vulnerable (floristic community type 8)

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: vegetated wetland, vegetated uplands

Vegetation and Flora: limited survey (Trudgen 1990); detailed survey (part Site — Keighery, BJ, and Clarke 2000b, Keighery, GJ, 1992a, Weston 1989a & 1990)
Structural Units: mapping (part Site — Keighery, BJ, and Clarke 2000b, Weston 1989a & 1990); general mapping (Trudgen 1990)
Uplands: *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland to Low Open Forest, with scattered *Eucalyptus marginata, E. todtiana* and *Nuytsia floribunda*; *Banksia attenuata* Low Woodland; *Banksia ilicifolia* Low Open Forest to Woodland
Wetlands: *Banksia attenuata* and *Melaleuca preissiana* Low Woodland; *Melaleuca preissiana* Low woodland; *Kunzea glabrescens* Tall Open Scrub; Tall Closed Scrub to Tall Open Scrub dominated by *Melaleuca rhaphiophylla*; *M. viminea* and *M. uncinata* or combinations of these; Closed Heath to Open Heath dominated by *Melaleuca rhaphiophylla*; *Melaleuca teretifolia, M. viminea, M. incana, M. uncinata, M. lateriflora* and

M. lateritia or combinations of these; *Actinostrobus pyramidalis* Closed Tall Scrub to Tall Open Shrubland; *Regelia ciliata* Closed to Open Heath; *Verticordia densiflora* Closed to Open Heath; *Pericalymma ellipticum* Closed to Open Heath; mixed Heath; *Evandra pauciflora* Sedgeland; mixed Herbland; Many of the wetland communities are typical of the Pinjarra Plain and occur together in the area as a mosaic.
Vegetation Condition: >75% Excellent to Pristine, <25% Very Good to Good, with areas of severe localised disturbance (Trudgen 1990)
Total Flora: 381 native taxa (Keighery, GJ, 1992a) (estimated >70% expected flora)
Significant Flora: *Diuris purdiei* (R) (Weston 1989a); *Jacksonia sericea* (3), *Tripterococcus paniculatus* ms (1), *Stylidium mimeticum* (3), *Stylidium longitubum* (3) (Keighery, GJ, 1992a), *Villarsia submersa* (4), *Verticordia lindleyi* subsp. *lindleyi* (4), *Drosera occidentalis* (4) (Keighery, GJ, 1992a); *Banksia telmatiaea*, *Dielsia stenostachya*, *Beaufortia squarrosa*, *Stylidium utricularioides*, *Pityrodia uncinata* (most southern population, Keighery, GJ, 1992a), *Dysphania glomulifera* subsp. *glomulifera* (one of two populations on the Swan Coastal Plain, Keighery, GJ, 1992a), *Evandra pauciflora*, *Myriocephalus helichrysoides* (Weston 1990), *M. isoetes*, *Blancoa canescens* (Weston 1990)

Fauna: Significant mammal species: Quenda (Friend 1996 D)
Linkage: adjacent bushland to the north (Site 413, across road) and west; part of Greenway 126 (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); 'wetland of special note' (Payne 1993a); majority Site Category One Area, Middle Canning Catchment Study (Evangelisti & Associates *et al.* 1995); one of the most plant species diverse areas on the Swan Coastal Plain in the PMR, currently considered second to Site 387; contains plant communities representative of the eastern side of the Swan Coastal Plain

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Criteria: Representation of ecological communities, Diversity, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal
Recommendation: Part A: Site with Some Existing Protection; the care, control and management of this portion of this Site for conservation purposes within Jandakot Regional Park is endorsed. Part B: Urban Negotiated Planning Solution. Part C: Proposed Parks and Recreation Reservation (see Table 3, Volume 1).

ANSTEY/KEANE DAMPLAND AND ADJACENT BUSHLAND, FORRESTDALE

Boundary Definition: protected area/bushland/conservation wetland boundary (Areas of bushland within the boundaries of the Bushplan Site are not accurately mapped. The boundary has been drawn to include any unmapped bushland.)

SECTION 1: CADASTRAL INFORMATION

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

Bushplan Site no. 342 **Map no.** 69, 75, 76 **Map sheet series ref. no.** 2033–I NE, 2033–I SE

Other Names
Hale Rd Bushland, Part Submission Areas 13 and 246 combined

Area (ha): total 368.1; bushland 311.6

Local Authorities (Suburb)
City of Armadale (Forrestdale)

Zoning
MRS: Rural, Parks and Recreation, Industrial
TPS: General Industry, General Rural, Public Purposes, Landscape

Ownership Categories
Private (including commercial organisation), State Government, Local Government

Lot/Location/Reserve numbers (Purpose), Street name
1, 68, 70, 12, 100, 102 Anstey Rd; 63, 66 101 Keane Rd; 2 Forest Rd; 65, 67, 69 Hale Rd; 70 Ranford Rd; 20 Armadale Rd
Crown Reserve

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

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, Sp2)

VEGETATION AND FLORA

Vegetation Complexes

Combinations of Bassendean Dunes/Pinjarra Plain
Southern River Complex

Floristic Community Types: *not sampled, types inferred

Supergroup 2: Seasonal Wetlands
*4 *Melaleuca preissiana* damplands
*5 Mixed shrub damplands
*8 Herb-rich shrublands in clay pans
*10a Shrublands on dry clay flats
* S2 Northern *Pericalymma ellipticum* dense low shrublands

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: sumpland, dampland, artificial channel

Natural Wetland Groups

Bassendean—Pinjarra transition OR Bassendean with fluvial features
Bennett Brook (B/P.4)

Wetland Management Objectives: Conservation (235ha), Resource Enhancement

Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Not determined, Endangered (floristic community type 10a), Vulnerable (floristic community type 8)

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: vegetated wetland, vegetated uplands

Vegetation and Flora: detailed survey (part Bushplan Site — Keighery, GJ, 1992a, Weston 1989a and 1990); limited survey (Trudgen 1990)

Structural Units: mapping (Weston 1989a and 1990); general mapping (Trudgen 1990)
Uplands: *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland to Low Open Forest, with scattered *Eucalyptus marginata, E. todtiana* and *Nuytsia floribunda*
Wetlands: *Melaleuca preissiana* Low woodland; *Kunzea ericifolia* Tall Open Scrub; *Melaleuca rhaphiophylla* and *M. viminea* Tall Open Scrub; *Melaleuca teretifolia, M. viminea, M. incana, M. uncinata, M. lateriflora* and

M. lateritia Open Heath; *Actinostrobus pyramidalis* Tall Open Shrubland; *Regelia ciliata* Closed to Open Heath; *Pericalymma ellipticum* Closed to Open Heath; mixed Heath; *Evandra pauciflora* Sedgeland; mixed Herbland; (Many of the wetland communities are typical of the Pinjarra Plain and occur together in the area as a mosaic.)

Vegetation Condition: >75% Excellent to Pristine, <25% Very Good to Good, with areas of severe localised disturbance (Trudgen 1990)

Total Flora: 381 native taxa (Keighery, GJ, 1992a) (estimated >70% expected flora)

Significant Flora: *Diuris purdiei* (R) (Weston 1989a), *Jacksonia sericea* (3), *Tripterococcus paniculatus* ms (1), *Stylidium mimeticum* (3), *Stylidium longitubum* (3) (Keighery, GJ, 1992a), *Villarsia submersa* (4), *Verticordia lindleyi* subsp. *lindleyi* (4), *Drosera occidentalis* (4) (Keighery, GJ, 1992a); *Banksia telmatiaea, Restio stenostachyus, Beaufortia squarrosa, Stylidium utricularioides, Pityrodia uncinata* (southernmost population, Keighery, GJ, 1992a), *Dysphania glomulifera* subsp. *glomulifera* (one of two populations on the Swan Coastal Plain, Keighery, GJ, 1992a), *Evandra pauciflora, Myriocephalus helichrysoides* (Weston 1990), *M. isoetes, Blancoa canescens* (Weston 1990)

Fauna: no systematic survey. Significant mammal species: Quenda (Friend 1996 D)

Linkage: adjacent bushland to the north (BS413 across road), east and west; part of proposed Greenway 142 (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); 'wetland of special note' (Payne 1993a); majority Bushplan Site Category One Area Middle Canning Catchment Study (Evangelisti & Associates *et al.* 1995); one of the most plant species diverse areas on the Swan Coastal Plain in the PMR, currently considered second to BS387); contains plant communities representative of the eastern side of the Swan Coastal Plain

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

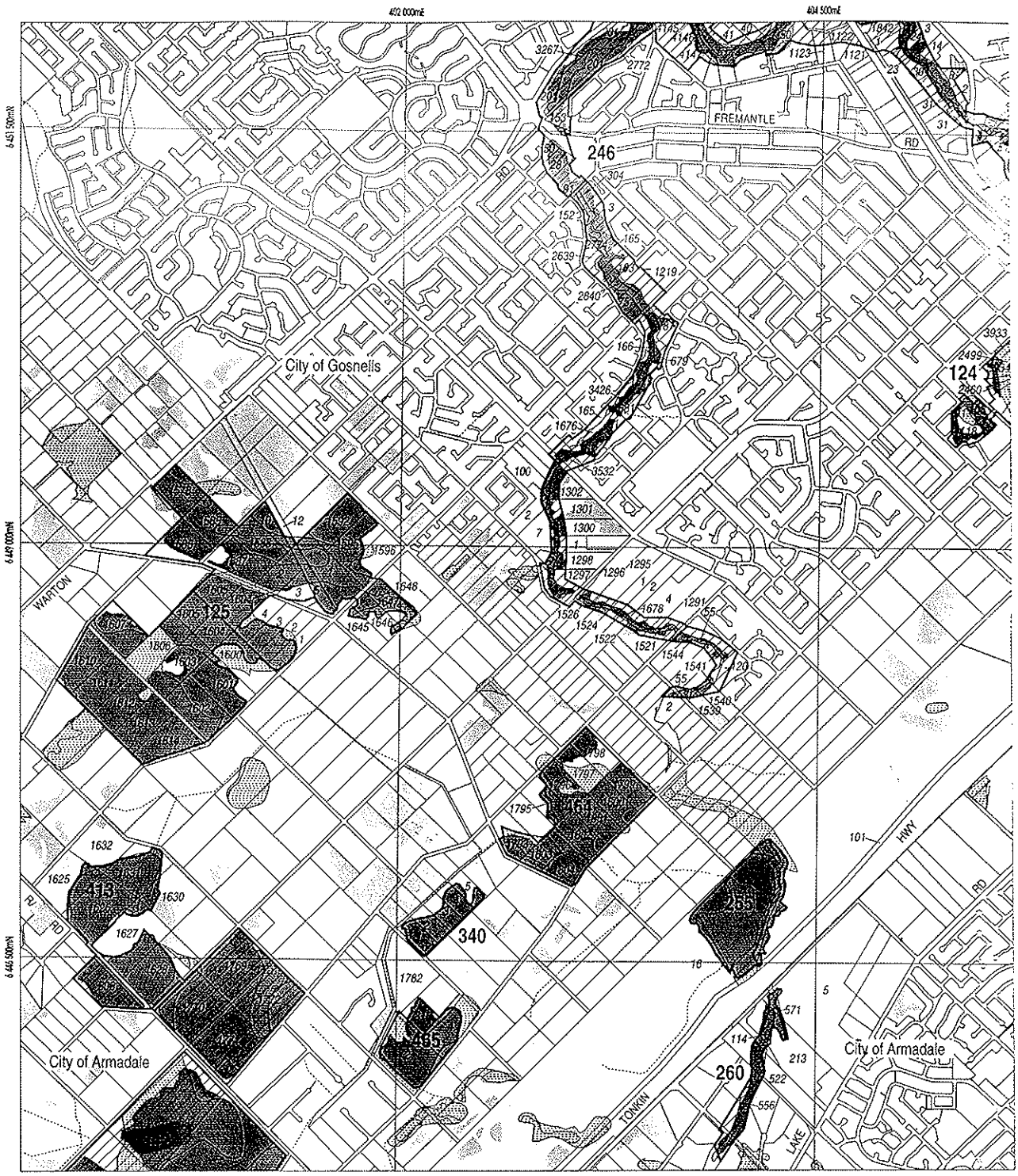
Criteria: Representation of ecological communities, Diversity, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal

Opportunities and/or Constraints

Opportunities: Bushplan Site/part Bushplan Site subject to Swan and Canning Rivers EPP; location of Declared Rare Flora, conservation category wetlands; under MRS Parks and Recreation Reservation and TPS Landscape Zoning, Crown Reserve

Constraints: private land; under MRS Industrial Zoning

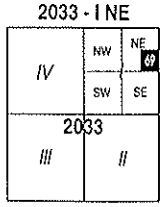
Recommendation: The care, control and management of parts of this Bushplan Site for conservation purposes within Jandakot Regional Park is endorsed. The most appropriate mechanism for the protection of the remainder of this Bushplan Site be considered through the public comment period in consultation with the land owner(s).



LEGEND

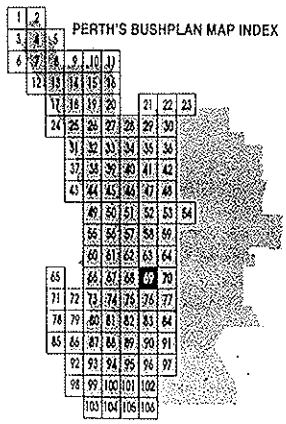
- 472 — Bushplan Sites With Regionally Significant Bushland
- Other Native Vegetation
- Conservation Category Wetlands
- Bushplan Sites With Some Existing Protection
- 696 — Lot Number, Location Number
- Channel Wetlands
- Local Government Boundary

2033 - I NE



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

PERTH'S BUSHPLAN MAP INDEX



N

SCALE

0 500 1000

Metres

Produced by Project Mapping Section
Land Information Branch, Ministry for Planning, Perth W.A. November 1998

ntw-map18//environ/bushplan//bushv2_69.ogn

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

MAP 2 - BS342 Lots 65-70 Vegetation Associations

(Boundaries of Uplands and Wetlands shown on overlay)

1:7,500

Lot 65

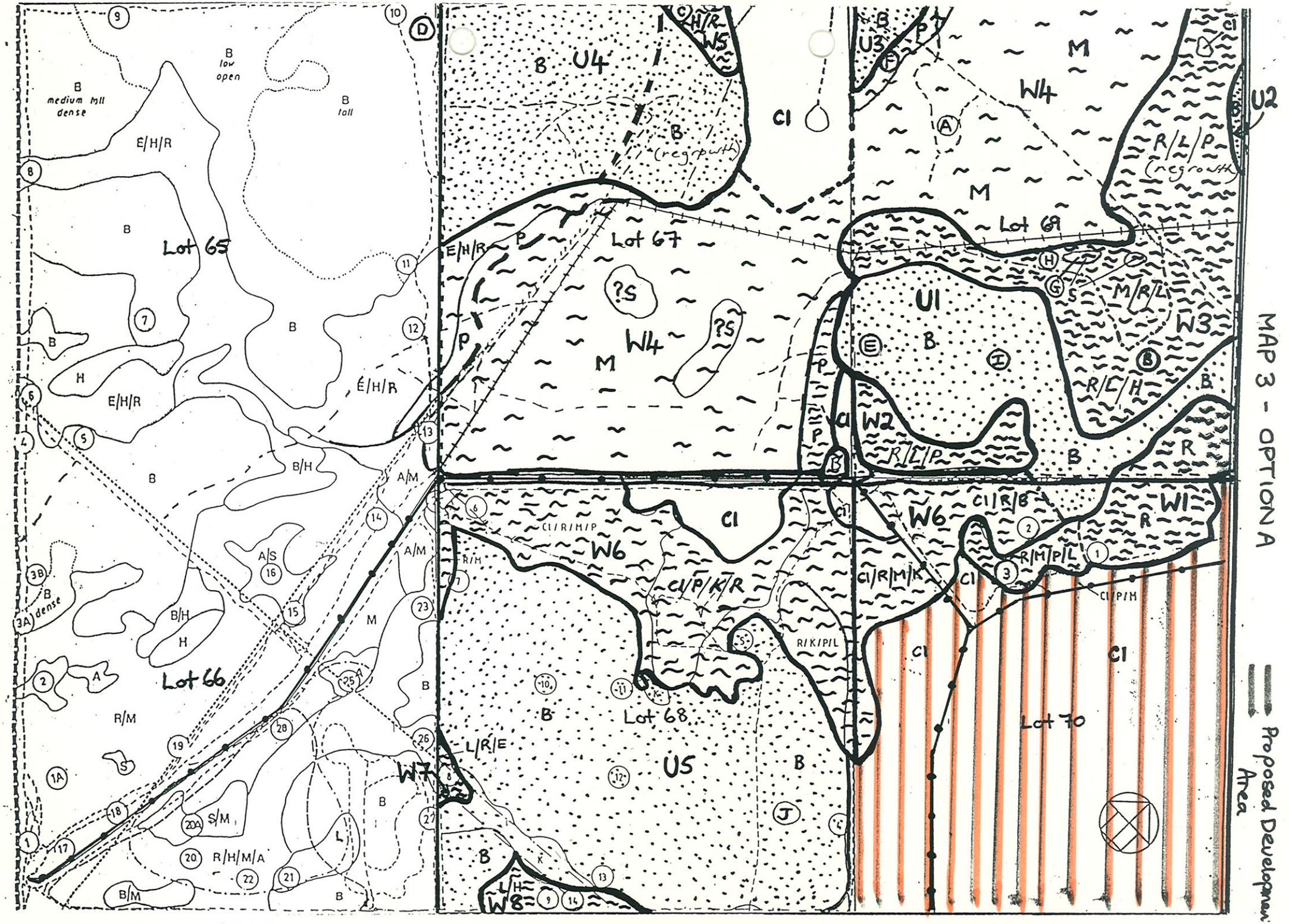
Lot 66

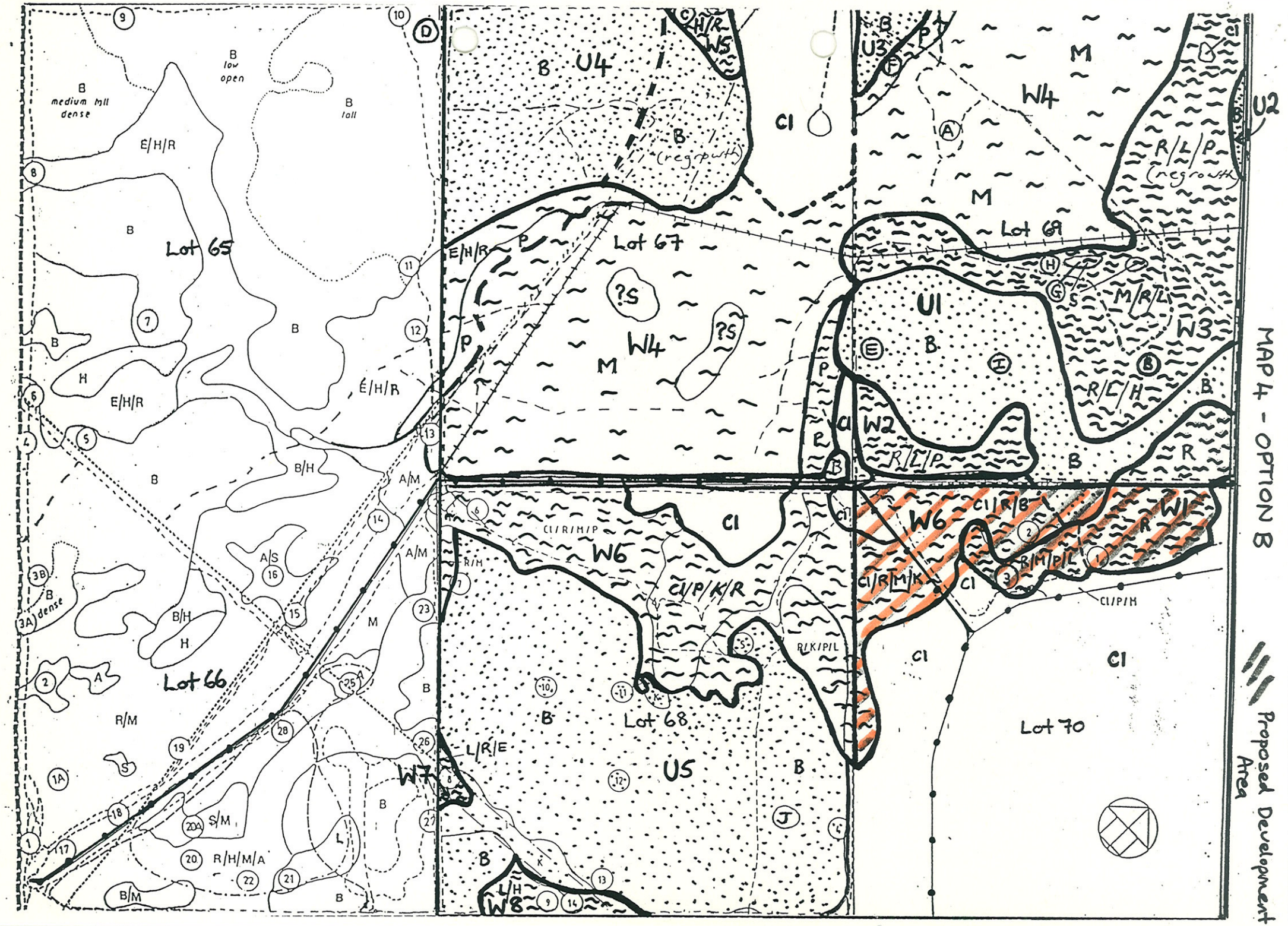
Lot 67

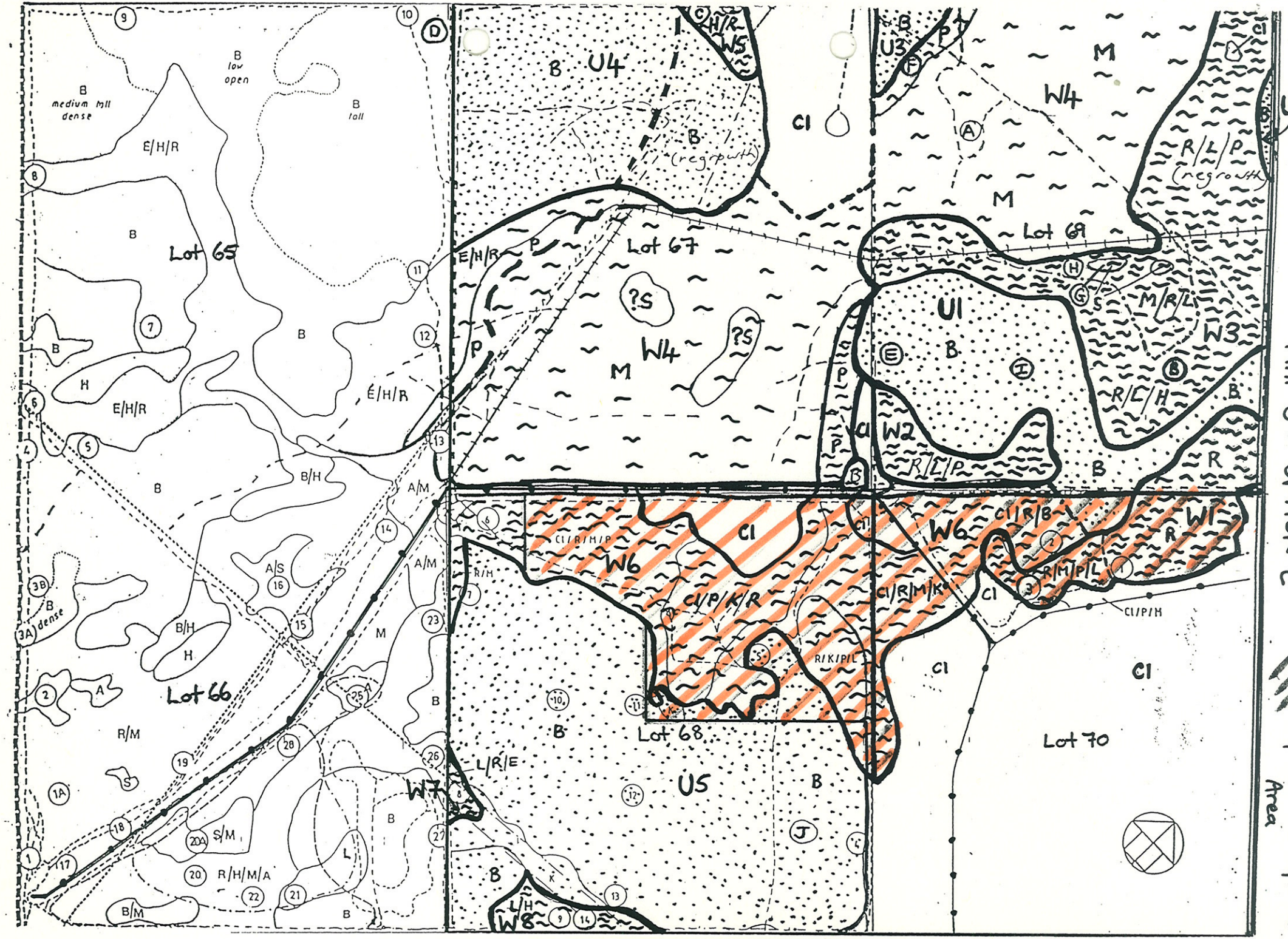
Lot 68

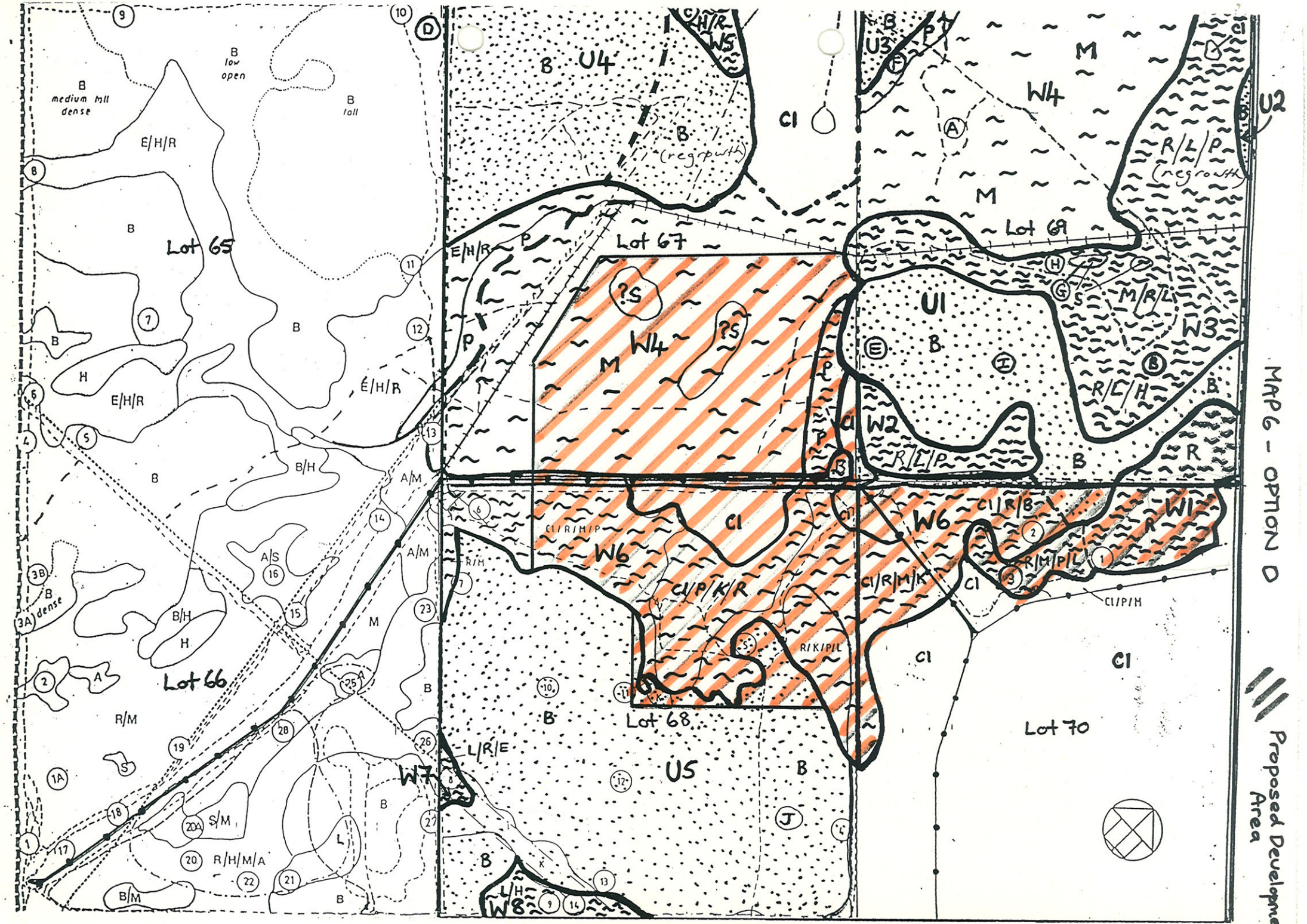
Lot 69

Lot 70


MAP 3 - OPTION A
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium mll dense
B low open
B tall
E/H/R
B/H
A/M
A/S
R/M
R/H/M/A
S/M
B/M
L/R/E
L/H
W1
W2
W3
W4
W5
W6
W7
W8
U1
U3
U4
U5
C1
C1/R/M/P
C1/P/K/R
R/K/P/L
C1/R/M/K
C1/R/B
R/M/P/L
C1/P/M
R/L/P (regrowth)
M/R/L
R/C/H
?S


MAP 4 - OPTION B
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium mll dense
B low open
B tall
E/H/R
B/H
A/M
A/S
R/M
S/M
R/H/M/A
B/M
L/H
L/R/E
R/H
CI/R/H/P
CI/P/K/R
R/K/P/L
CI/R/M/K
CI/R/B
R/H/P/L
CI/P/H
M/R/L
R/L/P
R/C/H
W1
W2
W3
W4
W5
W6
W7
W8
U1
U2
U3
U4
U5
CI
?S


MAP 5 - OPTION C
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium mll dense
B low open
B tall
E/H/R
B
H
E/H/R
B
B/H
A/M
A/S
B/H
H
B dense
A
R/M
S
S/M
R/H/M/A
B/M
L
B
M
B
L/R/E
W7
B
W8
L/H
B
U4
B
(regrowth)
C1
H/R
W5
W4
M
?S
?S
W4
M
E/H/R
P
P
P
P
C1
B
U3
F
P
M
W4
A
R/L/P
(regrowth)
M
Lot 69
H
G
S
M/R/L
U1
E
B
I
W3
R/C/H
B
W2
R/L/P
B
R
C1/R/M/P
W6
C1
C1/P/K/R
C1
C1/R/M/K
W6
C1/R/B
W1
R
R/M/P/L
C1
C1/P/H
R/K/P/L
C1
C1
U5
B
J
Lot 68
Lot 70
R/H
L
K
32


MAP 6 - OPTION D
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium mll dense
B low open
B tall
E/H/R
B
H
E/H/R
B
B/H
A/M
A/S
B/H
H
B
3A dense
3B
A
R/M
S
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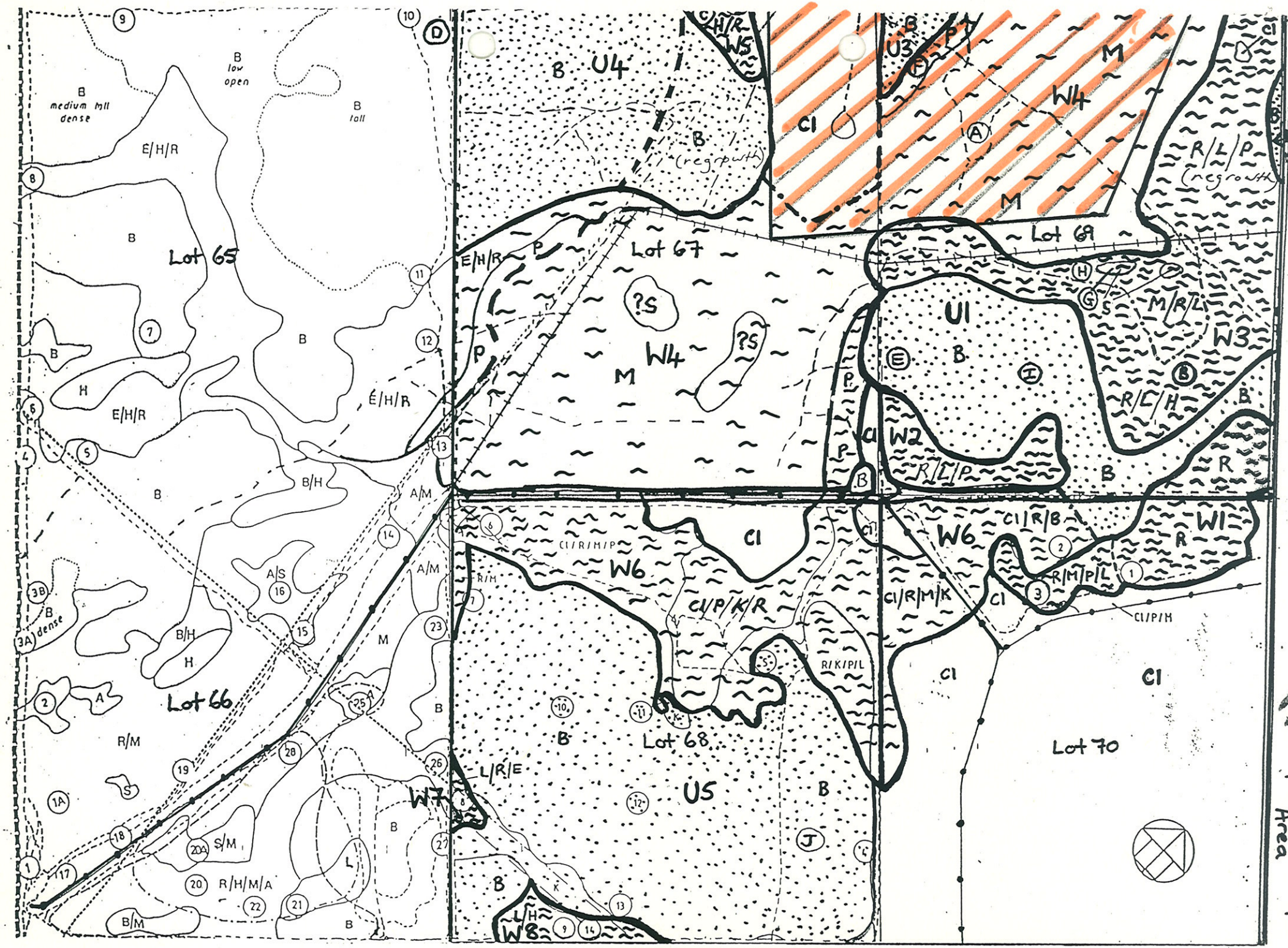
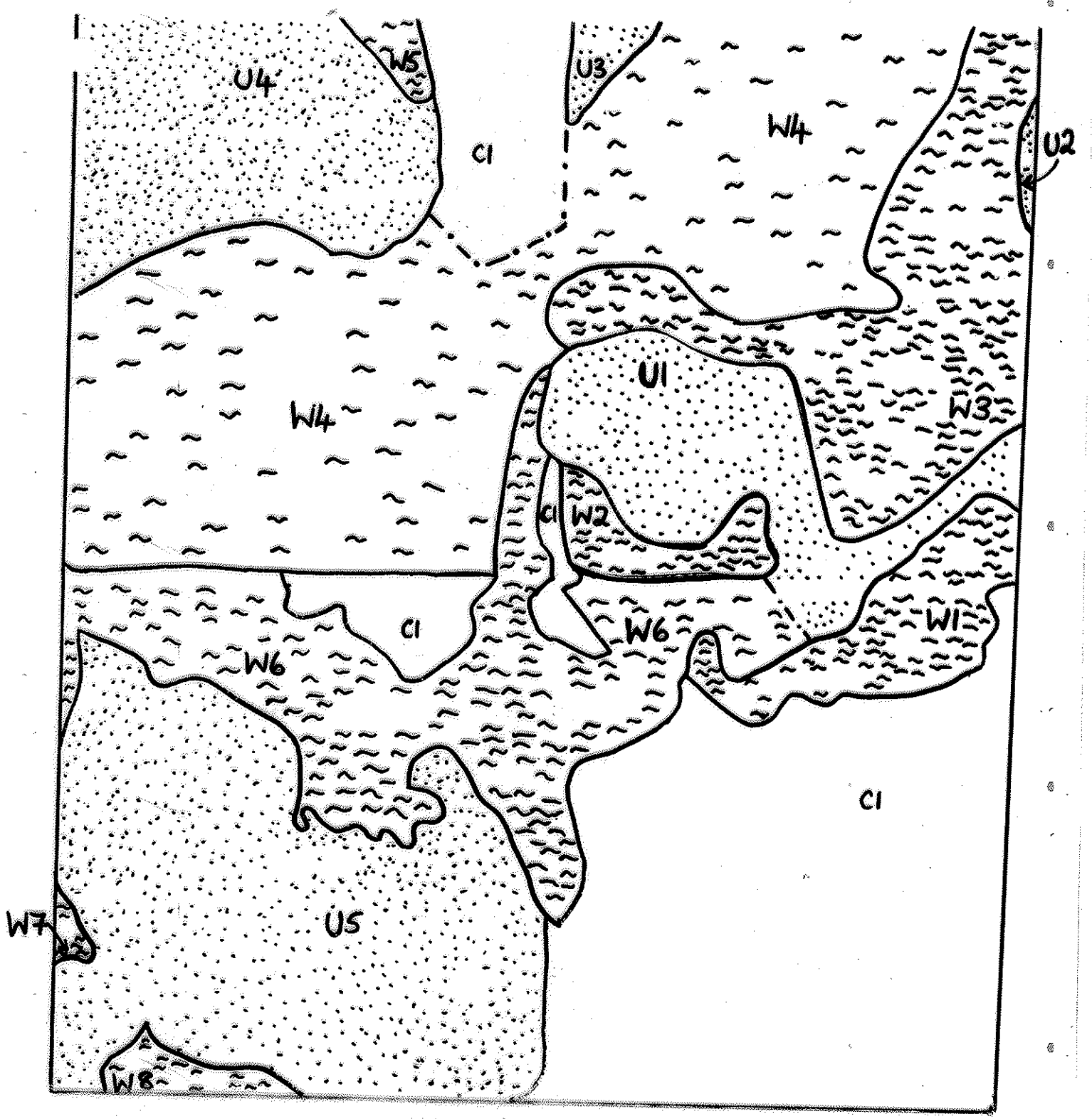
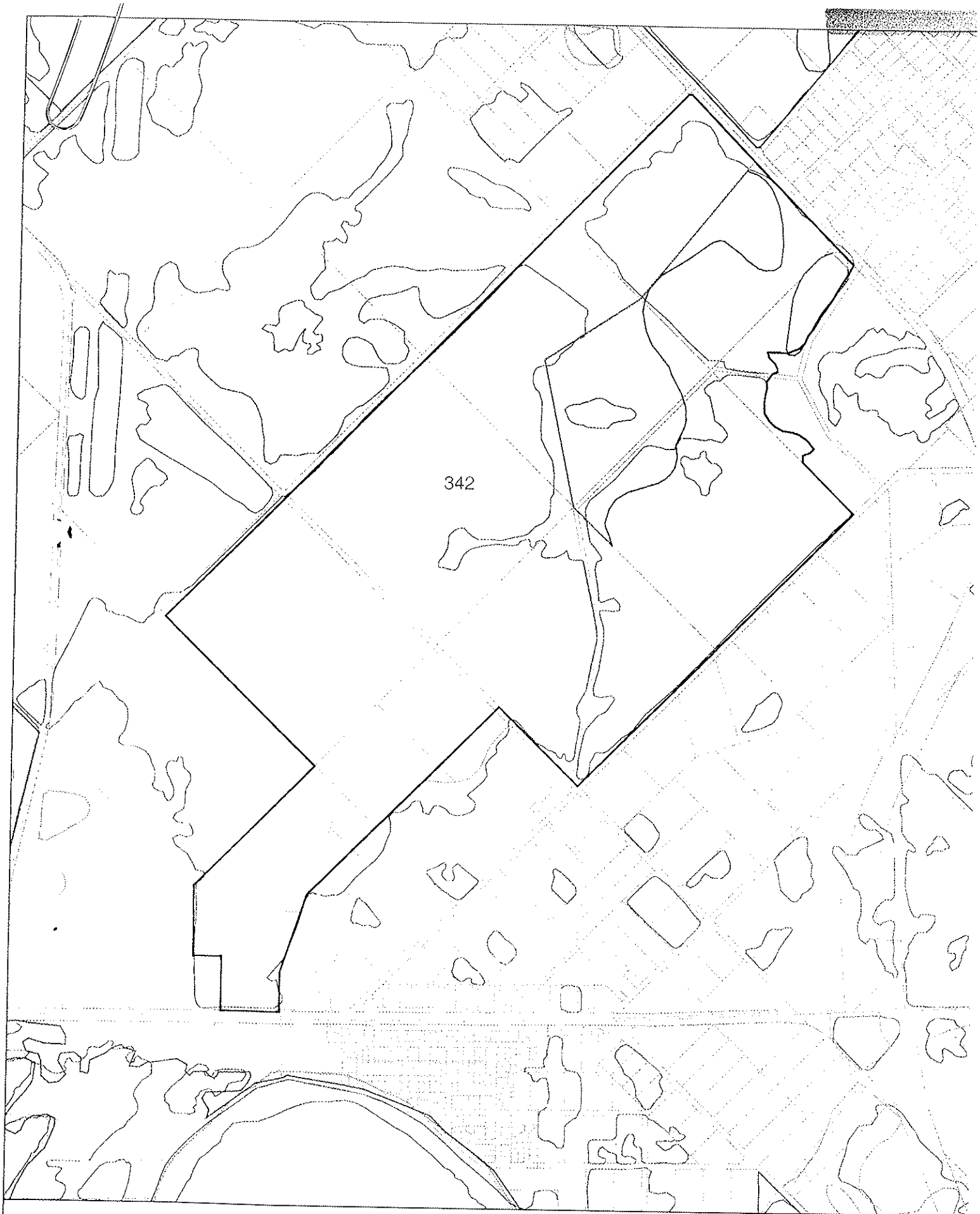
B/M
L
B
M
B
B
B


MAP 7 - OPTION E
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium mll dense
B low open
B tall
B U4
B (regrowth)
C1
H/R W5
B U3
W4
M
R/L/P (regrowth)
E/H/R
P
?S
U1
M/R/L
W3
R/C/H
W2
R/L/P
B/H
A/M
A/S
W6
C1/R/M/P
C1/P/K/R
C1/R/M/K
C1/R/B
W1
R/M/P/L
C1/P/M
R/K/P/L
L/R/E
U5
W7
S/M
R/H/M/A
B/M
W8
L/H
B dense
R/M
H
A
S
L
M
R
B
C1
J
K
E
I
G
H


U4
W5
U3
W4
U2
C1
W4
U1
W3
C1
W2
C1
W6
W1
W6
C1
U5
W7
W8



BUSHPLAN SITES CORRECTED

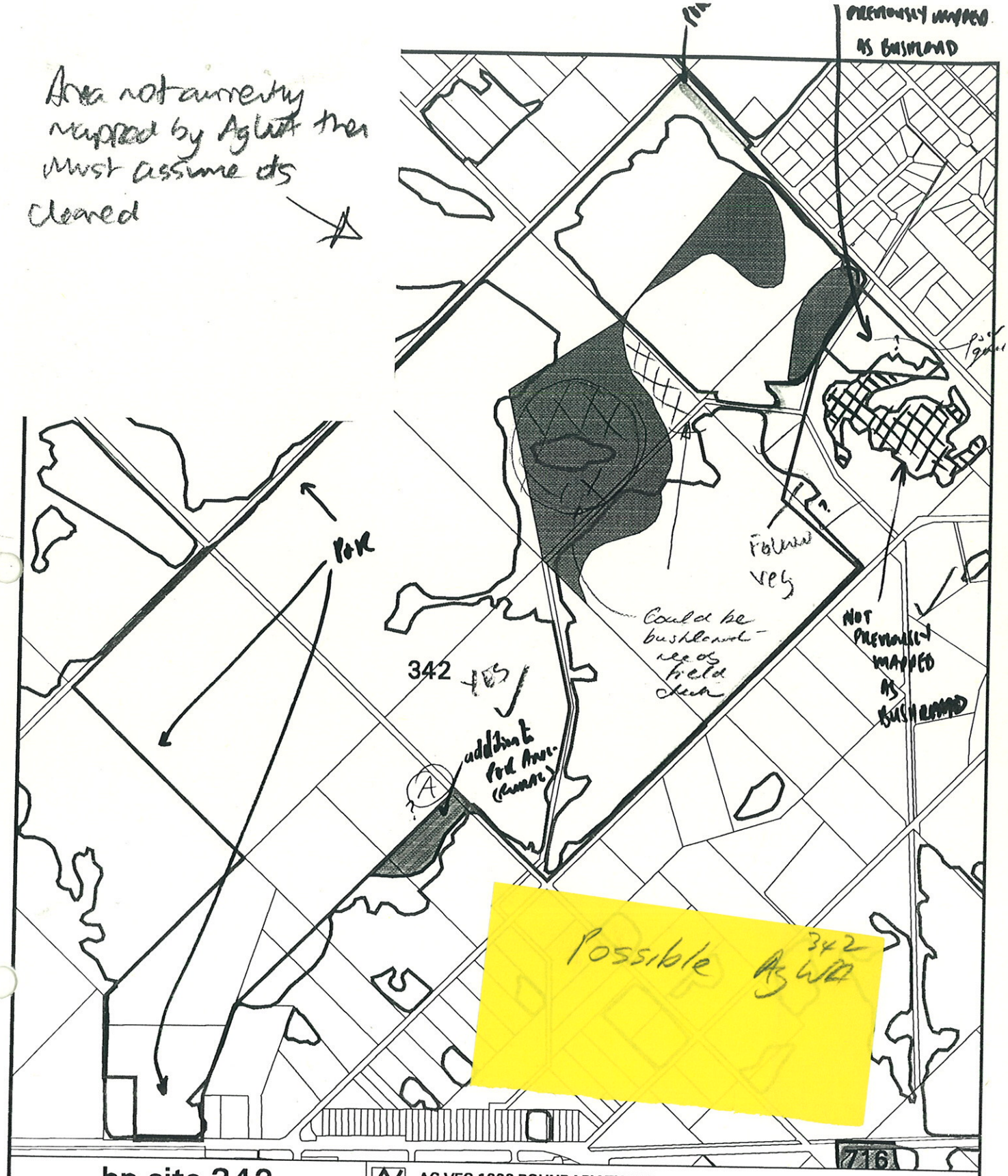
THE GOVERNMENT OF WESTERN AUSTRALIA

WESTERN AUSTRALIAN PLANNING COMMISSION

CUSTOMER FOCUS WESTERN AUSTRALIA

B DK 28/10/97

N



bp site 342

AG VEG 1998 BOUNDARY THEME

Cadastre

Bushplan sites refno 1-500 SCP BOUNDARY THEME

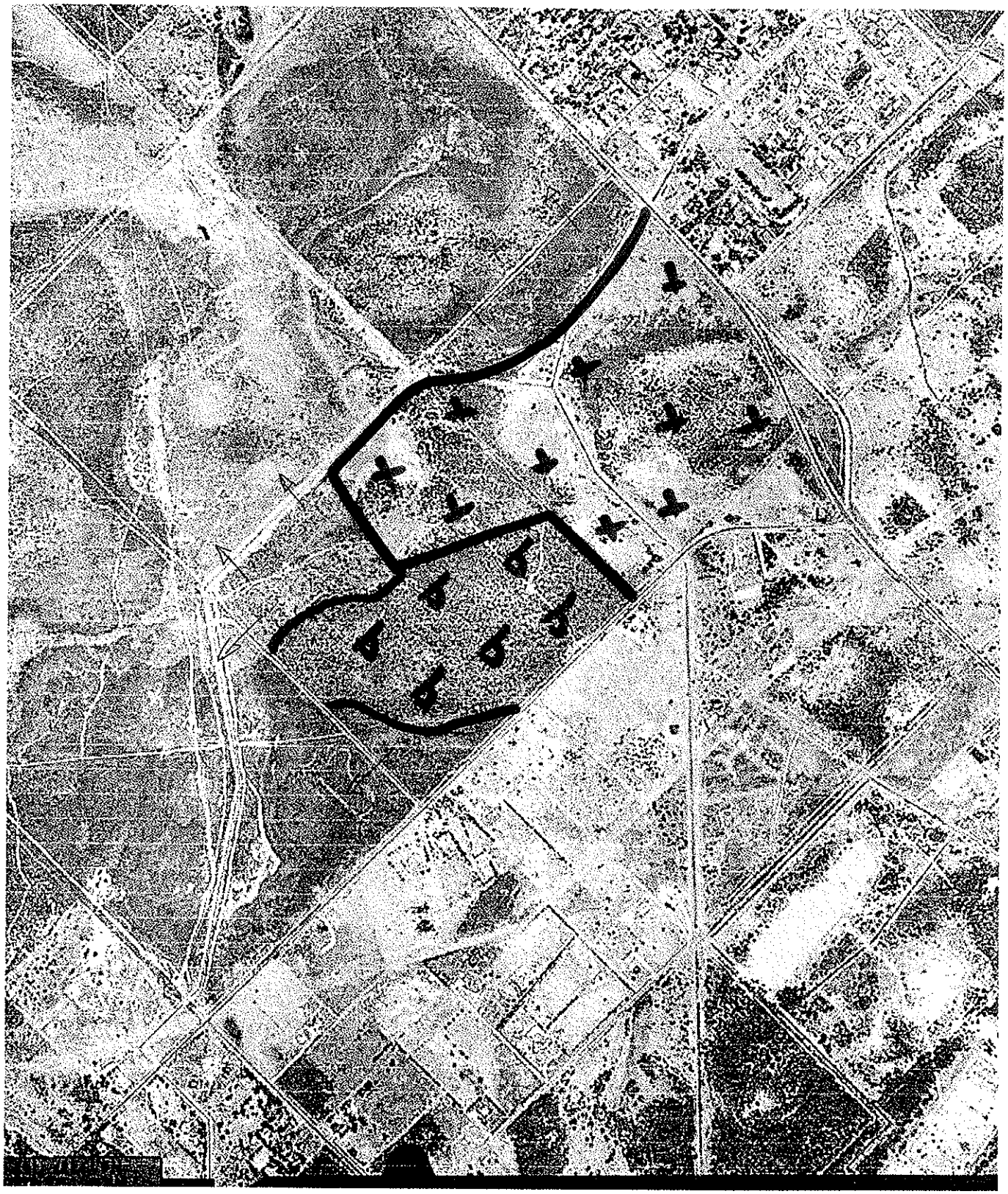
cons category wetlands

Verified CCWs

BK 25/9

(A) Include ccw wetland Ag Veg as some possible problems this area has heavy soils so could be or where yellow on photo

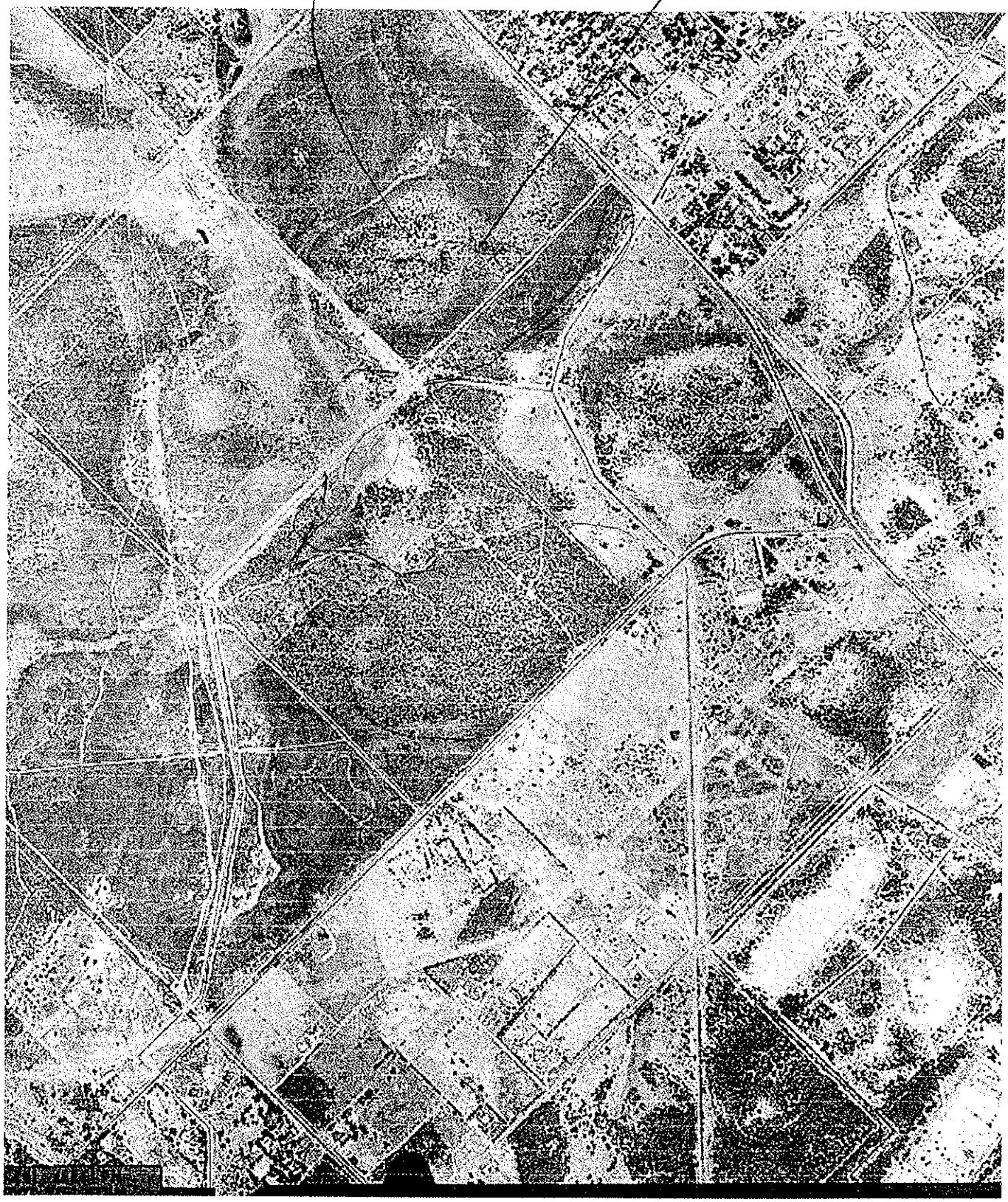
MFP INTERNAL USE ONLY
Prepared By: Andrea Zappacosta
Prepared For:
Map Ident: plot980529_1
Date: 29 May 98
Scale 1:16393



Consolidated area with vegetation in poorer condition

bb Banksia Woodland

Connections to other bushland



BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

KEY TO MAP 2: BS 342 Anstey/Keane Dampland and Adjacent Bushland, Forrestdale - Vegetation Associations (after Weston 1989a and 1990)

- - - - -	Tracks
.....	Transmission Line
-•—•—	Drain
———	Vegetation Association Boundary
+++++	Parks and Recreation Boundary
1 - 27	Vegetation sampling site nos (Weston 1989a and 1990)
A - J	Vegetation sampling site nos (DEP 1999)
	Upland vegetation
	Wetland vegetation (density of shading varies to allow W1 - W8 to be distinguished)
U1 - U5	Upland area nos
W1 - W8	Wetland area nos
Cl	Cleared

UPLAND VEGETATION ASSOCIATIONS

B Banksia Low Open Forest to Low Woodland (subunits not differentiated on map)

- B1 *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland to Low Open Forest, with scattered *Eucalyptus marginata, E. todtiana* and *Nuytsia floribunda*
- B2 *Banksia ilicifolia* Low Open Forest to Low Woodland with patches of adjacent *B. attenuata* and *Allocasuarina fraseriana*
- B3 *Banksia attenuata* Low Woodland
- B4 *Banksia attenuata* and *Melaleuca preissiana* Low Woodland

WETLAND VEGETATION ASSOCIATIONS

A *Actinostrobus pyramidalis* Tall Open Shrubland

E *Evandra pauciflora* Sedgeland

H Mixed Heath

K *Kunzea ericifolia* Tall Closed to Tall Open Scrub

L *Pericalymma ellipticum* Closed to Open Heath

M Tall Closed to Tall Open Scrub dominated by *Melaleuca rhaphiophylla, M. viminea, Melaleuca teretifolia, M. incana, M. uncinata, M. lateriflora* and *M. lateritia* or combinations of these

P *Melaleuca preissiana* Low Woodland to Open Woodland

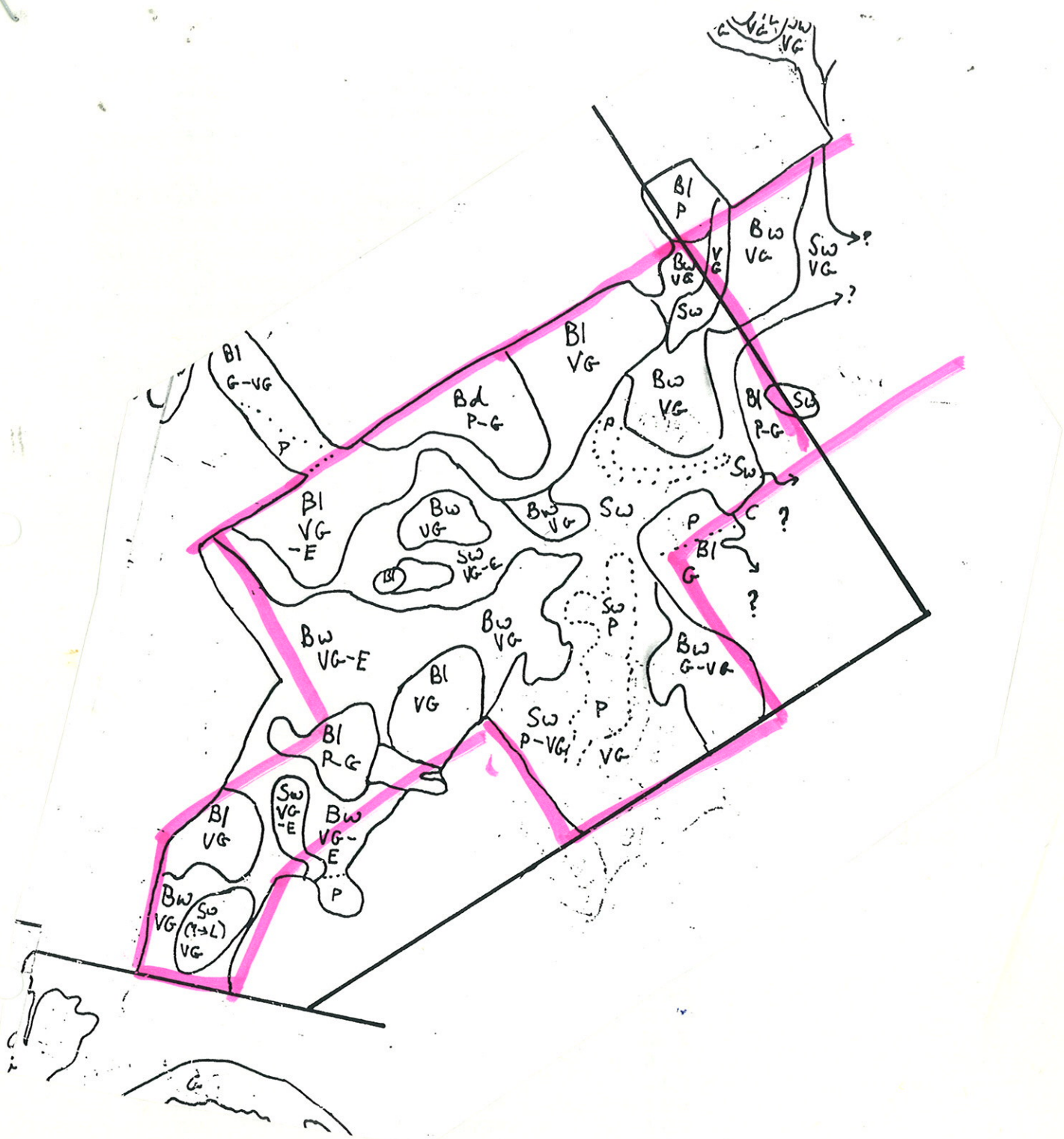
R *Regelia ciliata* Closed to Open Heath

S Seasonal Ponds (patchy *Melaleuca rhaphiophylla* Tall Closed to Tall Open Scrub)

V *Verticordia densiflora* Closed to Open Heath

-/-/- mosaic or mixture of vegetation units

Bowman, Bishaw + Gorham, 1990, Proposed Jandakot Botanic Park



Hale Rd Bushland, part Subm 13 + 246
(Anstey Keane Damplands)

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 occassional Banksia ilicifolia, Allocasuarina fraseriana, Eucalyptus marginata and Nuytsia floribunda.

Bl: Low open forest of Banksia menziesii-Banksia ilicifolia-Eucalyptus marginata with occassional 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 rhaphiophylla with occassional Eucalyptus rudis and Banksia ilicifolia. With sedgelands of Baumea and Leptocarpus species and closed heaths dominated by Myrtaceae species.

L: Woodlands of Melaleuca rhaphiophylla-Eucalyptus rudis with the occassional 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

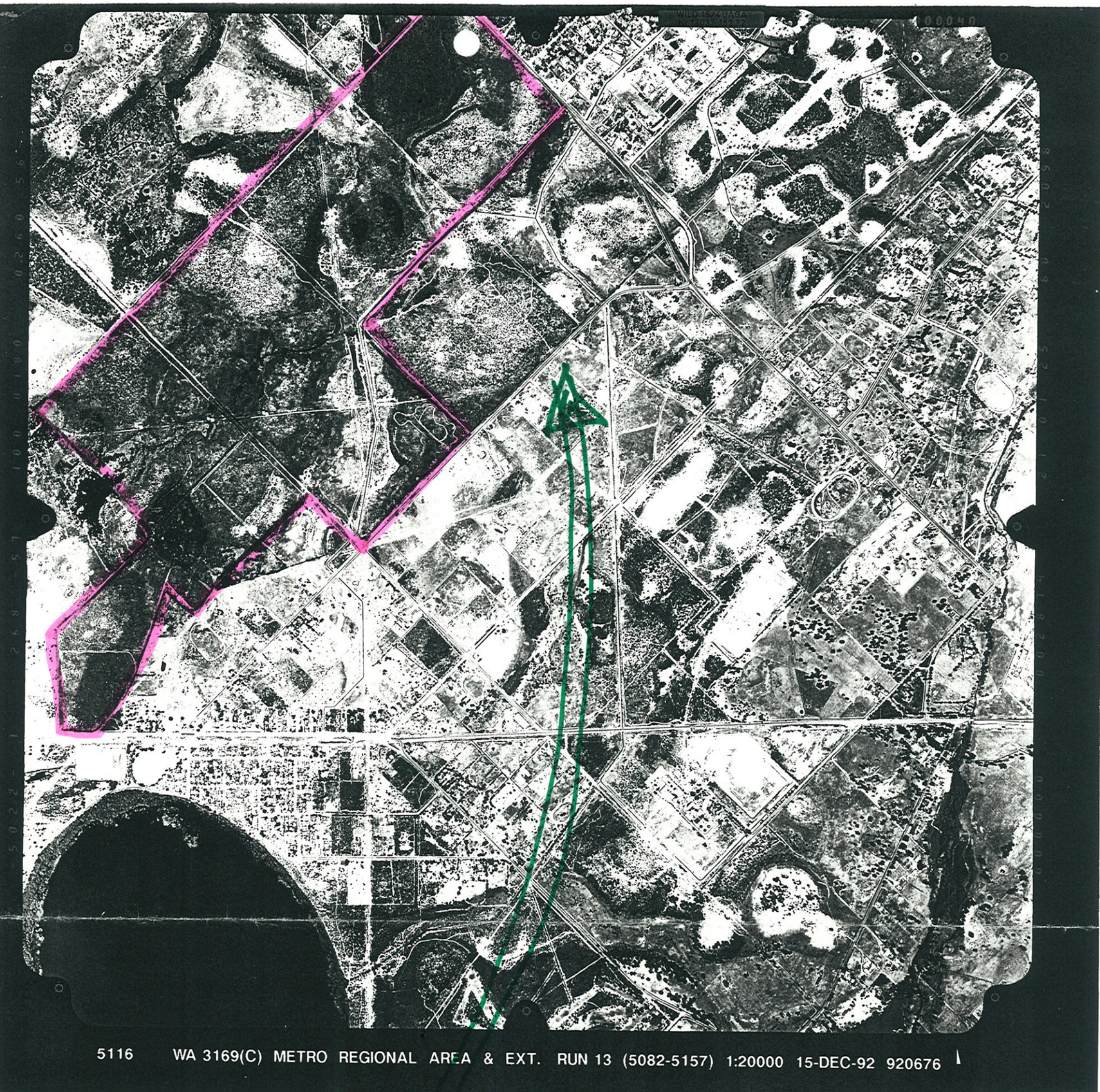
K: Woodlands of Eucalyptus gomphocephala-Eucalyptus calophylla-Eucalyptus marginata with admixtures of Banksia attenuata-Banksia menziesii and Allocasuarina fraseriana.

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)



Why has Lot 68 been omitted

Hale Road

BS No. 342

Aerial 1999

Map Ident: plot991118_7	DATE: 18 Nov 1999
Prepared By: Sean Collingwood	Prepared For: SPC
Scale 1:10000	MFP INTERNAL USE ONLY

0 500 m

Bushplan Sites (boundaries)

Cadastre with Lot Numbers Blue - Overlay Images

Conservation Category Wetlands - Boundaries

Contours - 1m & 2m (WAWA)

MAP 1 - AERIAL PHOTOGRAPH OF BS 342 LOTS 65-70

h.

SYSTEM 6 BUSHLAND SUBMISSION FORM
FOR CONSIDERATION IN THE UPDATE PROGRAMME

If you wish to submit more than one area for consideration in the System 6 update, please use a separate form for each area.

Please fill in each section giving as much information as possible.

LOCATION, OWNERSHIP AND ZONING OF THE AREA

1. Location Ranfurlie Rd

Please give as accurate and detailed a description as possible of the site location

Please include either a hand drawn or copied map showing the area of the area

a) Bordering Roads: ..... Ranfurlie / Annesley .....

b) Nearest Corner: .....

c) Lot Number: Part 67 / Part 69 Street Number: .....

d) Town/Suburb/Location: ..... Forrestdale .....

e) Local Council: ..... City of Armadale .....

f) Site Name (if any): .....

g) Approximate size of the area (ha): .....

h) Please locate the area on a map and give us map references if possible:

.....

i) Map: ..... Streetsmart /UBD/Other: .....

j) Map no.: .....

k) Grid Ref: .....

l) Please give any other information that may help us to find the location:

..... (See Map: Planning Control area 7.2704 19/5/92.)

m) Are you aware of any development proposals that are likely to affect the area?

.....

.....

NOTE: Areas that have already been given development APPROVAL should not be nominated

Please fill out those questions that you can answer

2. **Who owns the area?** (If owned by the person/s making the nomination please indicate) Landcorp

3. **If you own the area, and may be interested in participating in conservation on private land initiatives please indicate** (and leave your name and address at the end of this submission form) /

4 .**What is the area zoned?** (please indicate whether zoning is Town Planning Scheme or Metropolitan Region Scheme) Rural & Industrial

CAN YOU TELL US A LITTLE ABOUT THE PHYSICAL CHARACTERISTICS OF THE AREA

5. **Why do you consider this area important?** (Refer to Guiding Issues paper)
Would provide a substantial conservation reserve. MFP has already proposed adjoining Lot 9 to be P+R+ part of Proposed Jandakot Botanical Rz. (Lee Reserve, Cabbeb, Anstey Estate 360 ha)

6. **What is/are the soil type/s and colours ?**

Type: Sand/Clay/Gravel/Loam/Silt
Colour: White/Grey/Brown/Orange/Yellow/Red/Black

7. **Does the area have any special features such as unusual landforms / landscapes that still retain their natural vegetation?** Yes/No

If yes, what are they?

8. **Is the area a wetland or does it include a wetland?**

If yes, what kind of a wetlands is it?

a) lake

b) river

c) stream

d) swamp

e) estuary

(f) seasonally wet

g) other

9. What percentage of the wetland is open water in summer? .....

CAN YOU TELL US A LITTLE ABOUT THE VEGETATION /FAUNA ON THE NOMINATED AREA.

10. What percentage of the area is indigenous vegetation? .....

11. If the area includes regions cleared of native bushland please indicate reasons for the inclusion. .....

.....

12. Has any previous flora or fauna survey work been done on the area?
...See Semeniuk Study CWMA "Wetlands in the City of Armadale Report" DEP, MRS Agreement SWest Corridor.
If yes, please give details of the work .....CALM & Private consultant work.....

.....

.....

13. How would you rate the condition of the native bushland? (see attached table)

a) pristine
b) excellent
c) very good
d) good
e) degraded — variable.
f) completely degraded
g) don't know

14. Please indicate the disturbances affecting the area and where appropriate the percentage of the area disturbed.

a) Partial clearing
b) fragmentation
c) Selective removal of species: timber cutting, wildflower picking, mowing dieback and other plant diseases
d) Fire regime, including intensity, season and frequency
e) 'Enrichment plantings' that is plantings of species not found in that community
f) Weed invasion
g) Animal impact: horses, foxes, rabbits, cats, dogs, camels, goats etc
h) Soil movement, both removal and dumping
i) Changes in water regimes; flooding, drainage and watering
j) Salinity
k) Fertiliser drift and along waterways nutrient influx
l) Mining, including that for road works

m) Grazing: stock, overgrazing by feral or native mammals

n) Proliferation of tracks, fire breaks and walk trails

o) Off-road vehicle use

p) Use as service corridors by the SEC, Main Roads, Water Authority.

(Source: B Keighery. Bushland Plant Survey, September 1994)

15. Does the area contain any plant species of special interest that you know of? (eg. declared rare flora, priority taxa, outlier populations) .....

Do you know what they are? .....

.....

16. Do you know of any native animals that use the area? .....

Can you list those you know of? (birds, mammals, reptiles, amphibians etc)

.....

17. Is the area used by any native animals of special interest? (eg. endangered species, large/important populations).....

If yes, please name them and indicate source of information

.....

.....

CAN YOU TELL US A LITTLE ABOUT THE SURROUNDING AREA

18. Are there any bushland areas (including wetlands) near to this area?

.....

If yes, how close are they ? .....

.....

.....

Are they already conservation reserves? .....

What is their approximate size? .....

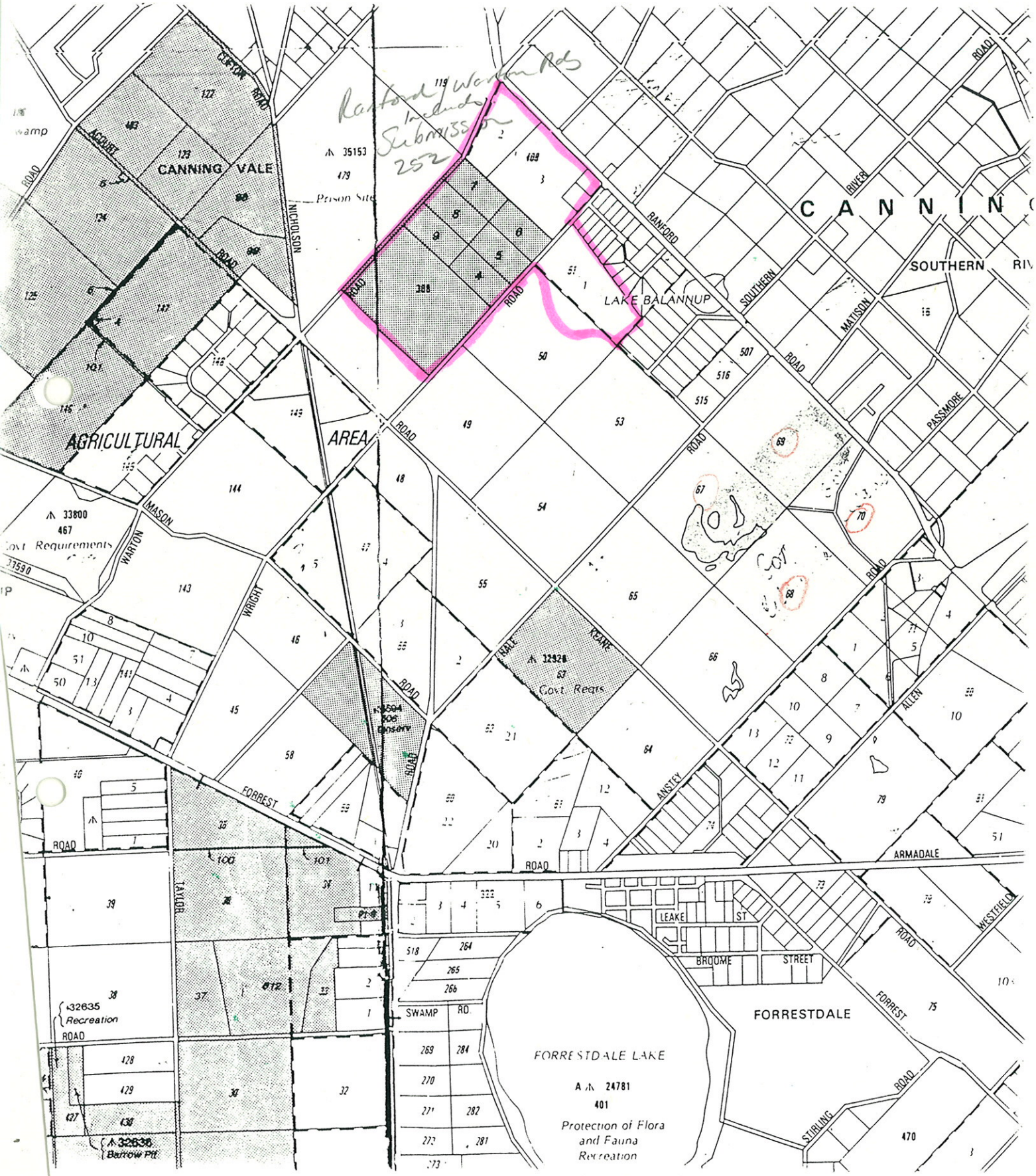
19. Does the submitted area link other bushland areas? .....

.....

.....

Please attach any additional information about the area which may be of use when assessing it.

Plan 1. 2704
SPC 19/5/92



SYSTEM 6 BUSHLAND SUBMISSION FORM
FOR CONSIDERATION IN THE UPDATE PROGRAMME

If you wish to submit more than one area for consideration in the System 6 update, please use a separate form for each area.

Please fill in each section giving as much information as possible.

LOCATION, OWNERSHIP AND ZONING OF THE AREA

1. Location RANFORD/ANSTEY RD.

Please give as accurate and detailed a description as possible of the site location
Please include either a hand drawn or copied map showing the area of the area

a) Bordering Roads: (See above)

b) Nearest Corner:

c) Lot Number: 68 (ANSTEY RD) Street Number:

d) Town/Suburb/Location: FORRESTDALE

e) Local Council: CITY OF ARMADALE

f) Site Name (if any):

g) Approximate size of the area (ha):

h) Please locate the area on a map and give us map references if possible:
See attached Photocopy Planning Control Area 1.2704 map

i) Map: Streetsmart /UBD/Other:

j) Map no.:

k) Grid Ref:

l) Please give any other information that may help us to find the location:

m) Are you aware of any development proposals that are likely to affect the area?
Previously proposed for industrial development appears to have been dropped.

NOTE: Areas that have already been given development APPROVAL should not be nominated

Please fill out those questions that you can answer

2. **Who owns the area?** (If owned by the person/s making the nomination please indicate) ..... Landcorp. / Landcorp advised SPC willing to consider part of Lot 68 Austin going to P+R (See MRS SWest Public Submissions Report).

3. **If you own the area, and may be interested in participating in conservation on private land initiatives please indicate** (and leave your name and address at the end of this submission form) .....

4 .**What is the area zoned?** (please indicate whether zoning is Town Planning Scheme or Metropolitan Region Scheme) ..... Industrial.....

CAN YOU TELL US A LITTLE ABOUT THE PHYSICAL CHARACTERISTICS OF THE AREA

5. **Why do you consider this area important?** (Refer to Guiding Issues paper) ...Ordyanis ashbyi P+R. (part of proposed Jandakot Botanic Park. Provides different habitat type, eg. Banksia woodland.

6. **What is/are the soil type/s and colours ?** .....

Type: Sand/Clay/Gravel/Loam/Silt
Colour: White/Grey/Brown/Orange/Yellow/Red/Black

7. **Does the area have any special features such as unusual landforms / landscapes that still retain their natural vegetation?** Yes/No

If yes, what are they? .....

.....

.....

8. **Is the area a wetland or does it include a wetland?** .....

If yes, what kind of a wetlands is it?

a) lake

b) river

c) stream

d) swamp

e) estuary

f) seasonally wet

g) other

9. What percentage of the wetland is open water in summer? .....

CAN YOU TELL US A LITTLE ABOUT THE VEGETATION /FAUNA ON THE NOMINATED AREA.

10. What percentage of the area is indigenous vegetation? .....

11. If the area includes regions cleared of native bushland please indicate reasons for the inclusion. .....

.....

12. Has any previous flora or fauna survey work been done on the area?

(1) Red Bugle' present in the area (Blancoa canescens) - no longer common. Most southern substantial

If yes, please give details of the work ..... paper bark forest (Only) and

..... Bushmead, Actual Ind. site

+ State Forest 65 (South)

(2) Conservation Value Rating HIGH in BBGorham Report

13. How would you rate the condition of the native bushland? (see attached table) 1990

a) pristine
b) excellent
c) very good
d) good
e) degraded
f) completely degraded
g) don't know

Variable - full of carbodies + rubbish but regeneration reasonable.

14. Please indicate the disturbances affecting the area and where appropriate the percentage of the area disturbed.

a) Partial clearing
b) fragmentation
c) Selective removal of species: timber cutting, wildflower picking, mowing dieback and other plant diseases
d) Fire regime, including intensity, season and frequency
e) 'Enrichment plantings' that is plantings of species not found in that community
f) Weed invasion
g) Animal impact: horses, foxes, rabbits, cats, dogs, camels, goats etc
h) Soil movement, both removal and dumping
i) Changes in water regimes; flooding, drainage and watering
j) Salinity
k) Fertiliser drift and along waterways nutrient influx
l) Mining, including that for road works

m) Grazing: stock, overgrazing by feral or native mammals

n) Proliferation of tracks, fire breaks and walk trails

o) Off-road vehicle use

p) Use as service corridors by the SEC, Main Roads, Water Authority.
Dumping ground for stolen cars.
(Source: B Keighery. Bushland Plant Survey, September 1994)

15. Does the area contain any plant species of special interest that you know of?
(eg. declared rare flora, priority taxa, outlier populations) ..... Blancoa canescens

Do you know what they are? .....

.....

16. Do you know of any native animals that use the area? .....

Can you list those you know of? (birds, mammals, reptiles, amphibians etc)

.....

17. Is the area used by any native animals of special interest? (eg. endangered species, large/important populations).....

If yes, please name them and indicate source of information

.....

.....

CAN YOU TELL US A LITTLE ABOUT THE SURROUNDING AREA

18. Are there any bushland areas (including wetlands) near to this area?
.....

If yes, how close are they ? .....

.....

.....

Are they already conservation reserves? .....

What is their approximate size? .....

19. Does the submitted area link other bushland areas? .....

.....

.....

Please attach any additional information about the area which may be of use when assessing it.

(166)

SYSTEM 6 BUSHLAND SUBMISSION FORM
FOR CONSIDERATION IN THE UPDATE PROGRAMME

see 164(9)

If you wish to submit more than one area for consideration in the System 6 update, please use a separate form for each area.

Please fill in each section giving as much information as possible.

LOCATION, OWNERSHIP AND ZONING OF THE AREA

1. Location

Please give as accurate and detailed a description as possible of the site location

Please include either a hand drawn or copied map showing the area of the area

a) Bordering Road#: Anstey road

b) Nearest Corner: Anstey – Ranford rds.

c) Lot Number: 68 Street Number: .....

d) Town/Suburb/Location: Forrestdale

e) Local Council: Armadale

f) Site Name (if any): .....

g) Approximate size of the area (ha): 40

h) Please locate the area on a map and give us map references if possible:

.....

i) Map: ..... (Streetsmart) /UBD/Other: .....

j) Map no.: 115

k) Grid Ref: A-B – 1-2

l) Please give any other information that may help us to find the location:

Maps attached

m) Are you aware of any development proposals that are likely to affect the area?

yes – but these may be shelved as Armadale Shire is planning a new industrial area – Armadale road near waste treatment plant

NOTE: Areas that have already been given development APPROVAL should not be nominated

Please fill out those questions that you can answer

2. **Who owns the area?** (If owned by the person/s making the nomination please indicate) ..... Land corp .....

.....

3. **If you own the area, and may be interested in participating in conservation on private land initiatives please indicate** (and leave your name and address at the end of this submission form) .....

4 .**What is the area zoned?** (please indicate whether zoning is Town Planning Scheme or Metropolitan Region Scheme) ..... Industrial .....

CAN YOU TELL US A LITTLE ABOUT THE PHYSICAL CHARACTERISTICS OF THE AREA

5. **Why do you consider this area important?** (Refer to Guiding Issues paper)
Very good Banksia attenuata woodland with a huge population of red bugles (plants). Dampland plants like lot 66. Its location to the Jandakot Botanical Pk

6. **What is/are the soil type/s and colours ?** .....

Type: Sand/Clay/Gravel/Loam/Silt
Colour: White/Grey/Brown/Orange/Yellow/Red/Black (2) Photos attached

7. **Does the area have any special features such as unusual landforms / landscapes that still retain their natural vegetation?** Yes/No

If yes, what are they? .....

.....

.....

8. **Is the area a wetland or does it include a wetland?** ..... It includes a wetland .....

If yes, what kind of a wetlands is it?

a) lake

b) river

c) stream

d) swamp

e) estuary

f) seasonally wet

g) other Dampland. ✓

9. What percentage of the wetland is open water in summer? .....

CAN YOU TELL US A LITTLE ABOUT THE VEGETATION /FAUNA ON THE NOMINATED AREA.

10. What percentage of the area is indigenous vegetation? ..... 95% .....

11. If the area includes regions cleared of native bushland please indicate reasons for the inclusion. ..... The NW Corner area contained the old pig farm (concrete base still there) A good area for a car park + information area for the Botanical Pk. surrounding this area

12. Has any previous flora or fauna survey work been done on the area? ..... CALM has had a look - a few years back. A professional survey needs doing

If yes, please give details of the work .....

I recently counted 35+ Christmas Trees for the Shire of Arnaud - as part of an overall Christmas Tree Protection scheme they are formulating now.

13. How would you rate the condition of the native bushland? (see attached table)

a) pristine
b) excellent
c) very good ✓
d) good ✓
e) degraded
f) completely degraded
g) don't know

14. Please indicate the disturbances affecting the area and where appropriate the percentage of the area disturbed.

✓a) Partial clearing on west side - (old fig shed area)
b) fragmentation
c) Selective removal of species: timber cutting, wildflower picking, mowing dieback and other plant diseases
d) Fire regime, including intensity, season and frequency
e) 'Enrichment plantings' that is plantings of species not found in that community
✓f) Weed invasion - west side
g) Animal impact: horses, foxes, rabbits, cats, dogs, camels, goats etc
h) Soil movement, both removal and dumping
i) Changes in water regimes; flooding, drainage and watering
j) Salinity
k) Fertiliser drift and along waterways nutrient influx
l) Mining, including that for road works

✓ m) Grazing: stock, overgrazing by feral or native mammals A pig farm once operated on west side

n) Proliferation of tracks, fire breaks and walk trails

✓ o) Off-road vehicle use A limestone track runs E & W through the block.

✓ p) Use as service corridors by the (SEC) Main Roads, Water Authority. — S. corner.

(Source: B Keighery. Bushland Plant Survey, September 1994)

15. Does the area contain any plant species of special interest that you know of? (eg. declared rare flora, priority taxa, outlier populations) .....

Do you know what they are? ...Red Bugles (Conostylis canescens)...

Over 1,000 clumps counted over several acres in area.

16. Do you know of any native animals that use the area? .....

Can you list those you know of? (birds, mammals, reptiles, amphibians etc)

.....

17. Is the area used by any native animals of special interest? (eg. endangered species, large/important populations).....

If yes, please name them and indicate source of information

.....

.....

CAN YOU TELL US A LITTLE ABOUT THE SURROUNDING AREA

18. Are there any bushland areas (including wetlands) near to this area?

.....yes.....

If yes, how close are they ? Adjacent. Lots 65 + 66 + 67 Private).

.....

.....

Are they already conservation reserves? ..yes Jandakot Botanical Pk. Lots 65-66.

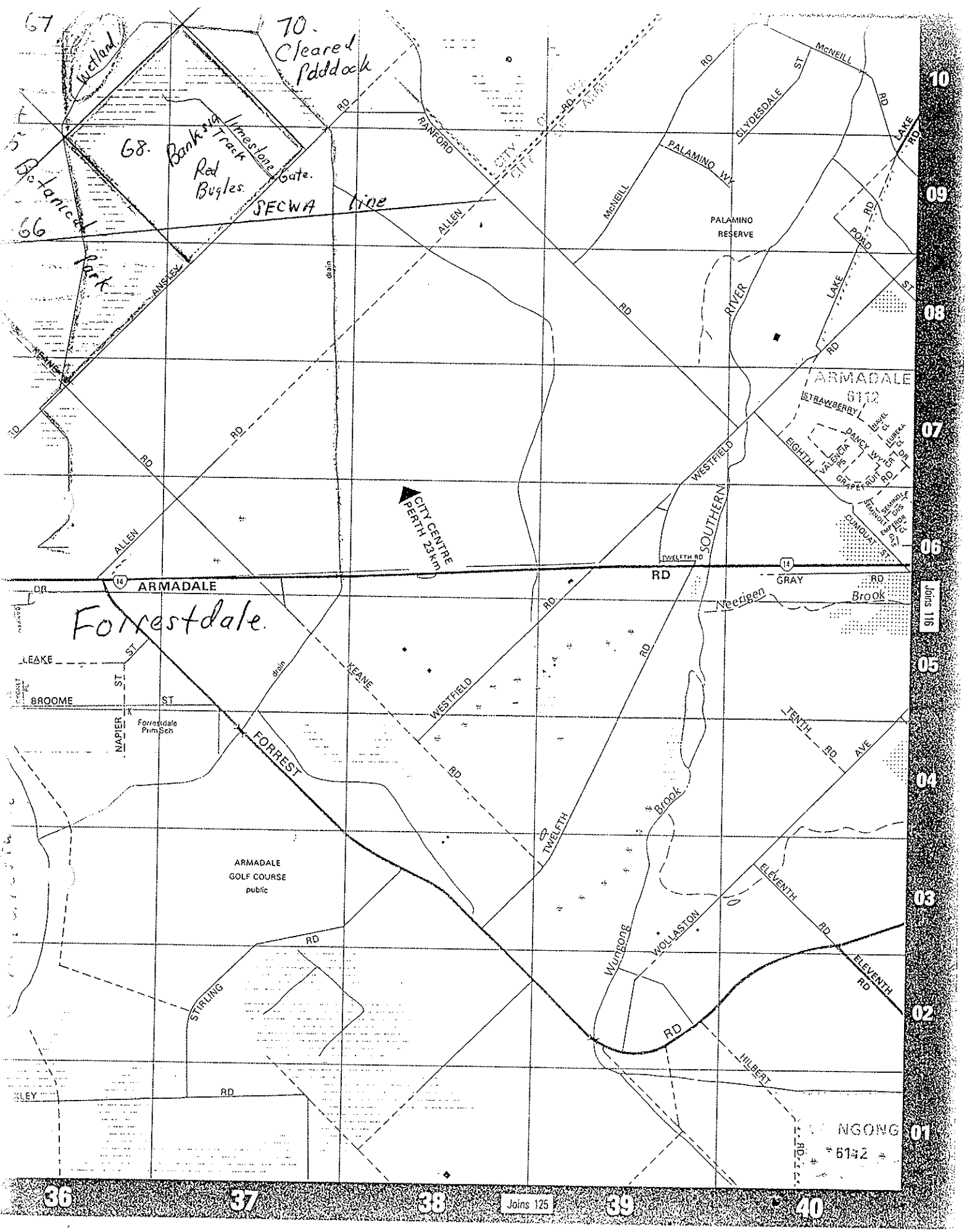
What is their approximate size? .....120 (ha) all together.....

19. Does the submitted area link other bushland areas? .....

.....

.....

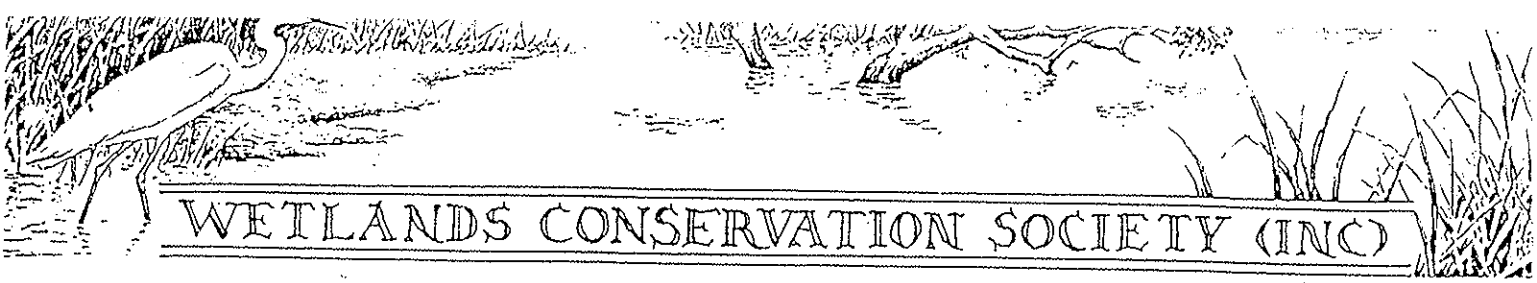
Please attach any additional information about the area which may be of use when assessing it.



POLICE STATION
HOSPITAL
POST OFFICE
PUBLIC TELEPHONE
TRAFFIC FLOW
TRAFFIC LIGHTS

FOR COMPREHENSIVE LEGEND, SEE PAGE 3

Map 115



WETLANDS CONSERVATION SOCIETY (INC)

(6) a to t

c/- 14 Stone Court, Kardinya, WA 6163

16 July 1995

The System Six Study Team
Department of Environmental Protection
141 St George's Terrace
Perth WA 6000

Dear Sir,

System Six Review

The Wetlands Conservation Society wishes to make a submission to the System Six Review. This submission is in two parts. Firstly some comments on the general principles and secondly some specific nominations.

(1) General Principles

The original System Six Red Book, published in 1983, included 19 general recommendations. Many of these are now irrelevant or outdated. Recommendations 1 - 6 relate to the management of State Forests. These have been overtaken by events. It is now clear that the only effective way to conserve State Forest is to place it in national parks or nature reserves. There is an urgent need to set aside a comprehensive and representative system of forest reserves and this should be part of a new general recommendation.

Recommendations 7 - 12 have also been overtaken by events. Many of the areas recommended for protection as reserves have been destroyed (eg. Casuarina M98, Buckland Hill M55, Port Kennedy M106, etc.) Many others have not been established because of CALM's reluctance to take on new reserves without additional funding. Perhaps these reserves should be vested in other authorities (eg. local government, community groups, LCDCs, etc.) if CALM are unwilling to accept them. The Port Kennedy LCDC has done an outstanding job of managing that reserve, for example, at little cost to the WA Government.

Recommendations 13 and 14 are still relevant and they should be supplemented by a recommendation about how this process will be funded. A regional improvement fund like the MRIF should be established to facilitate the acquisition of land for parks and recreation in regional areas.

Recommendations 15 - 17 need very careful attention. Although the Ministry for Planning has done quite a good job of identifying and resuming land for Regional

Parks, CALM has failed to co-operate and so far we still do not have any legally established Regional Parks. The WCS believes that the Regional Park Concept is extremely important in the System Six Area because of the multiple uses of reserves. The concept of a regional park as an area for conservation, recreation and landscape protection is now well established. We have least confidence in CALM's willingness to manage these Parks and we have proposed that MFP should continue to manage them until all of the policy and management issues have been resolved. We believe that funding should come from local authority rates, land tax and development tax. Ultimately a Regional Parks Authority may be the best body to manage them. Because they are so different to national parks and nature reserves the RPA should be quite different from the NPNCA and have its own budget. It should work closely with CALM, MFP and the local authorities.

Recommendations 18 and 19 are still relevant and have been partially implemented. However recommendation 18 does not specify which agency should fund and coordinate this task. This should be addressed in the update.

The General Recommendations should include an additional set which relate to the funding and implementation of the specific recommendations. We believe that there is a need for an implementation committee which will set priorities and review progress. A major review or progress report should be required every three years. A funding mechanism for implementation and management of the System Six conservation estate should be clearly identified in the general recommendations. The failure to do this was one of the main reasons why the original System Six exercise was so unsuccessful.

(2) Specific Recommendations

I am aware that the DEP has provided a detailed nomination form. However, we wish to nominate so many areas that it is quite impracticable for us to fill in such detailed forms. Most of the areas we wish to nominate are already documented in official Government reports, so the degree of detail requested is unnecessary. However, I would be happy to supply any additional information you require for any of the nominations we have made. Please call me on 337 7113 (h) or 360 2274 (w) or 310 1711 (fax) if you need further information.

Our specific recommendations for new areas to be included in the System Six Report are :

(a) The Spectacles Swamps near Kwinana. These are part of the Beeliar Regional Park and are fully described in the Planning Report for that Park. They are also zoned P & R in the MRS.

(b) Long Swamp on Hope Valley Road, Kwinana. This is also included in the Beeliar Regional Park. It is the last of the wetlands in the western chain of the Cockburn Wetlands. It is privately owned.

(c) Bollard Bulrush Swamp in Wellard. This is also part of the Beeliar Regional Park

(d) Tamworth Hill Swamp in Baldivis. This is part of the proposed Rockingham Lakes Regional park. It is fully documented in the ecological study of the Rockingham lakes carried out by V and C Semeniuk for the Australian Heritage Commission. It is zoned for Parks and Recreation in the MRS and it is affected by a mining claim.

(e) Anstey Swamp, Baldivis. This is also a part of the proposed Rockingham Lakes Regional Park. It is owned by the MFP and is zoned for Parks and Recreation. It is fully documented in the Semeniuk study and by the EPA in its original report on the Secret Harbour project.

(f) Paganoni Swamp, Baldivis. This wetland is an outstanding conservation area. It is owned by the MFP and is zoned for Parks and Recreation. it is fully documented in the Semeniuk study and in the Wildflower Society's nomination of this reserve to the Register of the National Estate.

(g) Lark Hill wetlands. This area lies adjacent to Port Kennedy M106 and contains some important wetlands and parallel dune formations. It is fully described by the Australian Heritage Commission in its listing of the area. The land is owned by the MFP and is zoned for Parks and Recreation. It is intended for inclusion in the Port Kennedy Scientific Park.

(h) Jandakot Botanical Park. This area is fully documented by the MFP in its Planning study for the Jandakot Botanical Park. It includes some areas such as M97, M98, M99 and M100 which are already in the System Six Red Book. However, there are several other important reserves in this area which should be included in the System Six Report. All of this land is reserved for Parks and Recreation and most of it is owned by the State.

(i) Piney Lake, Winthrop. This wetland was not included in System Six. However, it is part of the Beeliar Regional park and supports a diverse range of waterfowl and has some remnant vegetation. The City of Melville recently completed a management plan for this reserve.

(j) Blue Gum Swamp, Mt Pleasant. This wetland is an important wildlife refuge. It is well managed by the City of Melville and is being rehabilitated by a local group. It has a management plan, prepared by the City of Melville. It could be incorporated into M73 as it is very close to Booragoon Lake.

(k) Brixton Street Wetlands, Gosnells. These important wetlands should be added to M69. Their importance is well documented in the EPA assessment of the housing proposals for this area.

(l) Ken Hurst Park. Leeming. This is an important area of wetland and banksia woodland adjacent to M94. It contains declared rare flora as indicated in the Floristic Study of the Swan Coastal Plain. The Murdoch Branch of the Wildflower Society has done a detailed flora survey of the site. Contact Diana Corbyn for details.

(m) Twin Bartram Swamp, Hird Road Swamp, Solomon Road Swamp and Gibbs / Russell Swamp in Jandakot. These small wetlands are the best remaining examples of the Jandakot suite of wetlands. They are reserved in the local open space system and are well documented by V. Semeniuk in the report to Gold Estates on Wetlands East of Thomsons Lake.

(n) Creery Wetlands. These important samphire marshes should be added to C50 (Peel Inlet). Their values are fully documented in the Bamford Report which was attached to the proposal for the Harbour City Canal Estate.

(o) Vasse - Wonnerup Regional park. The whole area of the Broadwater, Deadwater and the Vasse Wonnerup estuaries should become a regional park. This concept should be proposed in the System Six update.

(p) Cockburn Wetlands - Eastern Chain M93. The boundaries of this area should be modified to coincide with the boundaries of the Beeliar Regional Park.

(q) Folly, Maramanup, Duck and Beenyup Pools, Baldivis. These small pools on the Folly Drain are important breeding and feeding areas for wildlife. The Folly Drain is an important wildlife corridor and its conservation value should be recognised in the System Six Report.

(r) West Corio Swamp, Karnup. This is an important breeding area for the straw-necked ibis. It should be protected. The EPA did an assessment of it several years ago when sand mining was proposed.

(s) Serpentine River Valley. The entire length of the Serpentine River and its flood plain should be listed in the System Six Report. It is a major wildlife corridor and a habitat for many species. It should be recommended as a regional park.

(t) Wilbinga and Guilderton. Two large blocks of coastal heathland south of the mouth of the Moore River. The Wilbinga block was proposed as a land swap for M1 which has been approved for subdivision. These blocks are adjacent to C12 and together provide an outstanding opportunity to conserve the best remaining transect of coastal vegetation in the northern part of System Six.

If you require further information about any aspect of this submission, please contact me. I would like some feedback on your decision about these areas.

Yours faithfully,

Philip Jennings
President

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

APPENDIX 2 - SITE DESCRIPTION

ANSTEY/KEANE DAMPLAND AND ADJACENT BUSHLAND, FORRESTDALE

Bushplan Site no. 342 **Map no.** 69, 75, 76

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

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, Sp2)

VEGETATION AND FLORA

Vegetation Complexes

Combinations of Bassendean Dunes/Pinjarra Plain
Southern River Complex

Floristic Community Types: *not sampled, types inferred

Supergroup 2: Seasonal Wetlands
*4 *Melaleuca preissiana* damplands
*5 Mixed shrub damplands
*8 Herb-rich shrublands in clay pans
*10a Shrublands on dry clay flats
* S2 Northern *Pericalymma ellipticum* dense low shrublands

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: sumpland, dampland, artificial channel

Natural Wetland Groups

Bassendean—Pinjarra transition OR Bassendean with fluvial features
Bennett Brook (B/P.4)

Wetland Management Objectives: Conservation (235 ha), Resource Enhancement

Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Not determined, Endangered (floristic community type 10a), Vulnerable (floristic community type 8)

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: vegetated wetland, vegetated uplands

Vegetation and Flora: detailed survey (part Bushplan Site — Keighery, G J, 1992a, Weston 1989a and 1990); limited survey (Trudgen 1990)

Structural Units: mapping (Weston 1989a and 1990); general mapping (Trudgen 1990)
Uplands: *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland to Low Open Forest, with scattered *Eucalyptus marginata, E. todtiana* and *Nuytsia floribunda*
Wetlands: *Melaleuca preissiana* Low woodland; *Kunzea ericifolia* Tall Open Scrub; *Melaleuca rhaphiophylla* and *M. viminea* Tall Open Scrub; *Melaleuca teretifolia, M. viminea, M. incana, M. uncinata, M. lateriflora* and *M. lateritia* Open Heath; *Actinostrobus pyramidalis* Tall Open Shrubland; *Regelia ciliata* Closed to Open Heath; *Pericalymma ellipticum* Closed to Open Heath; mixed Heath; *Evandra pauciflora* Sedgeland; mixed Herbland; (Many of the wetland communities are typical of the Pinjarra Plain and occur together in the area as a mosaic.)

Vegetation Condition: >75% Excellent to Pristine, <25% Very Good to Good, with areas of severe localised disturbance (Trudgen 1990)

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Total Flora: 381 native taxa (Keighery, G J, 1992a) (estimated >70% expected flora)
Significant Flora: *Diuris purdiei* (R) (Weston 1989a), *Jacksonia sericea* (3), *Tripterococcus paniculatus* ms (1), *Stylidium mimeticum* (3), *Stylidium longitubum* (3) (Keighery, G J, 1992a), *Villarsia submersa* (4), *Verticordia lindleyi* subsp. *lindleyi* (4), *Drosera occidentalis* (4) (Keighery, G J, 1992a); *Banksia telmatiaea, Restio stenostachyus, Beaufortia squarrosa, Stylidium utricularioides, Pityrodia uncinata* (southernmost population, Keighery, G J, 1992a), *Dysphania glomulifera* subsp. *glomulifera* (one of two populations on the Swan Coastal Plain, Keighery, G J, 1992a), *Evandra pauciflora, Myriocephalus helichrysoides* (Weston 1990), *M. isoetes, Blancoa canescens* (Weston 1990)

Fauna: no systematic survey. Significant mammal species: Quenda (Friend 1996 D)
Linkage: adjacent bushland to the north (BS413 across road), east and west; part of proposed Greenway 142 (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); 'wetland of special note' (Payne 1993a); majority Bushplan Site Category One Area Middle Canning Catchment Study (Evangelisti & Associates *et al.* 1995); one of the most plant species diverse areas on the Swan Coastal Plain in the PMR, currently considered second to BS387); contains plant communities representative of the eastern side of the Swan Coastal Plain

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

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

APPENDIX 3 - DETAIL OF THE SELECTION CRITERIA

Representation of ecological communities:
Vegetation Complexes
Combinations of Bassendean Dunes/Pinjarra Plain
Southern River Complex
Floristic Community Types: *not sampled, types inferred
Supergroup 2: Seasonal Wetlands
*4 *Melaleuca preissiana* damplands
*5 Mixed shrub damplands
*8 Herb-rich shrublands in clay pans
*10a Shrublands on dry clay flats
* S2 Northern *Pericalymma ellipticum* dense low shrublands
Supergroup 3: Uplands centred on Bassendean Dunes
*21c Low lying *Banksia attenuata* woodlands or shrublands
*22 *Banksia ilicifolia* woodlands
*23a Central *Banksia attenuata* — *B. menziesii* woodlands

Diversity
Regional floristic groups
Wetlands (at least 5 types)
Banksia woodlands (2 in Site description, additional 1 from recent field work, floristic community type 22)
Vegetation Associations (see mapped units after Weston, Map X)
Species: 381 native taxa (Keighery, GJ, 1992a) (estimated >70% expected flora), one of the most plant species diverse areas on the Swan Coastal Plain in the Perth Metropolitan Region, currently considered second to BS387

Rarity
Community
Endangered (floristic community type 10a), Vulnerable (floristic community type 8)
Species
Flora: *Diuris purdiei* (R) (Weston 1989a), *Jacksonia sericea** (3), *Tripterococcus paniculatus* ms (1), *Stylidium mimeticum* (3), *Stylidium longitubum* (3) (Keighery, GJ, 1992a), *Villarsia submersa* (4), *Verticordia lindleyi* subsp. *lindleyi* (4), *Drosera occidentalis* (4) (Keighery, GJ, 1992a); *Banksia telmatiaea, Restio stenostachyus, Beaufortia squarrosa, Stylidium utricularioides, Pityrodia uncinata* (southernmost population, Keighery, GJ, 1992a), *Dysphania glomulifera* subsp. *glomulifera* (one of two populations on the Swan Coastal Plain, Keighery, GJ, 1992a), *Evandra pauciflora, Myriocephalus helichrysoides* (Weston 1990), *M. isoetes, Blancoa canescens* (Weston 1990) (* error, should read *J. gracilis)*

Fauna: Quenda (Friend 1996 D)

Scientific or evolutionary importance
Series of newly recognised taxa, taxa at their range ends, disjunct populations, taxa that need further study for example one of the *Stylidium* species collected in November field work not as yet identified. Eastern side of the Plain communities complex and relatively poorly known.

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General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation

Diversity of wetland types (sumpland, dampland), floristic units, vegetation structural units and as a consequence habitat types related to the variety of bases - clay, clay/sands and humus rich sands

APPENDIX 4 - VEGETATION SAMPLE SITE DESCRIPTIONS (DEP 1999)

Upland 1
Site E (Vegetation Assn B2) - Rise between wet flat and seasonal wetland
Banksia ilicifolia Open Forest to Woodland with patches of adjacent *B. attenuata* and *Allocasuarina fraseriana*
Condition excellent - very good, burnt ~1 yr ago
Variations Band beside Site E - *Regelia*, same condition

Upland 1
Site I (Vegetation Assn B2) - Rise between wet flat and seasonal wetland
Banksia attenuata ? Woodland(with scattered *Eucalyptus todtiana, Nuytsia floribunda* and *Allocasuarina fraseriana* over scattered *Adenanthos cygnorum* ? Shrubland) over *Acacia pulchella* and *Lechenaultia floribunda* Heath/Shrubland.
Condition very good, burnt in very hot fire in past, patches of veldt grass but good seedling regrowth.

Upland 4
Site D (Vegetation Assn B1) - Rise between wet flat and seasonal wetland
Banksia attenuata, B. menziesii, Allocasuarina fraseriana and *Banksia ilicifolia* Low Open Woodland
Condition excellent - very good, cleared ~10-20 yrs ago, Banksia more open, patches of uncleared trees.

Upland 5
Site J (Vegetation Assn B1) - Rise between wet flat and seasonal wetland
Banksia attenuata, B. menziesii and *B. ilicifolia* Open Forest over *Kunzea ericifolia, Xanthorrhoea preissii* and *Acacia pulchella* ? Shrubland over *Leucopogon conostephioides, Petrophile linearis* and *Calytrix aurea/flavescens* Low Shrubland.
Condition excellent, perennial veldt grass at edges only.

Wetland 3
Site B (Vegetation Assn R/H/P) Dry flat?, sand
Regelia ciliata, Astartea aff. *fascicularis* and *Pericalymma ellipticum* Heath/Shrubland? with scattered emergent and clumps of *Melaleuca preissiana*
Condition excellent - good
Variations Band beside Site B - *Hypocalymma angustifolia* and scattered *Adenanthos obovatus* Open Heath? over *Phlebocarya ciliata* and *Dasypogon bromeliifolius* Open Herbland and *Hypolaena exsulca* Sedgeland?

Wetland 3
Site G (Vegetation Assn S) - Seasonal wetland, clay
Melaleuca rhaphiophylla Shrubland over *Centrolepis polygyna* Closed Annual Sedgeland, *Cotula coronopifolia, Goodenia sp., Calandrinia sp.* and *Stylidium sp.* ? Herbland and **Vulpia myuros, *Aira caryophyllea* and **Briza minor* Very Open Grassland.
Condition very good - good, weedy grass layer

Wetland 3
Site H (Vegetation Assn R/L/V) - Wet flat, sandy clay
Melaleuca rhaphiophylla Tall Open Shrubland (regrowth) over *Melaleuca incana* Heath/Shrubland? over *Pericalymma ellipticum* and *Verticordia densiflora* Low Open Shrubland (regrowth).
Condition excellent - very good, burnt in very hot fire in past, seedlings of *Pericalymma ellipticum, Regelia ciliata* and *Verticordia densiflora* present.

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Wetland 4

Site A (Vegetation Assn M) - Seasonal wetland, sumpland, clayey sand
Melaleuca lateritia, M. viminea and M. teretifolia Closed Heath (with patches of *Melaleuca incana*) over Sedgeland dominated by *Lepidosperma longitudinale* and/or *Lepyrodia ?muirii* over Exotic Herbland

Condition: Good - Degraded (patches Very Good)

Comments: Herb layer almost entirely weeds throughout Wetland 4 (see Map 2), some patches in Very Good condition where there is an intact sedge layer and *Villarsia albiflora.* Much of Wetland 4 has been recently burnt. Unburnt patches in Lot 69 have a closed canopy of *Melaleuca* species. Observations from the perimeter of Lot 67 indicate that this area has also been burnt. The Exotic Herbland has probably been the result of past clearing and grazing. Grazing has apparently ceased and the *Melaleuca* species are regenerating/have regenerated

Variations: Centre of wetland, deeper water - *Baumea articulata* Sedgeland, scattered *Triglochin* sp. in open water; patch of *Amphibromus neesii* Grassland
Edge of wetland - *Aotus intermedia, Astartea* aff. *fascicularis.* and *Regelia ciliata* Closed Heath

Wetland 4

Site F (Vegetation Assn P) - Lower dune slope beside seasonal wetland
Aotus intermedia, Astartea aff. *fascicularis* and *Regelia ciliata* Closed Heath with scattered emergent and clumps of *Melaleuca preissiana.*

Condition: very good - good, burnt, seedlings apparent, ground v. weedy in patches

Wetland 5

Site C (Vegetation Assn R/H/E) - Wet flat, sandy-clay (very fine)
Regelia ciliata, Pericalymma ellipticum and *Melaleuca sp. B* Open Low Heath with emergent *Melaleuca preissiana* and *Nuytsia floribunda.*

Condition: excellent - very good, burnt and rolled but good regrowth

CAPTIONS - PLATE 2

Gazetted Rare Flora (DRF) of the Perth Metropolitan Region

A *Drosera occidentalis* (DRF)

Drosera occidentalis is a minute, almost stemless pygmy sundew which grows on winter-wet firm sand and sandy-peat on the coastal plain. Its stipules are 3-lobed, and the leaf petiole is much longer than the circular, 0.5-1mm broad leaf blade. The cluster of populations near Anstey Road, Forrestdale, where these plants were photographed, is estimated to contain hundreds of sundew plants. Photographed in mid-October, 1989, weeks before flowering (ASW89.10.II-16). (See Rye and Hopper 1981)

B *Aponogeton hexatepalus* (DRF)

The largest leaves in the centre of the photograph - one green and the other pale brown - belong to *Aponogeton hexatepalus*. The floating blades are much wider than the below-surface part of each leaf. The small round yellow leaves between them are *Hydrocotyle lemnoides*. The plants are growing in a shallow, winter pool in a clay depression near Brixton Road, Kenwick. Photographed in mid-October, weeks after flowering finished (ASW89.10.I-18). (See Rye and Hopper 1981)

C *Hydrocotyle lemnoides* (DRF)

These floating leaves superficially resemble the slightly smaller leaves of the unrelated Duckweed (*Lemna disperma.*), but the *Hydrocotyle* leaves are often toothed and, in this photograph, have clusters of minute, dark red flowers between them. The long green leaf crossing the centre of the photograph is *Aponogeton hexatepalus*, and the kidney-shaped leaf in the lower right-hand corner belongs to *Villarsia capitata*. Photographed in pool near 'B' in mid-October, 1989 (ASW89.10.II-4). (See Rye and Hopper 1981)

D *Caladenia* sp. aff. *huegelii* (coastal plain) S. D. Hopper 3400 (DRF)

Unofficially known as *Caladenia* 'grandis', this flower was photographed in a low-lying eucalypt-banksia-sheoak open forest on Warton Road, Canning Vale, that was burnt the previous dry season. Other sites where the plant was found flowering in 1989 had not been burnt for a few years. The flower is large and the hairs on the edge of the labellum are long, yellow and often branched. Photographed in late September, 1989 (ASW89.9.I-11).

E *Diuris* sp. aff. *laxiflora* (Kwinana) A. P. Brown 10/9/84 (DRF)

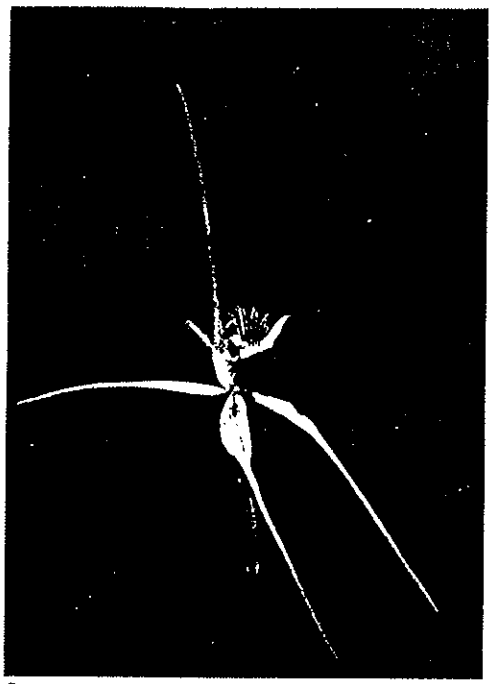
This close relative of *Diuris laxiflora*, and growing with it or nearby, is smaller, paler yellow and flowers earlier. The photographed plant is growing in a short *Lepidosperma* sedge swamp near Johnson Road, Casuarina, that is shallowly inundated in winter. Photographed in mid-September, 1989 (ASW89.9.I-1).

F *Diuris purdiei* (DRF)

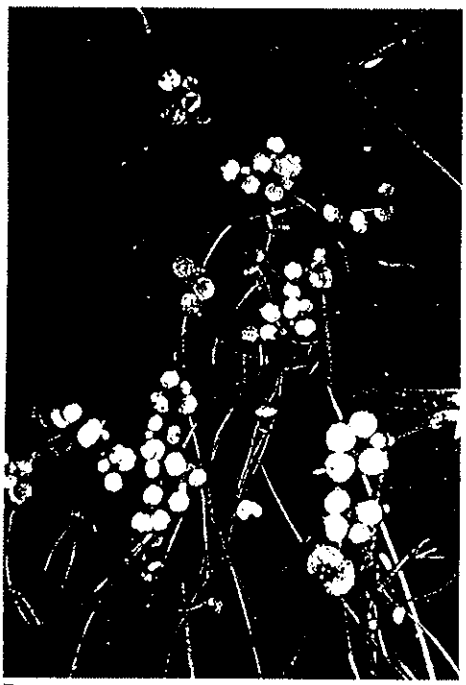
A relatively short *Diuris* flowering in what were dense, 1m tall *Regelia ciliata* and *Pericalymma ellipticum* shrublands near Anstey Road, Forrestdale until they were destroyed by fire during the 1988-89 dry season. Photographed in mid-October, 1989 (ASW.89.10.II-13). (See Patrick and Hopper 1982)

A

B



C



D

E

F

Plate 2

CAPTIONS - PLATE 3

Gazetted Rare Flora (DRF) and Some Priority Three Species (P3) of the Perth Metropolitan Region

A1 & A2 *Drakaea jeanensis* (DRF)

Flower and leaves of *Drakaea jeanensis* plants growing on firm white sandy soil in an old, long-unburnt *Kunzea ericifolia* tall shrubland near Robert Bay, Peel Inlet. Also found, previously, in then recently burnt banksia woodland in Anketell and Canning Vale. Photographed in late September, 1989 (ASW89.9.III-13 & ASW89.9.III-11).

B1 & B2 *Drakaea* sp. (south west) S. D. Hopper 3566 (DRF)

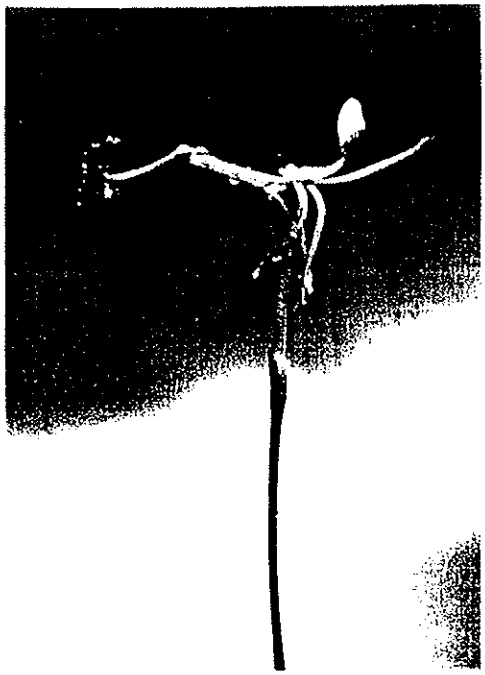
The flower and leaf of this species, unofficially called *Drakaea* 'micrantha', are the smallest of any south-western species of the genus. The whitish leaf with the dark venation, as shown in Plate B2, distinguishes it from other species. This plant was growing on sandy soil in eucalypt woodland next to Mowen Road in Mowen State Forest Block, east of Margaret River. Photographed in late September, 1989 (ASW89.9.III-22 & ASW89.9.III-21).

C *Restio stenostachyus* (P3)

Restio stenostachyus is a restionaceous, perennial, rhizomatous, creeping herbaceous plant recorded on the coastal plain only in the Perth Flora Region. The plant forms dense mats up to several metres broad and 0.6m tall, but where it survives in pastures it is grazed and much shorter. It is found in depressions and low areas that are wet, often with standing or flowing water, during the winter. *Restio stenostachyus* has been recorded between Gingin and a kilometre east of Serpentine River in the Lowlands area. It is more common and widespread than the Western Australian Herbarium collections indicate. Photographed near Thomas Road and Anketell Road, Oakford, in late September, 1989 (ASW89.9.II-14).

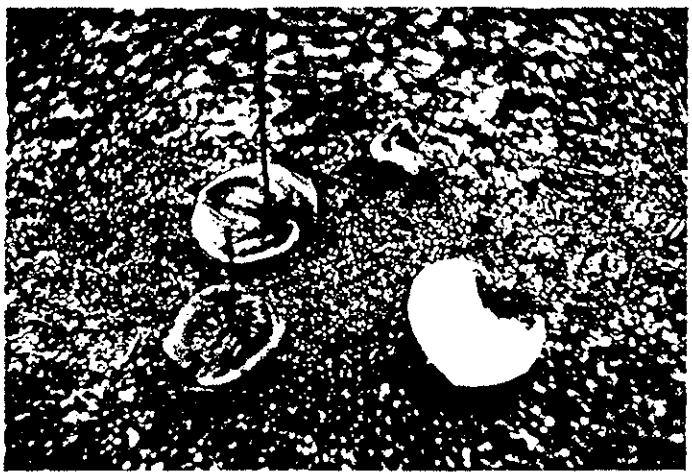
D *Villarsia submersa* (P3)

Like *Aponogeton hexatepalus*, with which the species sometimes occurs, *Villarsia submersa* grows in shallow, winter pools in clay depressions. It is, however, rarer than *Aponogeton hexatepalus*. Contrary to the description in the Perth Regional Flora (Marchant *et al.* 1987), the leaf blades as well as the white flowers float on the water surface. Normally the plant flowers in August and September, but in 1989 it was found still flowering in late October and early November. Until spring 1989 the species was believed to be restricted to a few localities in the south-west in the Boyanup-to-Busselton area, east of Manjimup and between Albany and Denmark (where it was found in the mid-1980s by Greg Keighery). In September 1989 the known range of *Villarsia submersa* was extended northward to the Perth Metropolitan Area, where it was found near Anstey Road, Forrestdale (by Arthur Weston) and near Brixton Road, Kenwick (by Peter Lambert). The Anstey Road populations, in which the photographed plant was growing, appear to be the largest yet recorded. Photographed in mid-September, 1989 (ASW89.9.I-21).

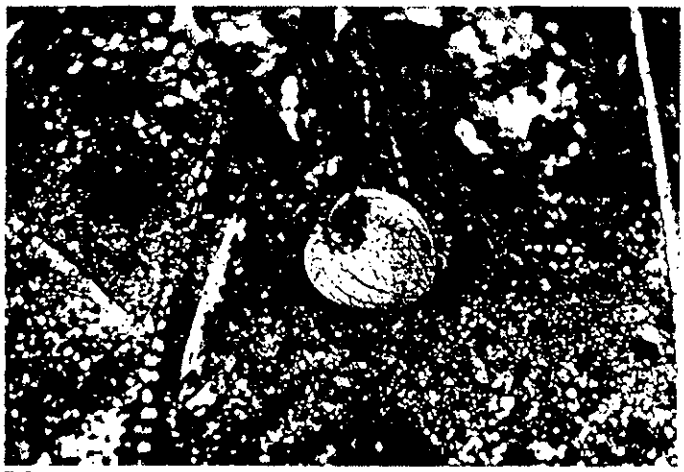


A1

B1

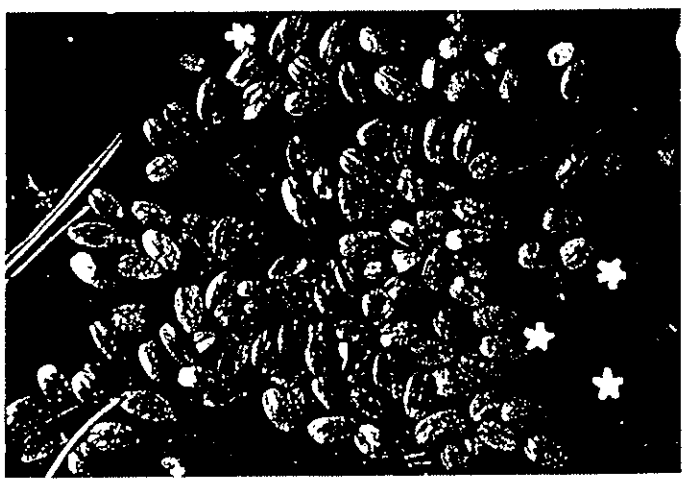


A2



B2

C



D

Plate 3

APPENDIX

APPENDIX

Native Plant Species Recorded in the Project Area (incomplete list)

[names conform to Green (1985) and Marchant *et al.* (1987)]

	Common Name	In Significant Species Habitats Area
Trees		
Allocasuarina fraseriana	She-oak	
Banksia attenuata		
B. grandis	Bull Banksia	
B. ilicifolia	Holly-leafed Banksia	
B. littoralis	Swamp Banksia	
B. menziesii		
Eucalyptus marginata	Jarrah	
E. todtiana	Prickly-bark	
Melaleuca preissiana	Moonah Paperbark	x
Nuytsia floribunda	Christmas-tree	x
Tall Shrubs (to over 2m tall)		
Acacia saligna	Orange Wattle	
Actinostrobus pyramidalis	Swamp Cypress	x
Adenanthos cygnorum		
Astartea fascicularis		
Hakea varia		
Jacksonia furcellata		
J. sternbergiana		
Kunzea ericifolia sens. lat. (K. vestita)		
Melaleuca cuticularis		
M. incana		
M. ? lateritia		x
M. lateriflora		x
M. rhaphiophylla (form)		x
M. teretifolia		
M. thymifolia		
M. viminea		x
Xanthorrhoea preissii	Blackboy	x
Lower Shrubs (under 2m tall)		
Acacia pulchella	Prickly Moses	
Adenanthos obovatus		
?Aotus sp.		x
Boronia crenulata		
Calothamnus hirsutus		x
C. lateralis		x
Conospermum ? triplinervium	a Smoke-bush	
Conostephium ? pendulum		
Daviesia spp.		x
Eremaea pauciflora		
Eriostemon spicatus		
Euchilopsis linearis		x
Hakea sulcata		x
Halosarcia ? lepidosperma		x
Hibbertia hypericoides		
H. ? subvaginata		
H. sp.		x
Hybanthus ? floribundus		
Hypocalymma angustifolium		x
Kunzea micrantha (K. 'limnicola')		
Leucopogon spp.		

Macrozamia riedlei	Zamia-palm	x
Pericalymma ellipticum		x
Petrophile sp.		
Phyllanthus calycinus		
Pultenaea reticulata		
Regelia ciliata		x
Lianas & Vines		
Cassytha sp.		x
Clematis pubescens		
Hardenbergia comptoniana		
Kennedia prostrata		
Orchids		
Caladenia flava		x
C. aff. huegelii		x
C. latifolia		x
C. longicauda		
C. marginata		x
C. menziesii		x
C. nana		x
Diuris 'carinata'		x
D. longifolia		x
D. purdiei		x
Elythranthera brunonis		x
Lyperanthus nigricans		
Microtus orbicularis		x
M. unifolia		x
M. ? aff. unifolia		x
Monadenia bracteata		x
Prasophyllum ? alatum		x
P. drummondii		x
P. cyphochilum		x
P. gibbosum		x
P. hians		x
Pterostylis ? vittata		
Thelymitra antennifera		x
T. campanulata		x
T. flexuosa		x
T. fusco-lutea		x
T. ? mucida		x
T. ? nuda		x
T. pauciflora		x
Grass-like Plants		
Evandra pauciflora		
Gahnia trifida		x
Juncus ? pallidus		
Lepidosperma longitudinale		
?Leptocarpus sp.		x
Restionaceae spp.		x
Stipa sp.		x
Other Herbaceous Plants		
Anigozanthus humilis		
A. manglesii		
A. viridis		x
Brachycome iberidifolia		x

Burchardia multiflora	x
B. umbellata	x
B. sp. A	x
Conostylis spp.	x
Cotula coronopifolia	x
Dampiera linearis	x
Dasypogon bromeliifolius	x
Dianella divaricata	
Drosera erythrorhiza	x
D. ? macrantha	x
Drosera neesii subsp. nov. (pers. comm. A.Brown: pale pink fl., erect greenish-yl foliage)	x
D. occidentalis	x
D. ? platystigma	x
Drosera spp.	x
Haemodorum sp.	x
Johnsonia acaulis	
?Millotia sp.	
Myriocephalus helichrysoides	x
Patersonia occidentalis	
Petrophile linearis	
Phlebocarya ciliata	x
Polypompholyx multifida	x
P. ? tenella	x
Sowerbaea laxiflora	x
Stylidium spp.	
Thysanotus patersonii	x
T. sp.	x
Tribonanthes sp.1	x
Tribonanthes sp.2	x
Triglochin procera	x
Utricularia violacea	x
Velleia trinervis (pale-flowered form)	x
Villarsia capitata	x
V. submersa	x
Wurmbea violacea	x

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DRAFT PERTH'S BUSHPLAN -

DETAILED ASSESSMENT OF VALUES FOR A NEGOTIATED PLANNING SOLUTION

BUSHPLAN SITE 342 -
Anstey/Keane Dampland and Adjacent Bushland, Forrestdale

18/1/2000

Department of Environmental Protection
B. Keighery and K. Clarke
January 2000

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

SUMMARY

The regionally significant bushland in Lots 67, 68, 69 and 70 is identified and is worthy of inclusion in Perth's Bushplan (Map 2). The bushland consists of:

- Uplands: *Banksia attenuata* and *B. menziesii* Low Woodland and,
  Banksia attenuata and *B. ilicifolia* Low Woodland
- Wetlands: The vegetated wetlands are in generally Very Good to Excellent condition and typical of the eastern Southern River vegetation complex.

At least seven floristic community types typical of the Bassendean Dunes are considered to be found in the area. The site is at the interface between the Bassendean Dunes and Pinjarra Plain landforms and supports vegetation elements of both making is a relatively large and exceptionally diverse site. The area is constrained by its industrial zoning and a series of boundaries for encompassing the values of the area are suggested. Option D (Map 6) encompasses the smallest area that includes the described attributes but at significant cost to the integrity of the site.

BACKGROUND

Boundary Determination for Bushplan Site 342

The boundaries of Bushplan Site 342 for the Draft Perth's Bushplan (November 1998) were determined from the boundaries of the protected area (Parks and Recreation Reservation, see Map 2), mapped Conservation Category wetlands and native vegetation mapping (Agriculture WA 1997). Location of the boundaries took into account the

- core areas of outstanding conservation value in Lots 65 and 66 as outlined in Keighery, G J (1992a) and Weston (1989a and 1990);
- information from Submissions to the System 6 and Part System 1 Update;
- mapped vegetated conservation category wetlands (see Map 1);
- consolidation and connection of bushland in Lots 69, 67, 65 and 66 with native vegetation mapped in Lots 70 and 68
- inclusion of areas of *Banksia* Woodlands (Lot 69 and 68);
- aerial photography interpretation from which it was evident that areas of bushland within the boundaries of the Bushplan Site are not accurately mapped. (The boundary was drawn to include any unmapped bushland)

Significance of Bushplan Site 342

In terms of the Diversity criterion for inclusion in the Draft Perth's Bushplan, Site 342 is considered one of the most significant Bushplan Sites. Bushplan Site 342 has an outstanding diversity of flora, vegetation and wetland types (See Appendix 2, 3 and 4). Fauna studies have not been done in the Site but considering the diversity of habitats, the frequency of the interface between wetlands and uplands and the size of the area the Site would be expected to support a highly diverse fauna. The diversity of flora, vegetation and wetlands in Bushplan Site 342 is related to the location of the area on the interface between the Bassendean Dune System and the Pinjarra Plain. The Bushplan Site contains clay based wetlands typical of the eastern side of the Swan Coastal Plain as well as sandy clay wetlands interspersed with shallow and deep sand dune ridges supporting a variety of *Banksia* Woodlands.

Bushplan Site 342 appears to be the second most diverse Bushplan Site in Perth's Bushplan with Bushplan Site 387 (Greater Brixton Street Wetlands) having the greatest diversity. In both sites the high levels of diversity are related to a comparable diversity of wetlands. However Bushplan Site 342, as proposed in the draft Perth's Bushplan is twice the size of Bushplan Site 387, and includes substantial upland areas that are poorly represented in Site 387. Draft Perth's Bushplan recognised the significance of the area, consolidating the area currently recognised in Parks and Recreation Reservation with adjacent bushland and wetland.

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

Purpose of this study

Bushplan Site 342 is a very significant Site. In conservation terms any reduction in the Site cannot be justified. However Lots 68 and 70 have been zoned Industrial and Perth's Bushplan proposes that such areas of Bushplan Sites should be the subject of Negotiated Planning Solutions. As a consequence this study considers the flora, vegetation and wetlands of Lots 65 - 70 with the aim of identifying the relative value of specific vegetation and wetland units. This 'ranking' can then be used to compare the impact of the various proposed negotiated boundaries.

To supplement the existing information on the Bushplan Site (see Appendix 2: Lots 65 and 66 by Keighery, G J, 1992a and Weston 1989a; Lots 70 and 68 by Weston 1990) a series of field inspections have been made to sections of the Bushplan Site. While the field work has focussed on Lots 70 and 68 the values of these lots in relation to values of the entire Bushplan Site has required a detailed assessment of Lots 69 and 67 as well as a comparison between Lots 65 - 70. Field inspections occurred on three occasions:

- 6/9/99: Lots 68 and 70: Bronwen Keighery (DEP) and Sean Collingwood and Sam Bambridge (MfP)
- 9/11/99: Lots 68 -70: Bronwen Keighery (DEP) and Karen Clarke (MfP), Sean Collingwood (MfP) and Mike Allen and Melissa Patt (WRC)
- 11/11/99: Lots 65 -70: Bronwen Keighery (DEP) and Karen Clarke (MfP)

Overall about one and a half days were spent traversing the bushland by foot and vehicle. Lot 67 was observed from the fenceline. Being November many plants had finished flowering at the time of the latter field inspections.

FLORA, VEGETATION AND WETLANDS

Vegetation in Lots 65-70

The vegetation of the study area is described in Map 2, Tables 1 and 2 and Appendix 4 and is a complex of uplands (*Banksia* Woodlands) and wetlands (DEP 1999). The majority of the area within Lots 65 -70 within the Bushplan Site is naturally vegetated. The overlay to Map 2 identifies upland areas (U1-U5) and wetland areas (W1-W8) on Lots 67-70. A few areas have been Completely Degraded and are shown as Cleared (Cl).

The majority of the vegetation is in Very Good to Excellent condition - Uplands 1, 4 and 5; Wetlands 1, 2, 3, 5, 7 and 8. Some of the upland and wetland areas have been significantly disturbed and are generally in a Good to Degraded condition with patches in either Very Good or Completely Degraded condition - Uplands 2 and 3; Wetlands 4 and 6. The disturbance in these areas is related to the compounding effects of clearing (both recent and historic), past grazing, frequent fire, pasture establishment and changes in the water regime. As a consequence there is a high density of weed species in these upland and wetland areas.

Relative values of the Upland and Wetland Areas

The various wetland and upland areas were compared to identify the areas of highest priority for conservation. This comparison was based on consideration of

- the regional floristic groupings (floristic community types);
- diversity of structural vegetation units;
- vegetation condition and
- vegetation in Lots 65 and 66.

In general the areas in a disturbed condition - Uplands 2 and 3; Wetlands 4 and 6 have the lower priority for protection. Map 2 shows the location of these areas together with the areas that are cleared.

However, Wetlands 4 and 6 have important functions within the Bushplan Site related to

- linkage between high conservation value sections of the Site (see Map 2);
- linkage to an adjacent Bushplan Site and
- fauna habitat (disturbed areas, especially between intact bushland areas have significant value as fauna habitat).

In addition comparison of Weston's mapping, 1992 aerial photography, 1998 aerial photography and recent ground survey indicates that there is significant regeneration of the shrub layers in Wetlands 4 and 6. The Water and Rivers Commission support inclusion of all of the wetlands on the site in Perth's Bushplan and given the significant biodiversity values of the site recommend these wetlands be given Conservation Category status (Appendix 1).

Table 1: Comparison of Uplands in Lots 67 - 70 (see Map 2)

Upland No.	Floristic Community Type	Vegetation Condition Rating	Number of Vegetation Units	Diversity/ Condition/ Distribution Ranking[5]
1	22/21c	VG - E[1]	2 (B1, B2) [1]	1
2	21c	G - D[1/3]	1 (B3) [1/3]	4
3	21c	G - D[1/3]	1 (B3) [1/3]	4
4	21c/23a	VG - E[3]	2 (B1, B3)[3]	1
5	21c/23a	VG - E	3 (B1, B3, K)	1

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
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Conservation Branch - B. Keighery and K. Clarke, January 2000

Table 2: Comparison of Wetlands in Lots 67 - 70 (see Map 1 and 2)

Wetland No.	Floristic Community Type	Vegetation Condition Rating	Number of Vegetation Units	Management Category	Diversity/ Condition/ Distribution Ranking[5]
1	4/S2	VG[1]	3 (R, P, L) [1]	Conservation	2
2	4/S2	VG[1]	3 (R, L, P) [1]	Resource Enhancement	2
3	4/5/ 10a/S2	VG - E[1/3 (D)]	5 (R, L, H, P, S) [1]	Conservation	1
4		G - D/Cl[2]	1 (M)[2]	Conservation	4
5	4/5	VG - E[3]	2 (H, R) [3]	? Conservation	2
6	4/S2	G/D/Cl/VG	5 (R, M P, K, L)	Conservation/ Resource Enhancement[4]	5
7		E - VG	3 (L, R, E)	? Conservation	2
8		E - VG	2 (L/H)	Resource Enhancement	2

[1] These wetlands/uplands have been recently burnt (Summer 1997/98) but there is low weed density and they are regenerating well (good seedling recruitment as well as resprouting from rootstocks). Descriptions of the units are based on unburnt patches and dead material.
[2] Too few natives to determine floristic community type, probably FCT 8
[3] Cleared approximately 2 years previously, but mostly there is low weed density and they are regenerating well (good seedling recruitment as well as resprouting from rootstocks). D indicates occasional Degraded patches.
[4] Sections of this wetland are not mapped at present (see Map 1)
[5] 1 = Highest value, 5 = Lowest value

Comments on possible boundaries

A series of boundaries for proposed protected areas in Lots 67 to 70 are shown on Maps 3 - 7.

Option A (Map 3) - Protection of the majority of the Bushplan Site - Lots 67, 68, 69 and part Lot 70

Rationale: As previously outlined this Bushplan Site is of outstanding conservation value. Thus, the first option is to protect the entire Bushplan Site. On Map 3 the cleared, more disturbed areas are indicated by "Cl". However, even the majority of these areas retain important functions within the Site. **Any development of Bushplan Site 342 will involve filling wetlands and/or the clearance of regionally significant vegetation.** The wetlands are mostly Conservation Category and/or Category One Area Middle Canning Catchment Study (Evangelisti & Associates *et al.* 1995). Therefore, Option A is limited to the cleared area of Lot 70 as shown on Map 3. This is clearly the preferred option, as it protects fully this area of exceptional diversity as a single consolidated area, within boundaries that will minimise future (ongoing) management costs and impacts. This is the option supported by the Water and Rivers Commission (Appendix 1).

If it is not possible to protect the entirety of the vegetated areas there are a series of other options that take into consideration

- protection of the highest priority areas,
- identification of consolidated development and conservation areas
- linkage and
- wetland configuration.

It should be noted that the following were also taken in to account when developing these options

- The area within the Parks and Recreation Reservation boundary in Lots 67 and 69 was not seen as a priority for conservation. Over fifty percent of the area is significantly disturbed and Completely Degraded. The major function of this area was to connect to the adjacent Bushplan Site.
- The majority of the wetlands within Lots 67 - 69 are not 'discrete' wetlands having been internally segmented by roads, drains and fill. For example, Wetland 4 is part of a large wetland that crosses Hale Road and then Ranford Road. That is sections of wetlands are identified rather than entire wetlands.
- Individual lot boundaries.

Option B (Map 4) - Protection of Lot 67, Lot 68 and Lot 69,
Rationale: Wetland 1 in Lot 70 is a high priority area however as the vegetation units are represented elsewhere, it is a relatively small area on the edge of a larger area and Wetland 6 is disturbed. This option would allow the whole of Lot 70 to be developed. As development is confined to the edge of the protected area the management implications and impacts on Lots 67, 68 and 69 are minimised.

Option C (Map 5) - Protection of Lot 67, part Lot 68 and Lot 69
Rationale: The area of wetland 6 in Lot 68 identified for possible development is partially cleared or relatively disturbed and connects to Lot 70. Any expansion of this possible development area into Upland 5 should be limited to the area indicated to maintain the maximum consolidated area under protection. This option greatly increases the intrusion of industrial development into the protected area, increasing management problems and impacts on the high conservation value areas of Upland 5 and Wetland 4.

Option D (Map 6) - Protection of part Lot 67, part Lot 68 and Lot 69
Rationale: The area of Lot 67 in Wetland 4 identified for possible development is cleared/ relatively disturbed and connects to Lot 68. This option CANNOT be combined with any other option. This option would locate industry within the core of the proposed protected areas, contrary to established objectives of reducing boundary to area ratios and protecting core areas. It would have high impacts on values and substantially increase management problems and costs. This option is not favoured.

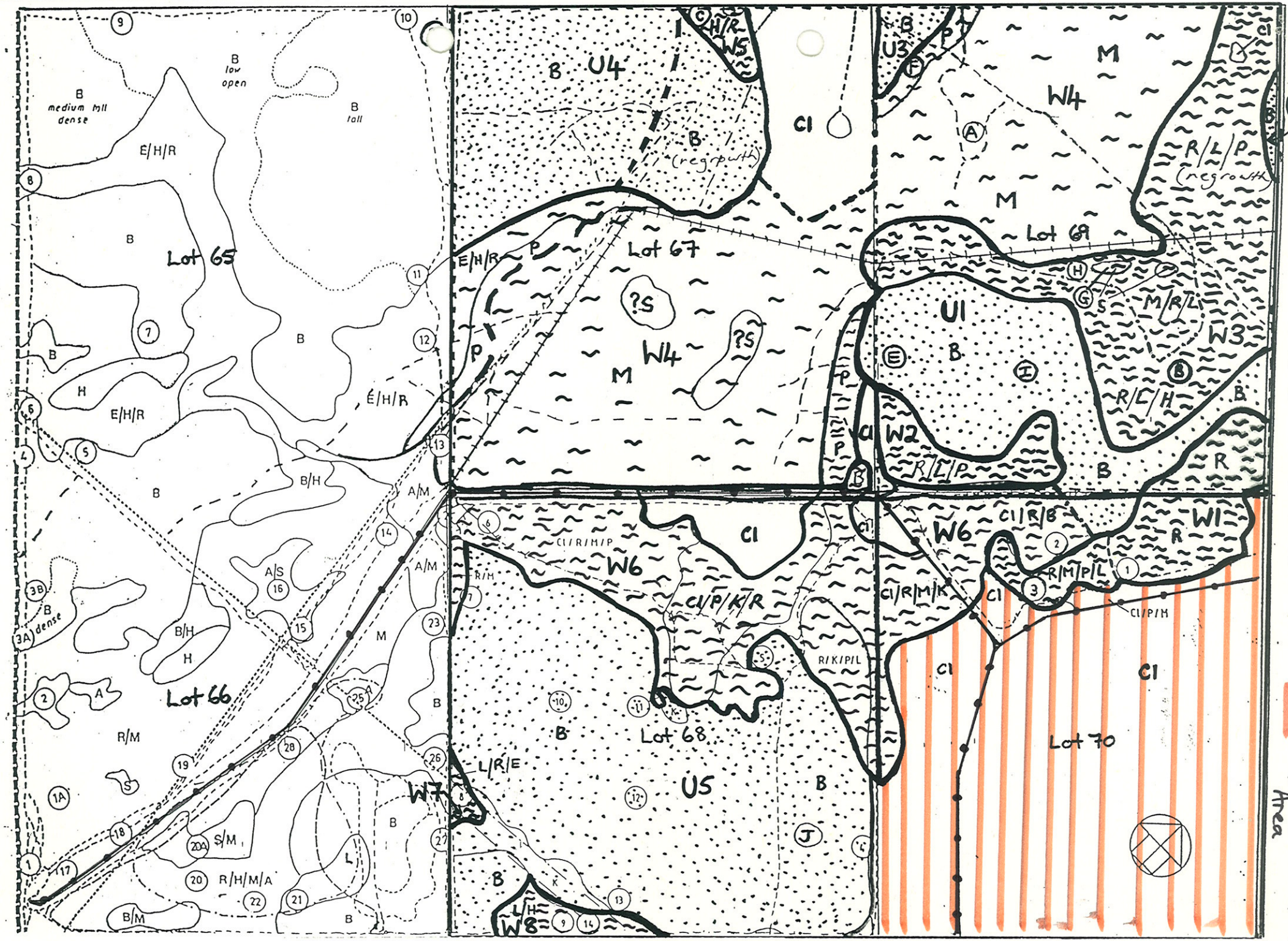
Option E (Map 7) - Protection of part Lot 67, Lot 68, part Lot 69 and Lot 70
Rationale: The area of Lots 67 & 69 in Wetland 4 identified for possible development is cleared/ relatively disturbed. This option would remove sections of Lots 67 and 69 from P&R, to be replaced by other sections of these lots. This option CANNOT be combined with any other option. This option involves significantly less loss of conservation value and fewer management impacts than Option C and, in particular, Option D.

Combination of Options
Some options can be combined or partially combined to ensure any land negotiated for development is from areas of lesser value. Some options CANNOT be combined as they will unacceptably compromise the representativeness of the Bushplan Site and/or viability of the core high conservation value areas.

REFERENCES

(Unlisted references can be found in Draft Perth's Bushplan Volume 2B)

DEP 1999 Perth's Bushplan Survey 1999. Unpublished bushland plot and area records. Department of Environmental Protection, Perth Western Australia


MAP 3 - OPTION A
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium hill dense
B low open
B tall
E/H/R
B/H
A/M
A/S
R/M
S/M
R/H/M/A
B/M
L/R/E
R/K/P/L
CI/R/M/P
CI/P/K/R
CI/R/M/K
CI/P/M
R/M/P/L
CI/R/B
R/L/P
M/R/L
R/L/H
U1
U2
U3
U4
U5
W1
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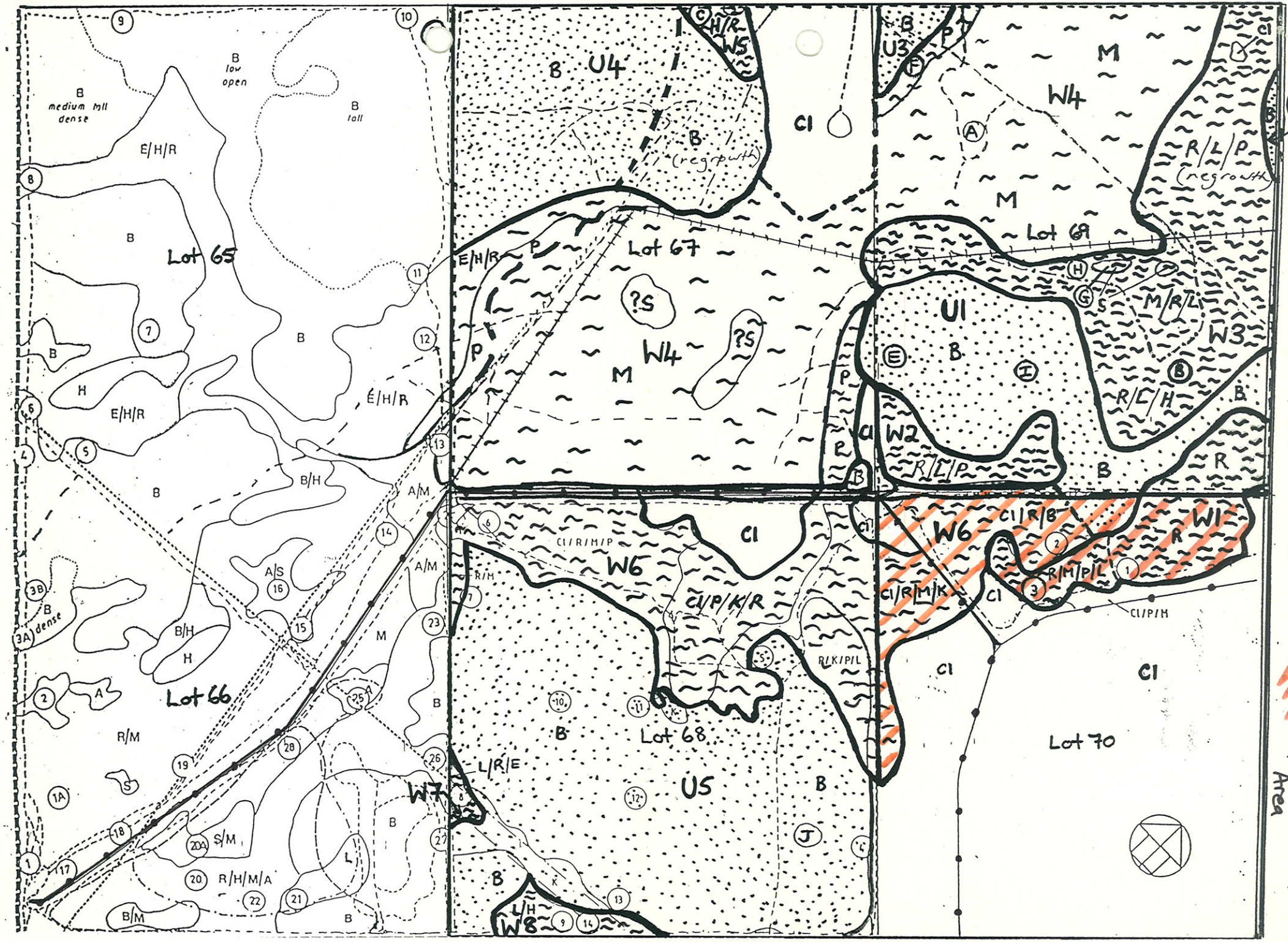
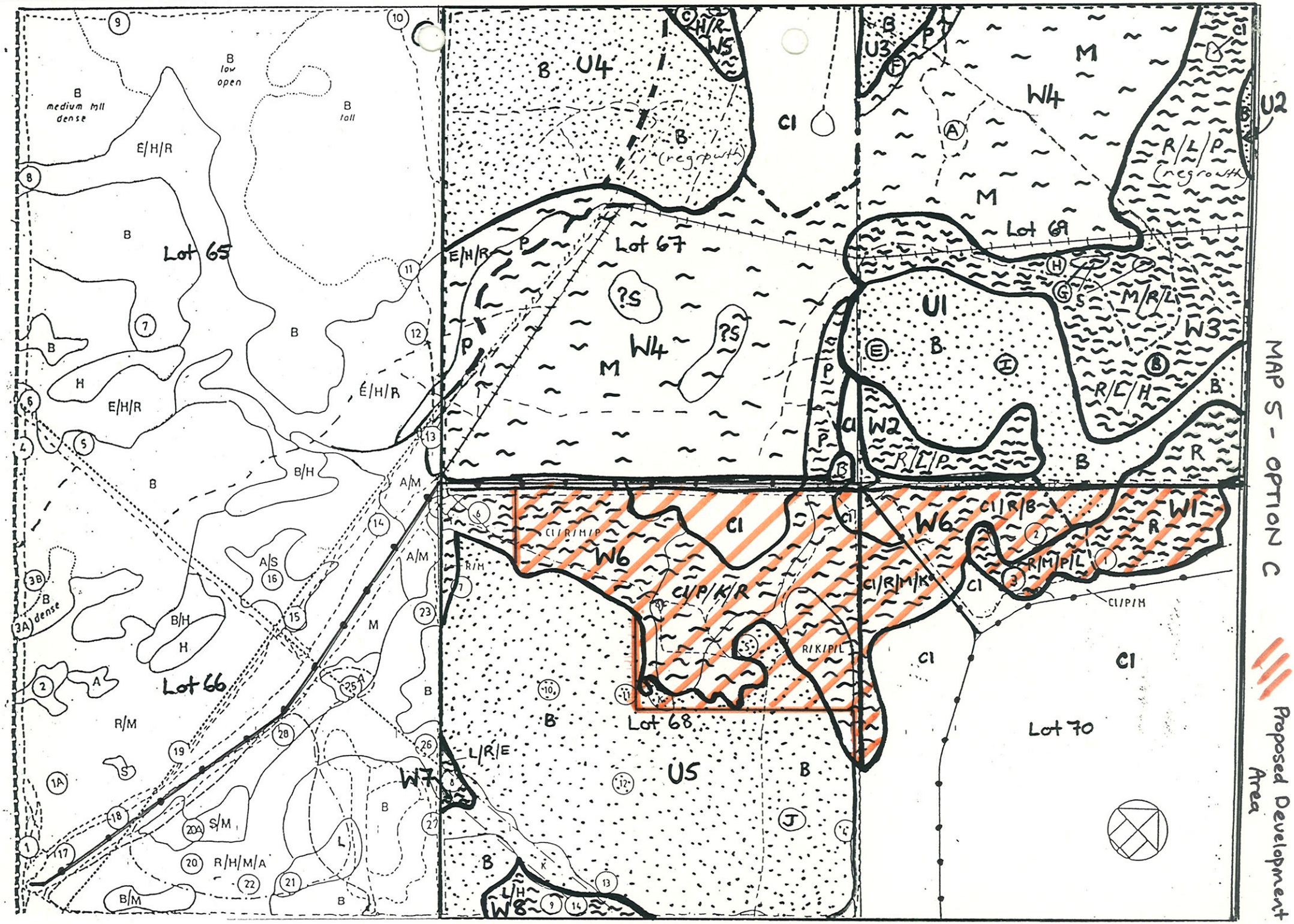
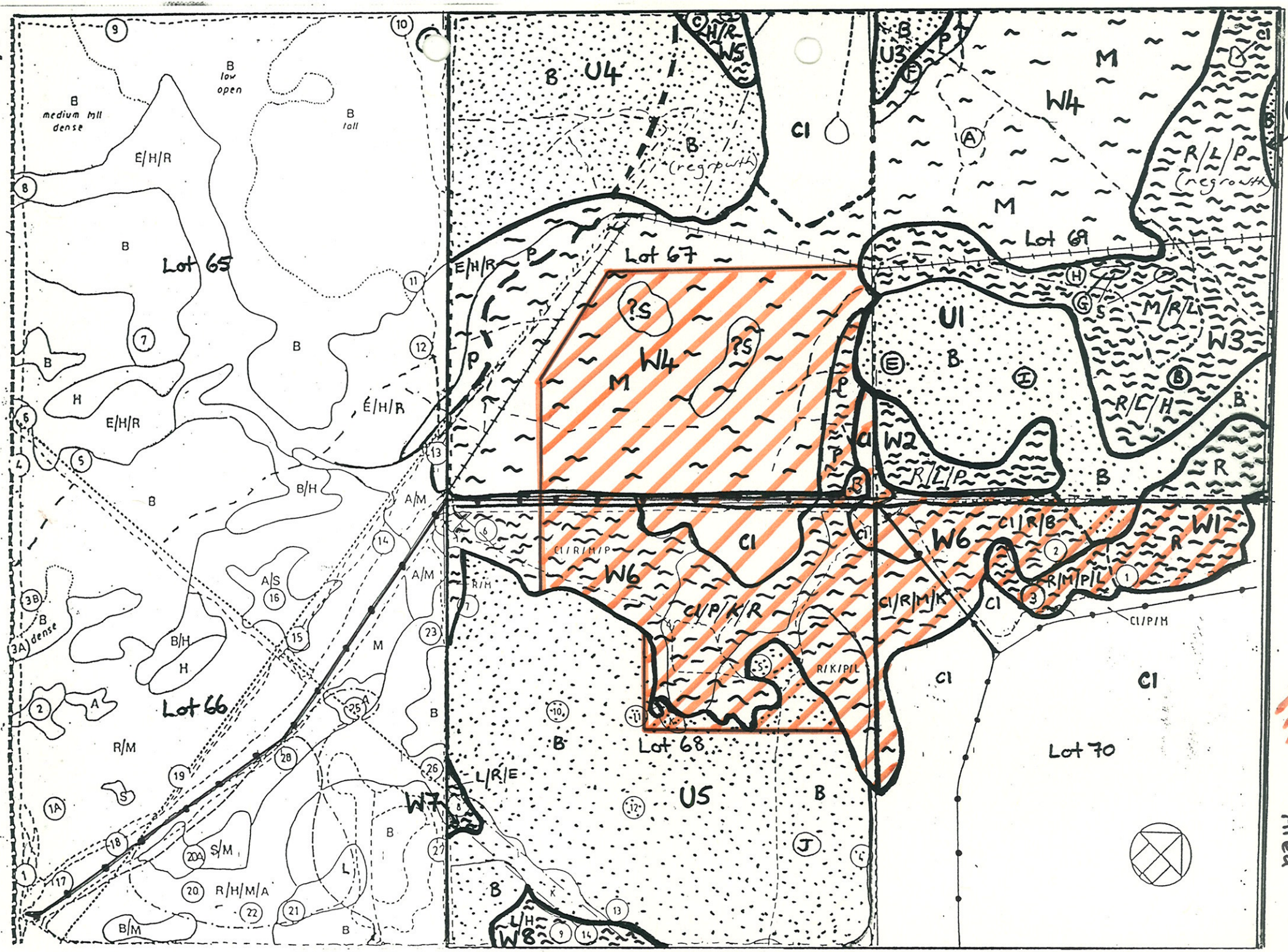
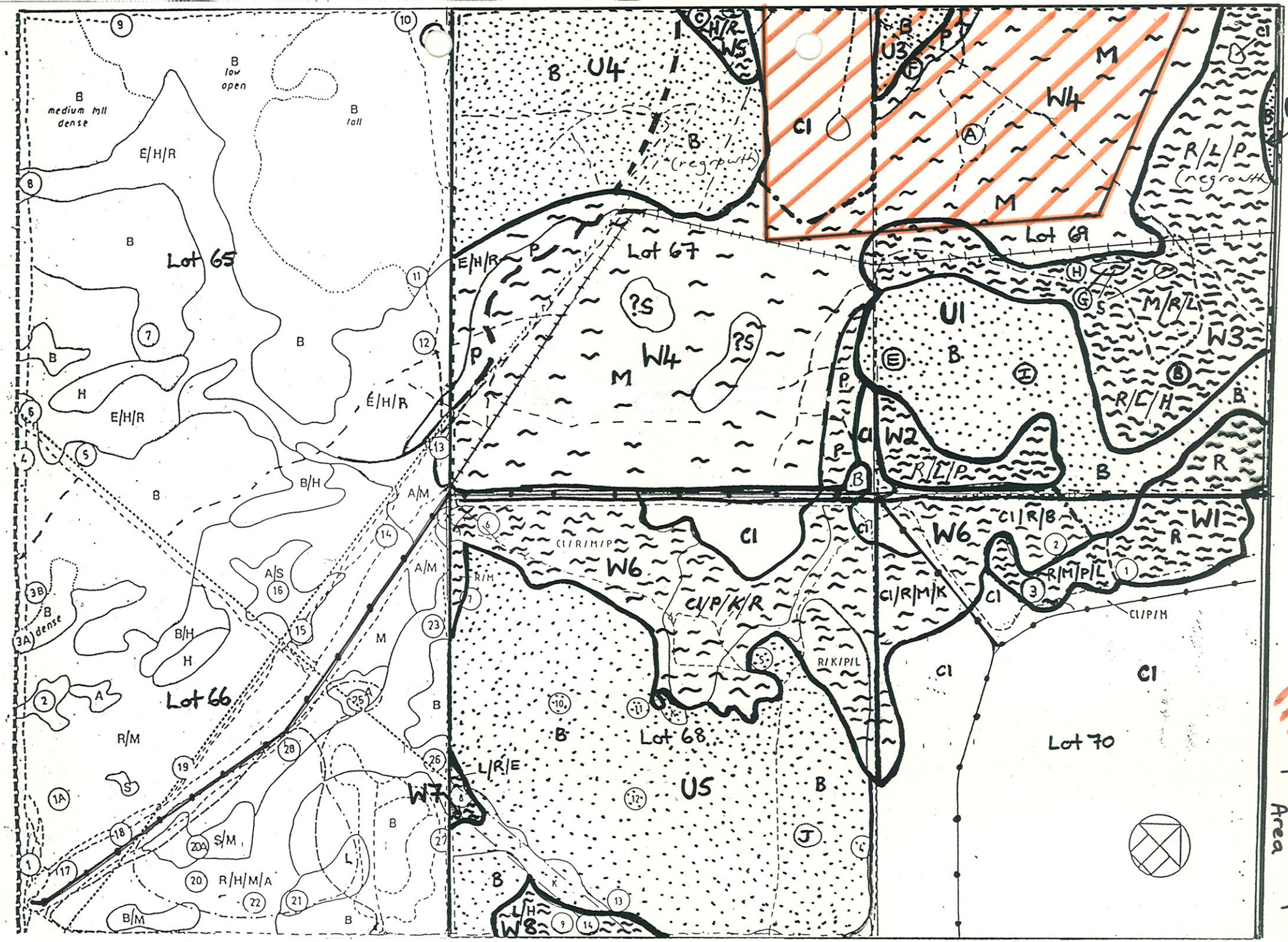
W3
W4
W5
W6
W7
W8
CI


MAP 4 - OPTION B
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium hill dense
B low open
B tall
E/H/R
B/H
A/M
A/S
R/M
S/M
R/H/M/A
B/M
L/R/E
L/H
W1
W2
W3
W4
W5
W6
W7
W8
U1
U3
U4
U5
C1
M/R/L
R/L/P (regrowth)
C1/R/M/P
C1/P/K/R
C1/R/B
C1/R/M/K
R/M/P/L
C1/P/M
R/K/P/L
?S


MAP 5 - OPTION C
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
U1
U2
U3
U4
U5
W1
W2
W3
W4
W5
W6
W7
W8
B medium hill dense
B low open
B tall
E/H/R
B/H
A/M
A/S
R/M
S/M
R/H/M/A
B/M
L/R/E
L/H
C1/R/M/P
C1/P/K/R
R/K/P/L
C1/R/M/K
C1/R/B
R/M/P/L
C1/P/M
M/R/L
R/L/P (regrowth)
B (regrowth)
C1
?S



MAP 6 - OPTION D


MAP 7 - OPTION E
Proposed Development Area
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
B medium hill dense
B low open
B tall
E/H/R
B/H
A/M
A/S
R/M
R/H/M/A
S/M
B/M
U1
U2
U3
U4
U5
W1
W2
W3
W4
W5
W6
W7
W8
Cl
Cl/R/M/P
Cl/P/K/R
Cl/R/M/K
Cl/R/B
R/M/P/L
Cl/P/H
R/K/P/L
L/R/E
L/H
M/R/L
R/L/P (regrowth)
R/C/H
?S

APPENDIX 1

WATER AND RIVERS
COMMISSION

YOUR REF
OUR REF 12123
ENQUIRIES Melissa Patt
DIRECT TEL (08) 9278 0451

Karen Clarke
Department of Environmental Protection
Westralia Square
141 St Georges Terrace
PERTH WA 6000

Dear Karen

Re: **DETAILED ASSESSMENT OF BUSHPLAN SITE NO. 342 – Anstey/Keane Dampland and Adjacent Bushland, Forrestdale**

Thankyou for allowing the Water and Rivers Commission the opportunity to comment on the potential inclusion of the Anstey/Keane dampland, Forrestdale into Bushplan.

Officers of the Commission undertook a site visit on the 9th November 1999 with yourself and officers from the Ministry for Planning. The visit was to assess the site for suitability for inclusion into Bushplan. Having completed the site assessment, the Commission feels that the extent, type and condition of the vegetation would warrant the site having Conservation Category status and would support Option A.

This is further warranted by the recognition of the significance of the site, it being of viable size and being the second most diverse Bushplan site. The Commission supports the Department of Environment's conclusion that in terms of conservation of biodiversity and representation, any reduction in area of the wetland will be deleterious.

The Commission would support a recommendation for the inclusion of the Anstey/Keane dampland, Forrestdale into Bushplan.

Yours sincerely

Dr Luke Pen
A/MANAGER
CATCHMENT AND WATERWAYS MANAGEMENT BRANCH
14th January 2000

APPENDIX 4 - VEGETATION SAMPLE SITE DESCRIPTIONS (DEP 1999)

Upland 1
Site E (Vegetation Assn B2) - Rise between wet flat and seasonal wetland
Banksia ilicifolia Open Forest to Woodland with patches of adjacent *B. attenuata* and *Allocasuarina fraseriana*
Condition excellent - very good, burnt ~1 yr ago
Variations Band beside Site E - *Regelia*, same condition

Upland 1
Site I (Vegetation Assn B2) - Rise between wet flat and seasonal wetland
Banksia attenuata ? Woodland(with scattered *Eucalyptus todtiana, Nuytsia floribunda* and *Allocasuarina fraseriana* over scattered *Adenanthos cygnorum* ? Shrubland) over *Acacia pulchella* and *Lechenaultia floribunda* Heath/Shrubland.
Condition very good, burnt in very hot fire in past, patches of veldt grass but good seedling regrowth.

Upland 4
Site D (Vegetation Assn B1) - Rise between wet flat and seasonal wetland
Banksia attenuata, B. menziesii, Allocasuarina fraseriana and *Banksia ilicifolia* Low Open Woodland
Condition excellent - very good, cleared ~10-20 yrs ago, Banksia more open, patches of uncleared trees.

Upland 5
Site J (Vegetation Assn B1) - Rise between wet flat and seasonal wetland
Banksia attenuata, B. menziesii and *B. ilicifolia* Open Forest over *Kunzea ericifolia, Xanthorrhoea preissii* and *Acacia pulchella* ? Shrubland over *Leucopogon conostephioides, Petrophile linearis* and *Calytrix aurea/flavescens* Low Shrubland.
Condition excellent, perennial veldt grass at edges only.

Wetland 3
Site B (Vegetation Assn R/H/P) Dry flat?, sand
Regelia ciliata, Astartea aff. *fascicularis* and *Pericalymma ellipticum* Heath/Shrubland? with scattered emergent and clumps of *Melaleuca preissiana*
Condition excellent - good
Variations Band beside Site B - *Hypocalymma angustifolia* and scattered *Adenanthos obovatus* Open Heath? over *Phlebocarya ciliata* and *Dasypogon bromeliifolius* Open Herbland and *Hypolaena exsulca* Sedgeland?

Wetland 3
Site G (Vegetation Assn S) - Seasonal wetland, clay
Melaleuca rhaphiophylla Shrubland over *Centrolepis polygyna* Closed Annual Sedgeland, *Cotula coronopifolia, Goodenia sp., Calandrinia sp.* and *Stylidium sp.* ? Herbland and **Vulpia myuros, *Aira caryophyllea* and **Briza minor* Very Open Grassland.
Condition very good - good, weedy grass layer

Wetland 3
Site H (Vegetation Assn R/L/V) - Wet flat, sandy clay
Melaleuca rhaphiophylla Tall Open Shrubland (regrowth) over *Melaleuca incana* Heath/Shrubland? over *Pericalymma ellipticum* and *Verticordia densiflora* Low Open Shrubland (regrowth).
Condition excellent - very good, burnt in very hot fire in past, seedlings of *Pericalymma ellipticum, Regelia ciliata* and *Verticordia densiflora* present.

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Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

Wetland 4
Site A (Vegetation Assn M) - Seasonal wetland, sumpland, clayey sand
Melaleuca lateritia, M. viminea and M. teretifolia Closed Heath (with patches of *Melaleuca incana*) over Sedgeland dominated by *Lepidosperma longitudinale* and/or *Lepyrodia ?muirii* over Exotic Herbland

Condition: Good - Degraded (patches Very Good)

Comments: Herb layer almost entirely weeds throughout Wetland 4 (see Map 2), some patches in Very Good condition where there is an intact sedge layer and *Villarsia albiflora*. Much of Wetland 4 has been recently burnt. Unburnt patches in Lot 69 have a closed canopy of *Melaleuca* species. Observations from the perimeter of Lot 67 indicate that this area has also been burnt. The Exotic Herbland has probably been the result of past clearing and grazing. Grazing has apparently ceased and the *Melaleuca* species are regenerating/have regenerated

Variations: Centre of wetland, deeper water - *Baumea articulata* Sedgeland, scattered *Triglochin* sp. in open water; patch of *Amphibromus neesii* Grassland
Edge of wetland - *Aotus intermedia, Astartea* aff. *fascicularis.* and *Regelia ciliata* Closed Heath

Wetland 4
Site F (Vegetation Assn P) - Lower dune slope beside seasonal wetland
Aotus intermedia, Astartea aff. *fascicularis* and *Regelia ciliata* Closed Heath with scattered emergent and clumps of *Melaleuca preissiana.*

Condition: very good - good, burnt, seedlings apparent, ground v. weedy in patches

Wetland 5
Site C (Vegetation Assn R/H/E) - Wet flat, sandy-clay (very fine)
Regelia ciliata, Pericalymma ellipticum and *Melaleuca sp. B* Open Low Heath with emergent *Melaleuca preissiana* and *Nuytsia floribunda.*

Condition: excellent - very good, burnt and rolled but good regrowth

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

APPENDIX 2 - SITE DESCRIPTION

ANSTEY/KEANE DAMPLAND AND ADJACENT BUSHLAND, FORRESTDALE

Bushplan Site no. 342 **Map no.** 69, 75, 76

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

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, Sp2)

VEGETATION AND FLORA

Vegetation Complexes

Combinations of Bassendean Dunes/Pinjarra Plain
Southern River Complex

Floristic Community Types: *not sampled, types inferred

Supergroup 2: Seasonal Wetlands
*4 *Melaleuca preissiana* damplands
*5 Mixed shrub damplands
*8 Herb-rich shrublands in clay pans
*10a Shrublands on dry clay flats
* S2 Northern *Pericalymma ellipticum* dense low shrublands

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: sumpland, dampland, artificial channel

Natural Wetland Groups

Bassendean—Pinjarra transition OR Bassendean with fluvial features
Bennett Brook (B/P.4)

Wetland Management Objectives: Conservation (235 ha), Resource Enhancement

Swan Coastal Plain Lakes EPP: none identified

THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Not determined, Endangered (floristic community type 10a), Vulnerable (floristic community type 8)

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: vegetated wetland, vegetated uplands

Vegetation and Flora: detailed survey (part Bushplan Site — Keighery, G J, 1992a, Weston 1989a and 1990); limited survey (Trudgen 1990)

Structural Units: mapping (Weston 1989a and 1990); general mapping (Trudgen 1990)
Uplands: *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland to Low Open Forest, with scattered *Eucalyptus marginata, E. todtiana* and *Nuytsia floribunda*
Wetlands: *Melaleuca preissiana* Low woodland; *Kunzea ericifolia* Tall Open Scrub; *Melaleuca rhaphiophylla* and *M. viminea* Tall Open Scrub; *Melaleuca teretifolia, M. viminea, M. incana, M. uncinata, M. lateriflora* and *M. lateritia* Open Heath; *Actinostrobus pyramidalis* Tall Open Shrubland; *Regelia ciliata* Closed to Open Heath; *Pericalymma ellipticum* Closed to Open Heath; mixed Heath; *Evandra pauciflora* Sedgeland; mixed Herbland; (Many of the wetland communities are typical of the Pinjarra Plain and occur together in the area as a mosaic.)

Vegetation Condition: >75% Excellent to Pristine, <25% Very Good to Good, with areas of severe localised disturbance (Trudgen 1990)

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

Total Flora: 381 native taxa (Keighery, G J, 1992a) (estimated >70% expected flora)
Significant Flora: *Diuris purdiei* (R) (Weston 1989a), *Jacksonia sericea* (3), *Tripterococcus paniculatus* ms (1), *Stylidium mimeticum* (3), *Stylidium longitubum* (3) (Keighery, G J, 1992a), *Villarsia submersa* (4), *Verticordia lindleyi* subsp. *lindleyi* (4), *Drosera occidentalis* (4) (Keighery, G J, 1992a); *Banksia telmatiaea*, *Restio stenostachyus*, *Beaufortia squarrosa*, *Stylidium utricularioides*, *Pityrodia uncinata* (southernmost population, Keighery, G J, 1992a), *Dysphania glomulifera* subsp. *glomulifera* (one of two populations on the Swan Coastal Plain, Keighery, G J, 1992a), *Evandra pauciflora*, *Myriocephalus helichrysoides* (Weston 1990), *M. isoetes*, *Blancoa canescens* (Weston 1990)

Fauna: no systematic survey. Significant mammal species: Quenda (Friend 1996 D)
Linkage: adjacent bushland to the north (BS413 across road), east and west; part of proposed Greenway 142 (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); 'wetland of special note' (Payne 1993a); majority Bushplan Site Category One Area Middle Canning Catchment Study (Evangelisti & Associates *et al.* 1995); one of the most plant species diverse areas on the Swan Coastal Plain in the PMR, currently considered second to BS387); contains plant communities representative of the eastern side of the Swan Coastal Plain

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Not listed

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

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

APPENDIX 3 - DETAIL OF THE SELECTION CRITERIA

Representation of ecological communities:
Vegetation Complexes
Combinations of Bassendean Dunes/Pinjarra Plain
Southern River Complex
Floristic Community Types: *not sampled, types inferred
Supergroup 2: Seasonal Wetlands
*4 *Melaleuca preissiana* damplands
*5 Mixed shrub damplands
*8 Herb-rich shrublands in clay pans
*10a Shrublands on dry clay flats
* S2 Northern *Pericalymma ellipticum* dense low shrublands
Supergroup 3: Uplands centred on Bassendean Dunes
*21c Low lying *Banksia attenuata* woodlands or shrublands
*22 *Banksia ilicifolia* woodlands
*23a Central *Banksia attenuata* — *B. menziesii* woodlands

Diversity
Regional floristic groups
Wetlands (at least 5 types)
Banksia woodlands (2 in Site description, additional 1 from recent field work, floristic community type 22)
Vegetation Associations (see mapped units after Weston, Map X)
Species: 381 native taxa (Keighery, GJ, 1992a) (estimated >70% expected flora), one of the most plant species diverse areas on the Swan Coastal Plain in the Perth Metropolitan Region, currently considered second to BS387

Rarity
Community
Endangered (floristic community type 10a), Vulnerable (floristic community type 8)
Species
Flora: *Diuris purdiei* (R) (Weston 1989a), *Jacksonia sericea** (3), *Tripterococcus paniculatus* ms (1), *Stylidium mimeticum* (3), *Stylidium longitubum* (3) (Keighery, GJ, 1992a), *Villarsia submersa* (4), *Verticordia lindleyi* subsp. *lindleyi* (4), *Drosera occidentalis* (4) (Keighery, GJ, 1992a); *Banksia telmatiaea*, *Restio stenostachyus*, *Beaufortia squarrosa*, *Stylidium utricularioides*, *Pityrodia uncinata* (southernmost population, Keighery, GJ, 1992a), *Dysphania glomulifera* subsp. *glomulifera* (one of two populations on the Swan Coastal Plain, Keighery, GJ, 1992a), *Evandra pauciflora*, *Myriocephalus helichrysoides* (Weston 1990), *M. isoetes*, *Blancoa canescens* (Weston 1990) (* error, should read *J. gracilis)*

Fauna: Quenda (Friend 1996 D)

Scientific or evolutionary importance
Series of newly recognised taxa, taxa at their range ends, disjunct populations, taxa that need further study for example one of the *Stylidium* species collected in November field work not as yet identified. Eastern side of the Plain communities complex and relatively poorly known.

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation

Diversity of wetland types (sumpland, dampland), floristic units, vegetation structural units and as a consequence habitat types related to the variety of bases - clay, clay/sands and humus rich sands

BS No. 342

Aerial 1999

Map Ident: plot991118_7	DATE: 18 Nov 1999
Prepared By: Sean Collingwood	Prepared For: SPC
Scale 1:10000	MFP INTERNAL USE ONLY

0 ——— 500 m

- Bushplan Sites (boundaries)
- Cadastre with Lot Numbers Blue - Overlay Images
- Conservation Category Wetlands - Boundaries
- Contours - 1m & 2m (WAWA)

MAP 1 - AERIAL PHOTOGRAPH OF BS 342 LOTS 65 - 70

, John, George, Steve, John D, Jan)

6/7/02.

eorge for VIC

900 - to locate business concepts

ew for land. (ILPA advise)

ommed)

1770's BA payroll

losed down now, import activity

with concrete (design, employment,

development)

eriods ill health - speech problems.

WA most advanced concept for

by himself (Don Buchanan)

to mill to Port (1770's)

Laura personal friend Steve's (Arbroath

relatives, ancestors

Family enterprise - Engineers, accountants

(WC Hammell son in Law)

Location for transport for raw materials

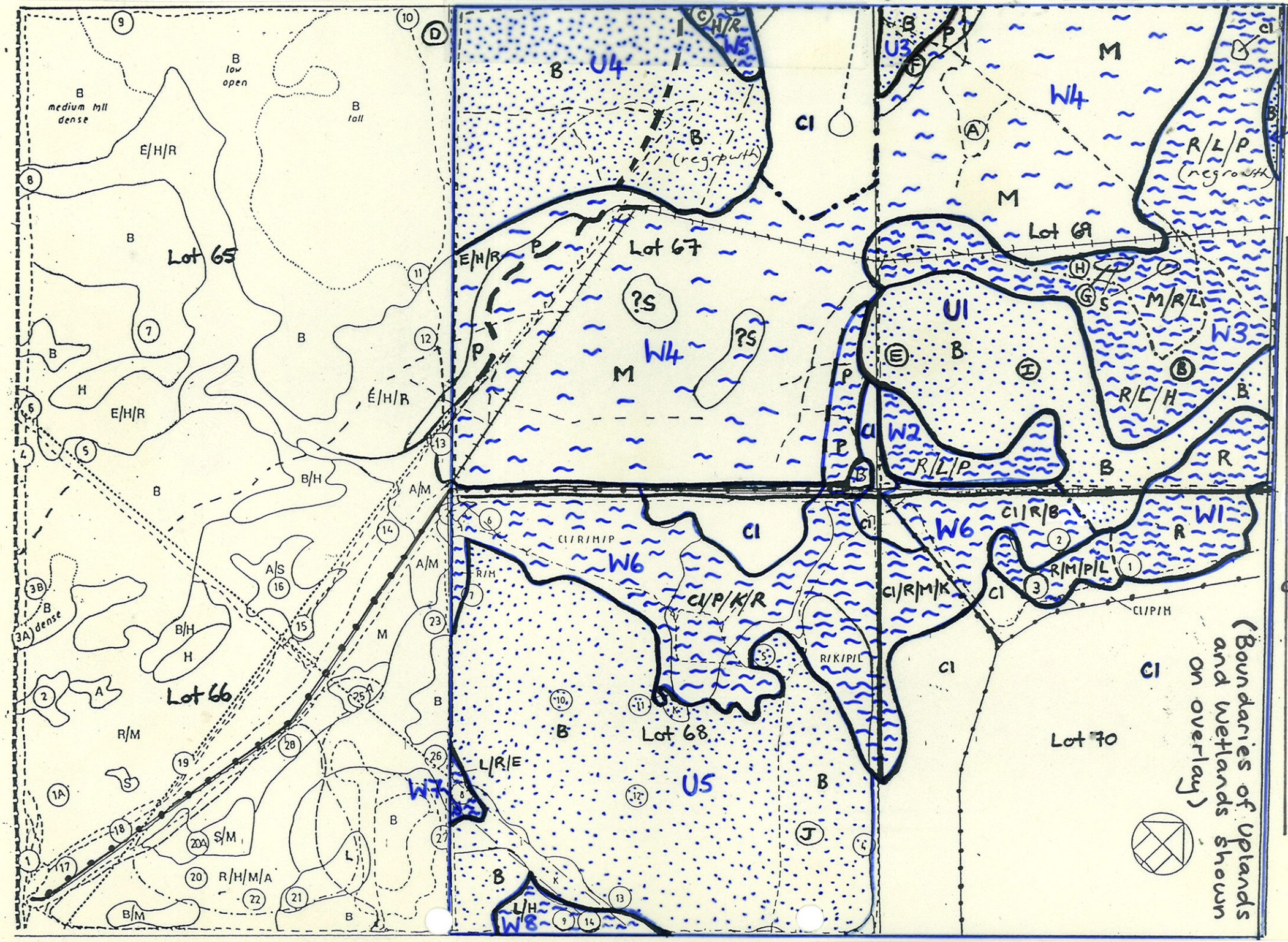
ABle to use land is right so

give much to country.

'Se

been treated by Fife'

World as 'cattle farm, playland'


MAP 2 - BS342 Lots 65-70 Vegetation Associations
(Boundaries of Uplands and Wetlands shown on overlay)
Lot 65
Lot 66
Lot 67
Lot 68
Lot 69
Lot 70
U1
U2
U3
U4
U5
W1
W2
W3
W4
W5
W6
W7
W8
B
M
R/L/P
(regrowth)
E/H/R
B/H
A/M
A/S
R/M
S/M
R/H/M/A
B/M
L/H
L/R/E
R/K/P/L
Cl/R/M/K
Cl/P/M
Cl/R/B
R/M/P/L
Cl/R/M/P
Cl/P/K/R
M/R/L
R/L/H
B/M
low open
medium mll dense
tall
(regrowth)
dense

BUSHPLAN SITE 342 - Anstey/Keane Dampland and Adjacent Bushland, Forrestdale
Department of Environmental Protection
Conservation Branch - B. Keighery and K. Clarke, January 2000

KEY TO MAP 2: BS 342 Anstey/Keane Dampland and Adjacent Bushland, Forrestdale - Vegetation Associations (after Weston 1989a and 1990)

- - - - -	Tracks
.....	Transmission Line
-●—●-	Drain
———	Vegetation Association Boundary
+++++	Parks and Recreation Boundary
1 - 27	Vegetation sampling site nos (Weston 1989a and 1990)
A - J	Vegetation sampling site nos (DEP 1999)
	Upland vegetation
	Wetland vegetation (density of shading varies to allow W1 - W8 to be distinguished)
U1 - U5	Upland area nos
W1 - W8	Wetland area nos
Cl	Cleared

UPLAND VEGETATION ASSOCIATIONS

B Banksia Low Open Forest to Low Woodland (subunits not differentiated on map)

- B1 *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* Low Woodland to Low Open Forest, with scattered *Eucalyptus marginata, E. todtiana* and *Nuytsia floribunda*
- B2 *Banksia ilicifolia* Low Open Forest to Low Woodland with patches of adjacent *B. attenuata* and *Allocasuarina fraseriana*
- B3 *Banksia attenuata* Low Woodland
- B4 *Banksia attenuata* and *Melaleuca preissiana* Low Woodland

WETLAND VEGETATION ASSOCIATIONS

A *Actinostrobus pyramidalis* Tall Open Shrubland

E *Evandra pauciflora* Sedgeland

H Mixed Heath

K *Kunzea ericifolia* Tall Closed to Tall Open Scrub

L *Pericalymma ellipticum* Closed to Open Heath

M Tall Closed to Tall Open Scrub dominated by *Melaleuca rhaphiophylla, M. viminea, Melaleuca teretifolia, M. incana, M. uncinata, M. lateriflora* and *M. lateritia* or combinations of these

P *Melaleuca preissiana* Low Woodland to Open Woodland

R *Regelia ciliata* Closed to Open Heath

S Seasonal Ponds (patchy *Melaleuca rhaphiophylla* Tall Closed to Tall Open Scrub)

V *Verticordia densiflora* Closed to Open Heath

-/-/- mosaic or mixture of vegetation units

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 it's 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 speci now recognised to be more common than previously thought (Jandakot w previously thought to be the most southerly location for this species).

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

Gonocarpos pithyoides. Found in sandy soils on the Coastal Plain, extendin nor to Gingin in Banksia woodland. It appears to be poorly collected rather tha 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 pa but has not been recollected there despite some searches. A population was recent found in the Moore River National Park (Griffin and B. Kieghery 1989) and may 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 1987), growing from Perth to south of Jandakot.

3.4.5 Other Significant Flora

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

Department of Agriculture, Western Australia.

Trudgen, M.E. (1984). The Leschenault Peninsula - a flora and vegetation su with an analysis of its conservation value and appropriate uses. Bulletin ..., Department of Conservation and Environment, Perth, W. A.

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VEGETATION AND SIGNIFICANT FLORA

IN

LOTS 65 AND 66 ANSTEY/KEANE ROADS

FORRESTDALE

CITY OF ARMADALE

Prepared for

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November 1989

BS 340

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2 Vegetation and Survey Sites in the Project Area

TABLES

1 Gazetted Rare Flora (DRF) of the Metropolitan Region

2 Gazetted Rare Flora (Government Gazette, WA, of 14 July 1989, pp. 2159, 2160)

3 Priority One, Two and Three Species of the Metropolitan Region (September 1989; from WAWRC)

PLATES

Title Page Site 25: Significant Species Habitats, *Melaleuca* Thicket, *Actinostrobus pyramidalis* (swamp cypress) - *Calothamnus hirsutus* community and Seasonal pond

1 Vegetation and Plants of the Forrestdale Project Area

2 Gazetted Rare Flora (DRF) of the Perth Metropolitan Region

3 Gazetted Rare Flora (DRF) and Some Priority Three Species (P3) of the Perth Metropolitan Region

APPENDIX

Native Plant Species Recorded in the Project Area (incomplete list)

SUMMARY

A botanical survey of the Forrestdale Project Area was carried out by car and on foot between mid-September and early November 1989. Results and discussion of the survey are summarised below.

Approximately half of the Project Area is banksia woodland, on the slightly elevated areas. The woodland covers about two-thirds of the north-western half of the Project Area and about one-third of the south-eastern half. Comparison with adjoining banksia woodland in neighbouring lots indicates that the Project Area's woodland is regenerating following the clearing of almost all of its banksias and other trees, possibly by burning.

The other half of the vegetation in the Project Area is a diversity of heath and swamp vegetation low in the landscape. The range of heath and swamp vegetation includes:

- *Regelia ciliata* Heath B to Dense Heath B,
- *Pericalymma ellipticum* Heath B to Dense Heath B,
- *Evandra pauciflora* tussock sedge savanna,
- *Melaleuca* Thicket,
- *Actinostrobus pyramidalis* (swamp cypress) communities, and
- seasonal ponds.

One hundred and thirty-five species of flora, including 29 species of orchids, recorded during the survey are listed in the Appendix. These include two gazetted rare species (Declared Rare Flora - DRF - species), one Priority Three species, and other significant species. The DRF species are *Diuris purdiei* and *Drosera occidentalis*. The Priority Three species is *Villarsia submersa*.

These species are described in Sections 5.2.1 to 5.2. 5, and the DRF species are further described in Table 1 and in captions to Plates 1A and 1F.

The Project Area is not in an area recommended for conservation by the System 6 Red Book (Environmental Protection Authority 1983) - the nearest recommended site is Forrestdale Lake (M95) - but the Red Book has no recommendations for preserving some of the plant communities found in the Project Area.

These include the *Evandra pauciflora* tussock sedge savanna and the most interesting areas identified during the survey in terms of significant species, numbers and types of orchids in them and diversity of habitats. These areas are Site 25 and the area containing Sites 20, 20A, 21 and 22. A composite of these areas is outlined in Figure 2 as the Significant Habitats Area.

Maintaining this Significant Habitats Area in its current state would protect all of the DRF species *Diuris purdiei* found in the Project Area and, with two exceptions, large proportions of the populations of the other significant species found in the Project Area, including *Villarsia submersa* and the other DRF species, *Drosera occidentalis*.

The two exceptions are *Johnsonia acaulis*, which was found only in the woodland in the northern corner, and *Evandra pauciflora*, which is abundant in lowlands west of the drain and occasional near the intersection of the transmission line and eastern boundary east of the drain.

1.0 INTRODUCTION

In a letter dated 10 August 1989 (Ref. 0.3.10), written in reference to telephone conversations with Mike Allen, of G. R. Crimp & Partners, Lyndon Mutter (for Syd Shea, Executive Director, Department of Conservation and Land Management) requested that a consultant botanist undertake a vegetation and rare flora survey of Lots 65 and 66, Anstey/Keane Roads, Forrestdale. The letter specified that the survey involve:

i. a search for declared rare flora (DRF) species, particularly:

Caladenia 'grandis' (coastal plain)	Flowers September - October
Diruis purdiei [flowers following previous summer burn]	Flowers mid Sept.- early Oct.
Drakaea jeanensis	Flowers September - November
Drakaea 'micrantha' (south west)	Flowers October
Drosera occidentalis	Flowers late Oct. - November

ii. a search for Priority One species (see Table 3 of this report)

iii. a general botanical survey:
   a. to give an overview of the floristics of the area and
   b. to identify any rare or restricted vegetation complexes

This report presents the results of the vegetation and rare flora surveys of Lots 65 and 66 (the 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.

The location of the Project Area is in the northern corner of Anstey Road and Keane Road (proposed), Forrestdale (Figure 1), and runs north-west to Hale Road (proposed). It is in the City of Armadale and is 21km south of the Perth city centre (corner of Cathedral Place and St. George's Terrace).

The vegetation and rare flora survey of the Project Area was carried out by car and on foot between mid-September and early November 1989.

DRF *Drosera* and *Drakaea* species which do not normally flower until October and November can, in the types of vegetation occuring in the Project Area, be identified from their leaves weeks in advance of their flowering. Photographs of the leaves of these species are shown in Plates 2A, 3A2 and 3B2, respectively.

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 to 1:100,000. The sheet's 1:100,000 geomorphology map shows the Project Area as being on Bassendean Dune eolian surfaces (Ed), on slopes of 0°- 3°.

The sheet's 1:50,000 scale environmental geology map shows the Project Area as being largely white to pale grey sand of eolian origin over Guildford Formation sandy-clay to clayey-sand (S10, Qpb/Qpa). There is one area of white to pale grey sand over yellow sand of eolian origin (S8, Qpb) in the northern corner of the Project Area. S10 also occurs in the lots neighbouring the Project Area, and S8 extends into the adjoining lots.

There are also relatively small areas of peaty-sand of lacustrine origin (Spl) swamp deposits (Qrw): two in the southern corner, near Keane Road, one along the central south-west boundary, and one touching the central north-eastern boundary from the north. A strip of land that is inundated during floods runs north from a few metres north of the southern corner of the Project Area; it runs parallel to the drainage canal and east of it.

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) maps it also at a scale of 1:1,000,000. 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 the Project Area as being banksia low woodland with scattered jarrah and she-oak (e2Mb.cbLi).

Heddle *et al.* show the native vegetation potential as being in the Southern River Complex (42): ope. woodland of *Eucalyptus calophylla* (marri) - *E. marginata* (jarrah) - *Banksia* species on the elevated areas and a fringing woodland of *Eucalyptus rudis* (flooded gum) -*Melaleuca rhaphiophylla* (swamp paperbark) along streams.

The relatively small scale vegetation maps by Beard and Heddle *et al.* do not reflect the diversity and complexity of the vegetation of the region in which the Projet Area lies.

3.2 Vegetation of the Project Area

The vegetation of the Project Area, as observed during field work and interpreted from large scale colour aerial photographs flown in December 1988 and 1:5,000 orthophoto maps, is described below. A map of vegetation survey sites and the vegetation of the Project Area is shown in Figure 2. Representative stands of vegetation are illustrated and described in Plate 1. The system of vegetation classification used in this report, where appropriate and capitalised, follows Muir (1977).

Approximately half of the Project Area is Banksia Low Woodland A to Open Low Woodland A on slightly elevated areas. The woodland covers about two-thirds of the north-western half of the Project Area and about one-third of the south-eastern half. Comparison with adjoining Banksia Low Woodland A (or Low Forest A) in neighbouring lots indicates that the Project Area's woodland has been cleared of a large proportion of its banksias and other trees, possibly by burning.

Eucalyptus marginata (jarrah), *E. todtiana* (prickly-bark), *Banksia menziesii, B. attenuata, Allocasuarina fraseriana* (she-oak) and *Nuytsia floribunda* (christmas tree) are scattered dominants of the woodland. Characteristic tall shrubs, the dominants in most cases, in the woodland are *Kunzea ericifolia, Melaleuca thymoides, Xanthorrhoea preissii* and *Adenanthos cygnorum*. The principal herbaceous species are *Dasypogon bromeliifolius, Phlebocarya ciliata* and *Patersonia ? occidentalis*.

Additional descriptions of the Project Area's banksia woodlands are given in Plate 1B.

The other half of the vegetation in the Project Area is a diversity of heath and swamp vegetation low in the landscape. The range of heath and swamp vegetation includes:

- *Regelia ciliata* Heath B to Dense Heath B,
- *Pericalymma ellipticum* Heath B to Dense Heath B,

- o *Evandra pauciflora* tussock sedge savanna,
- o *Melaleuca* Thicket,
- o *Actinostrobus pyramidalis* (swamp cypress) communities, and
- o seasonal ponds.

These types of heath and swamp vegetation are described briefly below, and there are additional details in the captions to Plate 1.

3.2.1 *Regelia ciliata* Heath B to Dense Heath B (see Plates 1A, 1C, 1E)

Regelia ciliata heath is the dominant vegetation over much of the low-lying area which is only rarely inundated if at all. *Regelia ciliata* usually forms near monospecific stands but is not uncommon as a component of other communities. *Jacksonia sternbergiana, Banksia sphaerocarpa* and *Thysanotus patersonii* are conspicuous in some dense stands of *Regelia ciliata*, as at Site 17.

3.2.2 *Pericalymma ellipticum* Heath B to Dense Heath B (see Plate 1E)

In slightly lower areas that are inundated for longer periods, *Pericalymma ellipticum* forms monospecific stands. These stands cover a much smaller part of the Project Area than *Regelia ciliata* heath, though they are much more extensive and common in the Metropolitan Region than the *Regelia.*

3.2.3 Mixed heath (see Plate 1C)

Regelia ciliata heath and *Pericalymma ellipticum* heath grade into each other and also are components of an often lower, more open and more variable mixed heath. Other components of mixed heath include *Dryandra nivea, Banksia sphaerocarpa, Stirlingia latifolia* and species of *Petrophile, Conostylis* and Restionaceae.

3.2.4 *Evandra pauciflora* tussock sedge savanna (see Plate 1D)

Along with *Regelia ciliata* heath and mixed heath, *Evandra pauciflora* tussock sedge savanna covers most of the low-lying half of the Project Area. Small *Melaleuca preissiana* trees are dotted through the savanna, while *Acacia pulchella* and other smaller shrubs are common.

3.2.5 *Melaleuca* Thicket (see Plates: Title Page, 1A)

Melaleuca Thickets to 2m tall and taller are most common in lowlands on both sides of the drain and are dominated by various species of *Melaleuca.* The most common species are *Melaleuca ? rhaphiophylla* and *M. viminea.* Other *Melaleuca* dominants in some Thickets are *M. incana, M. cuticularis, M. ? laterifia,* and *M. lateriflora..*

Some of the thickets surround seasonal ponds and depressions that hold water for only a few days following winter and spring rains. Many of the depressions, and other areas, have been torn up by motorcycles and four-wheel drive vehicles.

One such area is Site 2, which has *Melaleuca cuticularis, Gahnia trifida, Brachycome iberidifolia, Polypompholyx multifida* and a few alien weeds.

3.2.6 *Actinostrobus pyramidalis* (swamp cypress) communities (see Plates: Title Page, 1G, 1H)

According to Marchant *et al.* (1987), swamp cypress is " widespread in the Perth Region on sandy soil subject to winter inundation" and extends from Wongan Hills to Ravensthorpe. However, the type of community in the Project Area in which it is the dominant species, along with *Banksia sphaerocarpa* and *Calothamnus hirsutus*, is considered to be rare in the Metropolitan Area (L. Mutter: 10.8.89). The herbaceous small plant component of the community is particularly interesting and includes the DRF species *Drosera occidentalis.*

3.2.7 Seasonal ponds (see Plates: Title Page, 1F)

Though not rich in species, some of the seasonal ponds in the Project Area are of importance in being habitats for two species of *Villarsia V. capitata* and *V. submersa.*

3.3 Flora

The flora of the Project Area is described above and in captions to Plate 1 in terms of vegetation components. No attempt has been made to make a comprehensive listing of the Project Area flora, except the orchids, but the native species noted during traverses of the Project Area are listed in the Appendix. The orchid list of 29 species in the Appendix is more comprehensive than for other families, thanks to input of CALM botanists and members of the Native Orchid Society. The DRF species, Priority Species and other significant species found during the survey are discussed in Section 5.

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 o 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. During the time 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, 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 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, Section 4, 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 presumed threats to the continued survival of endangered species. 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 southwestern 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).

4.2 'Significant' Species

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

- rare, geographically restricted or apparently rare or restricted because they are poorly collected or recorded,
- at the limits of their ranges or in areas outside their normal ranges or habitats,
- particularly susceptible or vulnerable to environmental changes, especially ones caused by humans, either directly or indirectly,
- 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
- 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 teminology 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 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 ar Keighery (1979) list, addition of newly described species and local botanists' knowledge of species distributions and abundance. Gazettal 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 list of gazetted flora does not include all, or probably even a majority of, rare species. The current list (14 July 1989) concentrates on the southwestern 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 southwest 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 gazettal and being considered for gazettal.

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,

- Priority Four Species - species presumed to be extinct, and

- 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.

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:

- Gazetted Rare Flora (Government Gazette, WA, of 14 July 1989, pp. 2159, 2160), particularly those listed in Table 1 of this report,

- Priority One, Two and Three Species of the Metropolitan Region (provided by the WAWRC).

The lists are presented in this report as Tables 2 and 3, respectively. During the Project Area survey, an emphasis was placed on finding the eight Metropolitan Region DRF species listed and described in Table 1. Photographs of the eight species, and others, are shown in Plates 2 and 3, and additional information about them is given in the captions to the plates and, though not as up-to-date, 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 listed in Table 1 are all herbaceous plants and flower in the period between August and November. Most are species of low-lying areas and seasonal wetlands.

The flowering times given in the table suggest the period when a survey for the species could be undertaken most productively. However, in the case of the Drakaeas and the *Drosera* the leaves are distinctive enough for identification of the species before they flower. Consequently, surveys done between mid-September and mid-October should have been able to identify any of the species in Table 1 if any populations of them had been found.

5.2 Significant Plant Species found in the Project Area

Two DRF species, one Priority Three species and four other significant species were found during the survey.

These species are described below, in Sections 5.2.1 to 5.2. 5, and the DRF species are further described in Table 1. The descriptions are based upon my notes, field records and observations, upon information in Marchant *et al.* (1987) and upon information from WAWRC and Western Australian Herbarium botanists.

5.2.1 Diuris purdiei (DRF: Plates 1E, 2F)

Three contiguous populations of *Diuris purdiei* were found in the Project Area, in an area of *Pericalymma ellipticum* and *Regelia ciliata* heath which had been burnt since tha aerial photographs were flown in April 1989. The populations of *Diuris purdiei* extended between and slightly beyond Sites 20 and 22, in the central area between Anstey Road and the drain. Botanists from the Native Orchid Society and WAWRC counted numbers in the populations on field trips in October 1989, and recorded totals of up to 30 to 35 plants per count. As there was an overlapping sequence of flowering, the total number in the populations found is estimated to be between 50 and 100.

Other populations of the species probably occur in favorable coastal plain habitats of *Regelia* and *Pericalymma* heath, but the existence of such populations can be confirmed only during flowering after favourable burns.

5.2.2 Drosera occidentalis (DRF: Plates: Title Page, 2A)

During surveys of habitat favourable for *Drosera occidentalis* near the drain and on both sides of it, L. Mutter (pers. comm.) found more than 1,000 plants believed to belong to that species. The population was almost continuous along the length of the drain and extended into the lot northeast of the Project Area. This appears to be the largest recorded population of *Drosera occidentalis*.

5.2.3 Villarsia submersa (P3: Plates: Title Page, 1F, 3D)

Villarsia submersa was found in seasonal ponds in the same areas in which *Drosera occidentalis* was recorded and, like the *Drosera*, is believed to be better represented in the Project Area than anywhere else it has been found. The *Villarsia* is most abundant in the Site 20A ponds.

5.2.4 Evandra pauciflora (2K: Plate 1D)

According to Marchant *et al.* (1987) the tussock sedge *Evandra pauciflora* occurs on the coastal plain and coastal areas between Forrestdale and Albany, where it is relatively rare and poorly collected. Although it is not on any Priority Species list, it is listed by Briggs and Leigh (1988) as a 2K species i.e. a very restricted but poorly known species. The stands of *Evandra pauciflora* in the Project Area are larger than any I have seen further south.

5.2.5 Other Significant Species

At least four poorly collected herbaceous plants that are not DRF or Priority species or listed by Briggs and Leigh (1988) were also found during the surveys. One, *Johnsonia acaulis,* was found in banksia woodland in the northern corner. At least three, *Myriocephalus helichrysoides, Velleia trinervis* (pale-flowered form) and *Tribonanthes* sp. 2, were found in the Significant Species Habitats Area shown on Figure 2 as including Sites 20, 20A, 21, 22 and 25.

The significant and other species recorded as being in the Significant Species Habitats Area shown in Figure 2 are indicated in the Appendix.

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. Superficially, seasonal ponds in the Project Area appear similar to those along Brixton Road, Kenwick, which have populations of the DRF species *Aonogeton hexatepalus* and*Hydrocotyle lemnoides*, the DRF species *Villarsia submersa* and *Helipterum pyrethrum*, and several other significant species. None of these species in the Brixton Road pools, except the *Villarsia*, was found in the Project Area.

Perhaps the absence of these species in the Project Area is due to subtle but significant differences in habitat. For instance, Jordan (1986) shows the environmental geology of the Brixton Road area as white-grey to brown sandy-clay (Cs), none of which is shown as occurring in the Project Area.

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.

Native plant habitats in the Project Area considered to be significant are:

- *Regelia ciliata* and*Pericalymma ellipticum* heaths as habitat for *Diuris purdiei* (Plate 1E),
- *Evandra pauciflora* tussock sedge savanna (Plate 1D),
- *Actinostrobus pyramidalis* (swamp cypress) - *Calothamnus hirsutus* communities (Plates: Title Page, 1G, 1H), intrinsically and as habitat for *Drosera occidentalis*, and

- the seasonal ponds that are habitat for *Villarsia submersa*. (Plates: Title Page, 1F); Some of the areas bordering pools, as Site 25 and between Sites 20 and 20A, are habitats for a rich flora of attractive and interesting species.

All of these habitats, except *Evandra pauciflora* tussock sedge savanna, appear to be best-represented in the Significant Species Habitats Area shown in Figure 2.

6.0 DISCUSSION

The Project Area is not in an area recommended for conservation by the System 6 Red Book (Environmental Protection Authority 1983) - the nearest recommended site is Forrestdale Lake (M95) - but the Red Book has no recommendations for preserving some of the plant communities found in the Project Area.

These include the *Evandra pauciflora* tussock sedge savanna and the most interesting areas identified during the survey in terms of significant species, numbers and types of orchids in them and diversity of habitats. These areas are Site 25 and the area containing Sites 20, 20A, 21 and 22. A composite of these areas is outlined in Figure 2 as the Significant Habitats Area.

Maintaining this Significant Habitats Area in its current state would protect all of the DRF species *Diuris purdiei* found in the Project Area and, with two exceptions, large proportions of the populations of the other significant species found in the Project Area, including *Villarsia submersa* and the other DRF species, *Drosera occidentalis*.

The two exceptions are *Johnsonia acaulis*, which was found only in the woodland in the northern corner, and *Evandra pauciflora*, which is abundant in lowlands west of the drain and occasional near the intersection of the transmission line and eastern boundary east of the drain.

7.0 ACKNOWLEDGEMENTS

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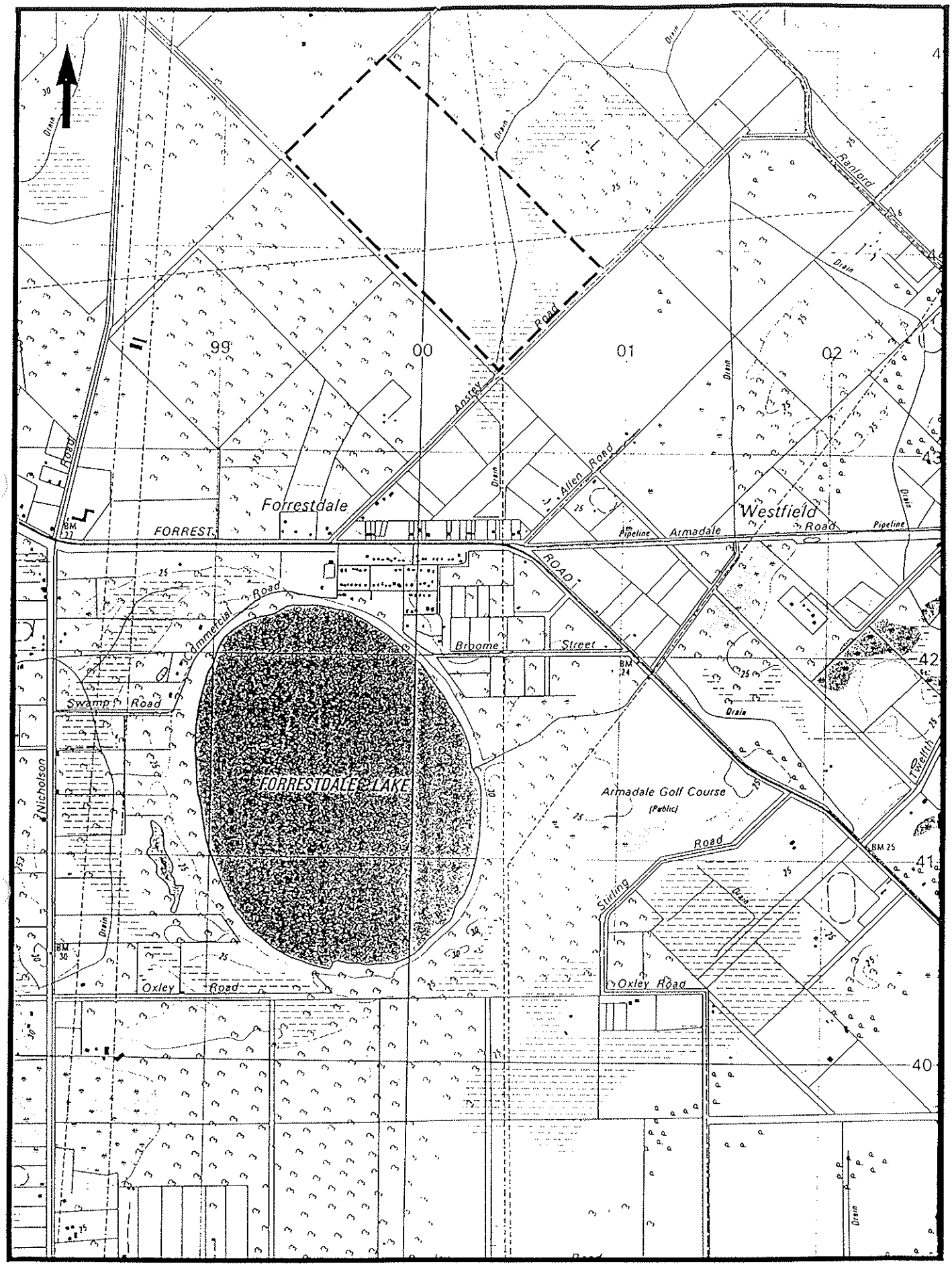
FIGURES



LOCATION OF THE PROJECT AREA

SCALE 1: 25 000

500m 0 1 2 3 Kilometres

Figure 1

Forrestdale Project Area Vegetation Units - Figure 2
(descriptions of units are given in Section 3.2 and captions for Plate 1)

A	*Actinostrobus pyramidalis* (swamp cypress) communities
B	Banksia woodland (regenerating)
E	*Evandra pauciflora* tussock sedge savanna
H	Mixed heath
M	*Melaleuca* Thicket
P	*Pericalymma ellipticum* Heath B to Dense Heath B
R	*Regelia ciliata* Heath B to Dense Heath B
S	Seasonal ponds
E/H/R	Mosaic or mixture of *Evandra pauciflora* tussock sedge savanna, Mixed heath and *Regelia ciliata* heath, with the savanna vegetation most abundant or prominent and the *Regelia ciliata* heath least prominent or abundant
B/H, A/M, A/S, R/M, R/H/M, S/M	Similar relationships as for E/H/R

CAPTIONS - PLATE 1

Vegetation and Plants of the Anstey Road, Forrestdale Project Area

Title Page Site 25 *Actinostrobus pyramidalis* (swamp cypress) community, seasonal pools, *Melaleuca* Thicket and, on other side of fence in far background, mature banksia-eucalypt open forest. *Banksia sphaerocarpa* and *Calothamnus hirsutus* are with the swamp cypress; *Melaleuca viminea* and *M. ? rhsphiophylla* border the pool; *Villarsia submersa* are visible in the pool, and the herbaceous small plant community in close foreground is habitat for *Utricularia violacea* and DRF species *Drosera occidentalis*. (ASW89.10.II-20)

A Site 1 *Melaleuca* Thicket in southern corner of Project Area, with tracks, seasonal pond and damage done by motorcycles and 4-wheel drive vehicles. The dominants are 1.5 to 3m tall shrubs of *Melaleuca viminea* and *M. ? rhaphiophylla*. (ASW89.9.II-20)

B Site 3B Open, scrubby, regenerating *Banksia attenuata - B. menziesii* woodland with *Banksia ilicfolia, Eucalyptus todtiana, E. marginata, Kunzea ericifolia, Melaleuca thymoides, Jacksonia sternbergiana, Patersonia occidentalis* and other species. It ends abruptly at fence, with mature eucalypt-banksia open forest on other side. A band of *Regelia ciliata* with *Pericalymma ellipticuk, Acacia pulchella* and scattered *Melaleuca preissiana* is in foreground. (ASW89.9.II-22)

C Site 4 *Regelia ciliata* heath with *Pericalymma ellipticum* (in local patches), *Acacia pulchella* and scattered *Melaleuca preissiana* prominent. (ASW89.9.II-23)

D Site 8 *Evandra pauciflora* tussock sedge savanna, with pair of kangaroos, *Pericalymma ellipticum, Regelia ciliata* and *Acacia pulcella*. In background (to north-east): regenerating banksia woodland with *Jacksonia sternbergiana, Kunzea ericifolia, Melaleuca preissiana,* jarrah and banksias. (ASW89.9.I-16)

E Site 20 DRF species*Diuris purdiei* habitat regenerating after recent fire. Open shrubland of dead *Regelia ciliata* and-*Banksia sphaerocarpa* in foreground; dense, dead heath of *Pericalymma ellipticum* behind it. (ASW89.10.IA-11)

F Site 20A The largest pool in a string of seasonal pools supporting Priority Three species*Villarsia submersa*, of which there is one plant visible in lower left-hand corner. Other plants visible in the pool include *Halosarcia ? lepidosperma, Triglochin procera, Villarsia capitata* and species of grass and Asteraceae. *Melaleuca* Thicket, some of it burnt, is in background and borders pool. (ASW89.9.II-18)

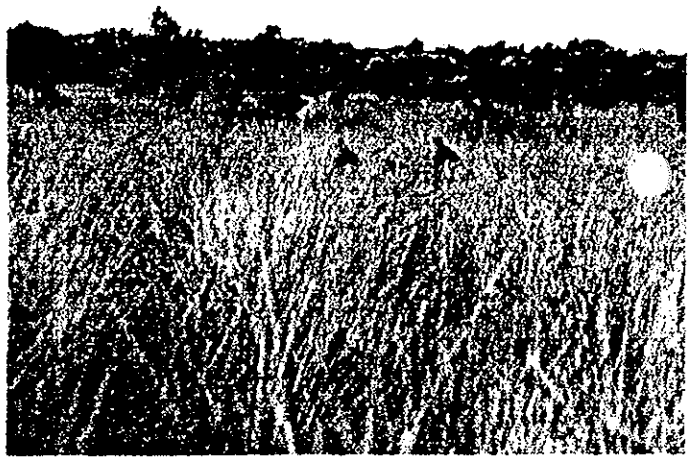
G Site 23 *Actinostrobus pyramidalis* (swamp cypress) community with *Banksia sphaerocarpa, Pericalymma ellipticum* and *Regelia ciliata*. Grading northwards into *Melaleuca* Thicket. (ASW89.10.I-14)

H Site 25 Suite of herbaceous, mostly small plants in *Actinostrobus pyramidalis* (swamp cypress) community. Species include *Diuris* 'carinata' (in centre), *Polypompholyx multifida, Brachycome iberidifolia, Anigozanthos viridis,* DRF species *Drosera occidentalis*, other species of *Drosera* and at least one species of *Centrolepis*. (ASW89.10.II-19)

A

B

C



D

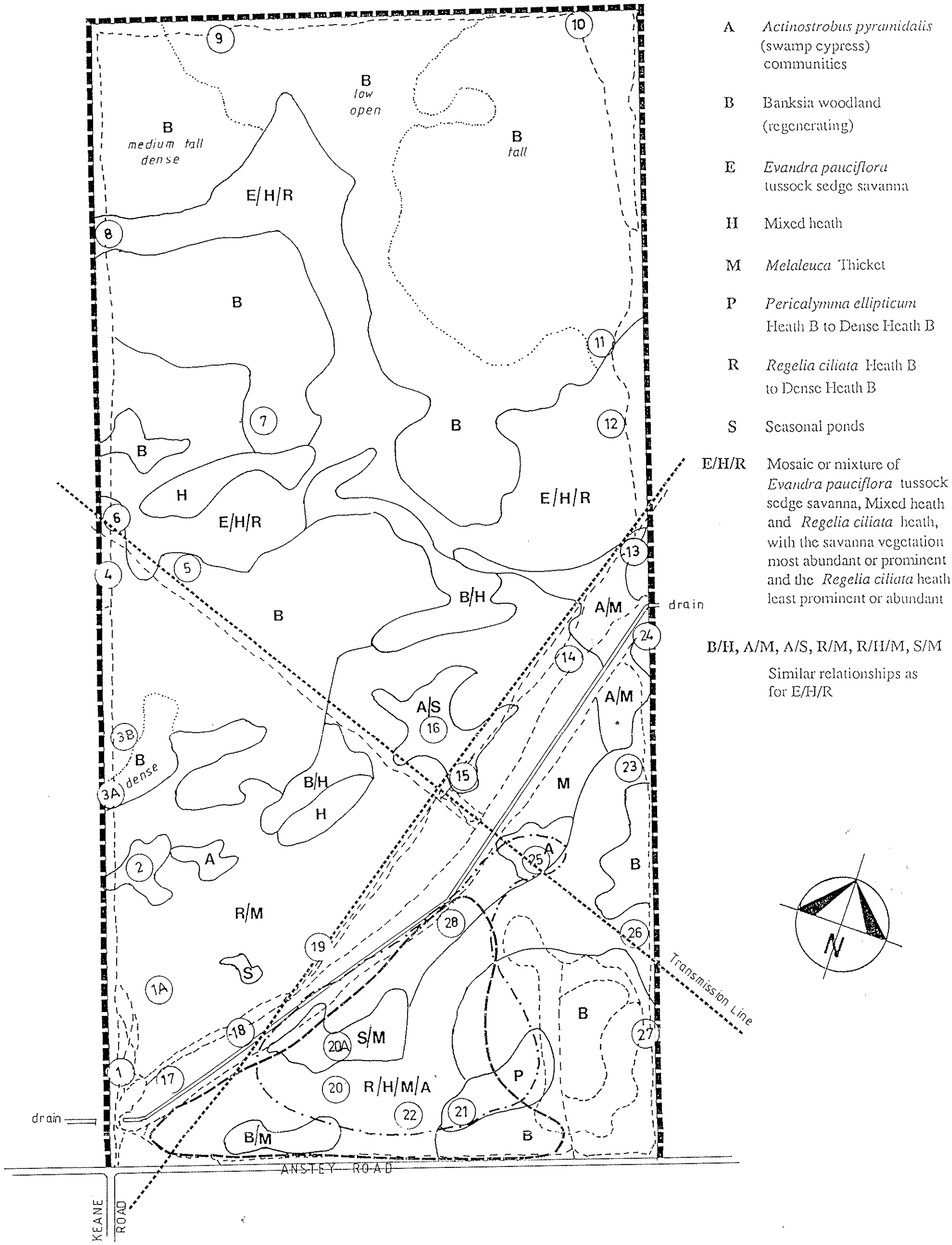
E

F

G

H

Plate 1



A *Actinostrobus pyramidalis* (swamp cypress) communities

B Banksia woodland (regenerating)

E *Evandra pauciflora* tussock sedge savanna

H Mixed heath

M *Melaleuca* Thicket

P *Pericalymma ellipticum* Heath B to Dense Heath B

R *Regelia ciliata* Heath B to Dense Heath B

S Seasonal ponds

E/H/R Mosaic or mixture of *Evandra pauciflora* tussock sedge savanna, Mixed heath and *Regelia ciliata* heath, with the savanna vegetation most abundant or prominent and the *Regelia ciliata* heath least prominent or abundant

B/H, A/M, A/S, R/M, R/H/M, S/M

Similar relationships as for E/H/R

FIGURE 2 VEGETATION AND SURVEY SITES IN FORRESTDALE PROJECT AREA

(1) SAMPLE SITE

SIGNIFICANT HABITAT AREA

VEGETATION UNIT BOUNDARY

A VEGETATION UNIT

APPROXIMATE BOUNDARY OF 1989 BURN

G.R. CRIMP & PARTNERS
TOWN PLANNING CONSULTANTS — 100 Colin Street WEST PERTH
Ph: 321 5426 FAX: 321 2075

REF. Nº 1053·89
DRAWN B.O'S.

TABLES

Table 1

Gazetted Rare Flora (DRF) of the Metropolitan Region

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

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 semicircinalis
Acacia simulans
Acacia vassalii
Acacia sp. (Chiddarcooping) J. Brown 59 & A. Williams
Acacia sp. (Dandaragan) S. van Leeuwen 269
Acacia sp. (Wongan Hills) K. F. Kenneally 7496
Adenanthos cunninghamii
Adenanthos dobagii
Adenanthos ellipticus
Adenanthos eyrei
Adenanthos ileticos
Adenanthos pungens
Adenanthos velutinus
Allocasuarina fibrosa
Allocasuarina sp. (Lake King) M. Graham 1127
Anigozanthos bicolor subsp. *minor*
Anigozanthos humilis subsp. *chrysanthus*
Anigozanthos viridis subsp. *terraspectans*
Apium prostratum subsp. *(Porongurups) G. J. Keighery 8873*
Aponogeton hexatepalus
Asplenium obtusatum
Asterolasia drummondii
Asterolasia grandiflora
Asterolasia nivea
Baeckea arbuscula
Banksia brownii
Banksia cuneata
Banksia goodii
Banksia oligantha
Banksia sphaerocarpa var. dolichostyla
Banksia tricuspis
Banksia verticillata
Billardiera mollis
Boronia adamsiana
Boronia revoluta
Caladenia bryceana
Caladenia cristata
Caladenia dorrienii
Caladenia integra
Caladenia wanosa
Caledenia sp. (Cape Naturaliste) S. D. Hopper 4518
Caladenia sp. (coastal plain) S. D. Hopper 3400
Caladeia sp. (Dunsborough) S. D. Hopper 5520b
Caladenia sp. (Esperance) D. R. Voigt 36
Caladenia sp. (Leeuwin-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. (Cataby) G. J. Keighery 11009
Chamelauciuni sp. (S coastal plain) R. D. Royce 4872
Conospermum toddii
Conostylis drummondii
Conostylis lepidospermoides
Conostylis micrantha
Conostylis misera
Conostylis rogeri
Conostylis scarsiflora subsp. *trichophylla*
Conostylis wonganensis
Coopernookia 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 wittwerorum
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. (Eneabba) 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

Eucalyptus brevipes
Eucalyptus burdettiana
Eucalyptus ceracea
Eucalyptus cerasiformis
Eucalyptus coronata
Eucalyptus crucis subsp. *crucis*
Eucalyptus crucis subsp. (Paynes Find) S. D. Hopper 1842
Eucalyptus erectifolia
Eucalyptus goniantha subsp. *goniantha*
Eucalyptus insularis
Eucalyptus johnsoniana
Eucalyptus latens
Eucalyptus lateritica
Eucalyptus merrickiae
Eucalyptus moorcana
Eucalyptus rhodantha
Eucalyptus steedmanii
Eucalyptus suberea
Eucalyptus synandra subsp.'(wheatbelt) A. S. George 16203
Eucalyptus sp. (Badgingarra) M.I.H. Brooker 9026
Eucalyptus sp. (Cape Naturaliste) K. H. Rechinger 58888
Eucalyptus sp. (Dandaragan) M. I. H. Brooker 9744
Eucalyptus sp. (E. Nambung) M. I. H. Brooker 9025
Eucalyptus sp. (Eneabba) M. I. H. Brooker 9736
Eucalyptus sp. (Lake Minigwal) M. I. H. Brooker 9686
Eucalyptus sp. (Midlands Highway) M. I. H. Brooker 8734
Eucalyptus sp. (Moresby Range) S. D. Hopper 2759
Eucalyptus sp. (Norseman) S. D. Hopper 2936
Eucalyptus sp. (N. Coomallo) M. I. H. Brooker 8823
Eucalyptus sp. (Northampton) M. I. H. Brooker 9196
Eucalyptus sp. (Pingaring) M. I. H. Brooker 9109
Eucalyptus sp. (Wagerup) M. I. H. Brooker 9807
Eucalyptus sp. (Yanchep) M. I. H. Brooker 8608
Eucalyptus sp. (Yandanooka) M. I. H. Brooker 9205
Gastrolobium appressum
Gastrolobium glaucum
Gastrolobium tomentosum
Grevillea cirsiifolia
Grevillea dryandroides
Grevillea inconspicua
Grevillea infundibularis
Grevillea involucrata
Grevillea prostrata
Grevillea saccata
Grevillea scapigera
Grevillea sp. (Dandaragan) S. D. Hopper 6350
Hakea aculeata
Hakea megalosperma
Halosarcia bulbosa
Hemiandra gardneri
Hemiandra rutilans
Hemigenia viscida
Hensmania chapmanii
Hibbertia bracteosa
Hydrocotyle lemnoides
Kennedia beckxiana
Kennedia glabrata
Kennedia macrophylla
Lambertia echinata
Lambertia fairallii
Lambertia orbifolia
Laxmannia jamesii
Lechenaultia chlorantha
Lechenaultia laricina
Lechenaultia pulvinaris
Lechenaultia superba
Lepidium catapycnon
Leucopogon obtectus
Melaleuca sciotostyla
Microtis globula
Microcorys eremophiloides
Myoporum salsaloides
Myoporum turbinatum
Myriophyllum petraeum
Pandanus spiralis var. *flammeus*
Pittosporum moluccanum
Pityrodia augustensis
Prostanthera carrickiana
Prostanthera magnifica
Pterostylis sp. (Northampton) S. D. Hopper 3349
Ptychosema pusillum
Pultenaea pauciflora
Rhagodia acicularis
Rhizanthella gardneri
Ricinocarpos trichophorus
Royceа pycnophylloides
Spirogardnera rubescens
Stawellia dimorphantha
Stylidium coroniforme
Stylidium galioides
Stylidium plantagineum
Stylidium scabridum
Tetratheca aphylla
Tetratheca harperi
Thelymitra psammophila
Thelymitra stellata
Thomasia montana
Thomasia sp. (York) A. S. George 8075
Thryptomene wittweri
Tribonanthes purpurea
Verreauxia verreauxii
Verticordia fimbrilepis
Verticordia helichrysantha
Verticordia hughanii
Verticordia staminosa
Verticordia sp. (Fitzgerald) C. A. Gardner 9148
Villarsia calthifolia
Wurmbea sp. (Cape Naturaliste) S. D. Hopper 5871
Wurmbea drummondii
Wurmbea tubulosa
Xyris sp. (Stirling Range) G. J. Keighery 7951

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

South Coast Region Draft Management Plan—Extension of Public Submission Period

THE Department of Conservation and Land Management has extended the public submission period on the Draft Management Plan for the South Coast Region from 31 July 1989 to 29 September 1989.

The South Coast Region is one of the eleven administrative regions of the Department of Conservation and Land Management. It stretches from the Irwin Inlet, west of Denmark, through to Eucla on the Western Australian/South Australian Border in the east. The region presently includes 13 national parks, 2 timber reserves, 4 forest blocks and over 100 nature reserves.

The draft management plan, released 2 May 1989, identifies the conservation, recreation and commercial values of the Region, and details management issues and strategies.

Copies of the draft may be purchased for $10 from the Department of Conservation and Land Management State Operations Headquarters, the South Coastal Regional Office at Albany, and the Esperance District Office. Reference copies are available for inspection at these offices, at CALM Regional Offices and at local authorities and libraries throughout the region.

Submissions should be directed to—

The Regional Plan Co-ordinator,
Department of Conservation and Land Management,
44 Serpentine Road,
Albany WA 6330.

SYD SHEA,
Executive Director.

Table 3

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

Priority One

METROPOLITAN

Species	Distribution	Flowering Period	Other CALM Regions
Asteridea gracilis	Gosnells	Sep-Oct	NF
Beyeria cygnorum	Reabold Hill	Nov	
Conostephium minus	Gnangara, Guildford, Belmont	Jul-Sep	GRE,NF
Grevillea thelemanniana subsp. thelemanniana	Cannington, Kenwick	Jun-Sep	NF
Hydatella dioica	Upper Swan	Sep-Nov	NF
Hydrocotyle hispidula	Garden Island	Sep-Nov	SC
Lepidosperma rostratum	Cannington	Aug	
Mitrasacme palustris	Midland	Oct	W
Schoenus andrewsii	Cannington	Jan-Feb	GRE
Schoenus pennisetis	Cannington	Aug-Sep	
Stylidium utricularioides	Canning Vale	Oct-Dec	NF
Thysanotus glaucus	Forrestdale	Nov-Feb	GRE

Priority Two

METROPOLITAN

Species	Distribution	Flowering Period	Other CALM Regions
Haloragis aculeolata	Cannington	Dec	SC
Lepidium puberulum	Rottnest Island	Aug	GRE,GAS
Leucopogon glaucifolius	Midland	Oct-Nov	SC
Lysinema elegans	Jandakot	Oct-Nov	GRE
Tripterococcus sp. (A.S. George 14234)	Cannington	Nov-Feb	CF

Priority Three

METROPOLITAN

Species	Distribution	Flowering Period	Other CALM Regions
Anthotium junciforme	Midland, Bayswater, Serpentine, Cannington, Kelmscott	Dec-Feb	NF,CF
Cartonema philydroides	Midland	Oct-Jan	GRE,CF,NF
Gonocarpus pithyoides	Fremantle	Oct-Nov	NF
Jacksonia gracilis	Perth	Jan-Feb	NF
Myriocephalus appendiculatus	Midland	Sep-Dec	GRE,SC
Philydrella drummondii	Bayswater, Guildford	Oct	NF,SF
Phlebocarya filifolia	Cannington, Jandakot	Sep-Nov	GRE,NF,
Restio stenostachyus	Canning River	Feb-Mar	NF
Rinzia crassifolia	Perth	Aug-Sep	GRE,W
Thysanotus arbuscula	Bayswater	Nov-Jan	NF,GRE,CF
Triglochin stowardii	Twin Swamps	Sep	GRE,W,CF

(SVL 13/9/89)

PLATES

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VEGETATION AND SIGNIFICANT FLORA

IN

LOTS 68 AND 70 ANSTEY ROAD

FORRESTDALE

CITY OF ARMADALE

Prepared for

Industrial Lands Development Authority
14th Floor
26 St George's Terrace
PERTH WA 6000
(09) 325 4266

By

Arthur S. Weston, Ph.D.
Consulting Botanist
8 Pitt Street
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December 1990

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2 Reserve List Flora Species of the Metropolitan Region

PLATES

1 Vegetation of the Forrestdale Project Area

2 Gazetted Rare Flora (DRF) of the Perth Metropolitan Region

3 Gazetted Rare Flora (DRF) and Some Priority Three Species (P3) of the Perth Metropolitan Region

1.0 INTRODUCTION

In a letter to M. Boegl, Department of Planning and Urban Development dated 12 August 1989, Lyndon Mutter (for Syd Shea, Executive Director, Department of Conservation and Land Management) strongly suggested that a botanist be contracted to conduct a vegetation survey of Lot 68 Anstey Road, Forrestdale and prepare a status report on the presence of Declared Rare Flora (DRF) and Reserve List Flora (RLF) species. The letter noted that Lot 68 has a relatively large area of bushland and that it is in close proximity to known populations of DRF and RLF species. Specifically, these species are:

i. declared rare flora (DRF) species (see Table 2 of this report)
   Diruis purdiei [flowers following previous summer burn]
   Drosera occidentalis

ii. reserve list flora (RLF) species (see Table 3 of this report)
   Evandra pauciflora
   Villarsia submersa
   Stylidium utricularioides (found in Lot 66 by CALM botanists in October 1990)
   ? Tripterococcus sp. (found in Lot 66 by CALM botanists in October 1990)

iii. other significant species
   Johnsonia acaulis
   Myriocephalus helichrysoides
   Tribonanthes sp. 2
   Velleia trinervis (pale-flowered form)

This report presents the results of the vegetation and rare flora surveys of Lots 68 and 70 (the Project Area) and discusses gazetted (DRF), reserve list (RLF), rare, geographically restricted, threatened, vulnerable and poorly collected species, with particular reference to the above species.

The location of the Project Area is on the northwest side of Anstey Road south of Ranford Road, Forrestdale (Figure 1). It is in the City of Armadale and is 20 km south of the Perth city centre (corner of Cathedral Place and St. George's Terrace).

The vegetation and rare flora survey of the Project Area was carried out by car and on foot on the 17th and 19th of October and the 3rd of November 1990.

DRF *Drosera* and *Drakaea* species which do not normally flower until October and November can, in the types of vegetation occuring in the Project Area, be identified from their leaves weeks in advance of their flowering. Photographs of the leaves of these species are shown in Plates 2 and 3.

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 on Bassendean Dune eolian surfaces (Ed), on slopes of 0°- 3°, with a northern, partially uncleared part of Lot 70 being eolian deflation hollows (Eh). The map also shows a prominent east-west oriented ridge in the centre of Lot 68, but none can be seen on the ground.

The sheet's 1:50,000 scale environmental geology map shows the Project Area as being largely

- white to pale grey sand of eolian origin over Guildford Formation sandy-clay to clayey-sand (S10, Qpb/Qpa) [peripheral parts of Lot 68 and western half or more of Lot 70],
- white to pale grey sand over yellow sand of eolian origin (S8, Qpb) [central two-thirds of Lot 68 and eastern corner of Lot 70],
- relatively small areas of peaty-sand of lacustrine origin (Sp1) swamp deposits (Qrw): two near the eastern corner, crossing Ranford Road and one touching the north-western boundary of Lot 68.

A strip of land that might be inundated during floods runs more or less parallel to the drainage canal and east and south of it in the northern and western corners of Lot 68 and on the southwestern side of Lot 70.

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) maps it also at a scale of 1:1,000,000. A large proportion of the region, including most of Lot 70 and much of Lot 68 has, however, been cleared and no longer supports unaltered native vegetation.

Beard's 1:250,000 scale map shows the native vegetation potential of the Project Area as being banksia low woodland with scattered jarrah and she-oak (e2Mb.cbLi).

Heddle *et al.* show the native vegetation potential as being in the Southern River Complex (42): open woodland of *Eucalyptus calophylla* (marri) - *E. marginata* (jarrah) - *Banksia* species on the elevated areas and a fringing woodland of *Eucalyptus rudis* (flooded gum) -*Melaleuca rhaphiophylla* (swamp paperbark) along streams.

The relatively small scale vegetation maps by Beard and Heddle *et al.* do not reflect the diversity and complexity of the vegetation of the region in which the Projet Area lies.

3.2 Vegetation of the Project Area

The vegetation of the Project Area, as observed during field work and interpreted from large scale colour aerial photographs and 1:5,000 orthophoto maps (Perth 5000 BG 34/08.02W and 03W) is described below. A map of vegetation survey sites and the vegetation of the Project Area is shown in Figure 2. As the vegetation boundaries shown on the map are based upon 1984 aerial photography, they can be considered only approximate; there have been vegetational changes since 1984. Vegetation and survey site symbols used in Figure 2 are defined on the page facing the figure. Representative stands of vegetation are illustrated and described in Plate 1. The system of vegetation classification used in this report, where appropriate and capitalised, follows Muir (1977).

Approximately 25% of Lot 68 is covered in exotic grasses and other herbaceous plants with individual plants and small groupings of native trees and shrubs. Of the remaining area, approximately 80% is Banksia Low Forest A to Open Low Woodland A on slightly elevated areas and 20% is lower-lying paperbark-dominated vegetation, Thicket, Heath B to Dense Heath B and tussock sedge savanna.

More than 80% of Lot 70 is covered in exotic grasses and other herbaceous plants with individual plants and small groupings of trees and shrubs, including an oak (*Quercus* sp.) and large flooded gum (*Eucalyptus rudis*). The remaining area, mainly northwest of the drainage canal, is *Regelia cilia.* Heath B to Dense Heath B with a few *Nuytsia, Banksia, Eucalyptus todtiana, E. rudis, Melaleuca preissiana* and *M. rhaphiophylla* trees and patches of heaths and thickets of species of *Melaleuca* spp., *Astartea fascicularis* and *Pericalymma ellipticum.*

Descriptions of the vegetation, principally of Lot 68, are given below, and additional descriptions of the Project Area's vegetation are given in Plate 1. Map symbols and Plate numbers for the vegetation units are given in brackets for each unit.

3.2.1 Banksia Low Forest A to Open Low Woodland

(B; Plates 1A, 1B and backgrounds of 1C & 1H)

Banksia menziesii, B. attenuata and *Allocasuarina fraseriana* (she-oak) are dominants of the banksia woodland and forest, while *Eucalyptus marginata* (jarrah), *E. todtiana* (prickly-bark) and *Nuytsia floribunda* (christmas tree) are other conspicuous trees. The Site 10 woodland, at the open woodland end of the density range, is more extensive than in the 1984 aerial photography and has many dead banksia trees in it, probably caused by the dieback fungus. There are also other areas of dead banksias in the woodland/forest, probably also caused by the fungus.

Characteristic tall shrubs in the woodland are *Kunzea ericifolia, Melaleuca thymoides, Xanthorrhoea preissii* and *Adenanthos cygnorum.* Low shrubs that are common in the banksia vegetation include *Hibbertia hypericoides, H. subvaginata, Bossiaea eriocarpa* and *Adenanthos obovatus.* The principal native herbaceous species are *Dasypogon bromeliifolius, Phlebocarya ciliata* and *Patersonia ? occidentalis. Andersonia heterophylla, Leucopogon ? tenuis, Eriostemon spicatus, Conostylis canescens, Anigozanthos manglesii, A. humilis* and other species, both native and exotic, are conspicuous. Exotics include *Ehrharta calycina* and *Gladiōlus caryophyllaceus.*

3.2.2 Paperbark Low Woodland A to Open Low Woodland A (P; Plates 1C, 1D background)

Remnant paperbark woodlands, generally of *Melaleuca preissiana* trees, occupy some of the lowest-lying sites in the Project Area. The woodlands vary greatly in density and composition of the understoreys. In Lot 68 they are restricted to the periphery, principally in or near the north, west and south corners. In Lot 70 they are few, small and in the northwest part.

3.2.3 *Kunzea ericifolia* Thicket (K; Plate 1E)

Kunzea ericifolia occurs as an associated or tall understorey shrub in low-lying and peripheral parts of the banksia woodland and as two distinct types of Thicket bordering the woodland in Lot 68. The northern thicket is a 4-5 m tall shrub or multi-stemmed tree with a canopy cover density approaching 100% and virtually no understorey. The southern thicket is shorter, more open, more variable, shares dominance with *Melaleuca thymoides* and has an often dense understorey of low shrubs and tussock sedges. This thicket is in the transmission line easement, where it merges with Mixed Heath at the eastern end and with *Regelia/Pericalymma/Evandra* heath/tussock sedgeland in the western end.

3.2.4 *Melaleuca* Thicket (M; Plate 1F background)

Melaleuca Thickets to 2 m tall and taller are most common in lowlands, epecially in the northwest part of Lot 70, and are dominated by various species of *Melaleuca.* The most common species are *Melaleuca ? rhaphiophylla* and *M. viminea.* Other *Melaleuca* dominants in some Thickets are *M. incana, M. cuticularis,* and *M. lateriflora.*

3.2.5 *Regelia ciliata* Heath B to Dense Heath B (R; Plate 1F foreground)

Regelia ciliata heath is the dominant vegetation over much of the low-lying area which is only rarely inundated if at all. *Regelia ciliata* usually forms near monospecific stands but is not uncommon as a component of other communities. *Jacksonia sternbergiana* and *Thysanotus patersonii* are conspicuous in some dense stands of *Regelia ciliata,* and *Pericalymma* heath occurs as enclaves and merges with *Regelia* heath.

3.2.6 *Pericalymma ellipticum* Heath B to Dense Heath B (L; Plate 1D & 1F foregrounds, 1H)

In slightly lower areas that may be temporarily inundated, *Pericalymma* (*Leptospermum*) *ellipticum* forms monospecific stands. These stands cover a much smaller part of the Project Area than *Regelia ciliata* heath, though they are much more extensive and common in the Metropolitan Region than the *Regelia.*

3.2.7 Mixed heath (H; Plate 1D)

A lower, more open and more variable mixed heath than the other heaths in the Project Area occurs in the southern corner of Lot 68, south of the transmission line. Along with the *Regelia* and the *Pericalymma* this mixed heath includes the shrubs and subshrubs *Dryandra nivea, Banksia sphaerocarpa, Hakea ? sulcata, H. ? varia, H.* sp., *Petrophile macrostachya, P. media, Stirlingia latifolia, Synaphea petiolaris, Leucopogon tenuis, Boronia ? dichotoma, Jacksonia sericea* and *Euchilopsis linearis.* Herbaceous plants include *Conostylis setigera, C. ? aculeata, Mesomelaena tetragona, Lepidosperma ? longitudinale, Schoenus* sp., *Loxocarya fasciculata* and a number of species of other cyperaceous and restionaceous sedges, *Drosera* and small herbaceous plants. There are also a few large shrubs of *Melaleuca preissiana* and, near the fence, one *Leptospermum laevigatum* shrub.

3.2.8 *Evandra pauciflora* tussock sedge savanna (E; Plate 1G)

Under the western end of the transmission line that cuts across the southern corner of Lot 68, a relatively small population of *Evandra pauciflora* tussock sdege savanna is one component of a vegetation mosaic shared with *Regelia ciliata* and *Pericalymma ellipticum* heaths.

3.3 Flora

The flora of the Project Area is described above in terms of vegetation components. No attempt has been made to make a comprehensive listing of the Project Area flora, but the significant species found are discussed below.

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. During the time 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; Hopper *et al.* 1990). 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 1 June 1990, comprises 247 species. Some of the species first gazetted in 1980 are absent from the current list, 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 some cases a species is still on the list but under a different name. One example is the orchid *Drakaea jeanensis*, which is currently listed as *Drakaea elastica*.

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 geographically restricted but also because their continued, long-term survival in the wild is believed to be threatened.

Gazetted rare species, also known as declared rare flora or Endangered Flora (see Hopper *et al.* 1990), 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, Section 4, discusses such species, particularly ones that are gazetted as declared rare flora (DRF) or are on the Reserve Flora list, which have been recorded in the 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 presumed threats to the continued survival of endangered species. 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.

Five 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 southwestern 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).

The species on the 1989 list of declared rare flora are listed, described and illustrated, generally with colour photographs, in Hopper *et al.*(1990). Hopper *et al.* also list Reserve Flora and describe and illustrate a selection of presumed extinct Western Australian plants.

4.2 'Significant' Species

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

- rare, geographically restricted or apparently rare or restricted because they are poorly collected or recorded,
- at the limits of their ranges or in areas outside their normal ranges or habitats,
- particularly susceptible or vulnerable to environmental changes, especially ones caused by humans, either directly or indirectly,
- 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
- 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 and Hopper *et al.* (1990) discuss appropriate teminology 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 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 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, at least one population of the gazetted orchid *Drakaea elastica* 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 such species are gazetted as rare flora or are included in lists of significant 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. Gazettal 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 list of gazetted flora does not include all, or probably even a majority of, rare species. The current list (1 June 1990) concentrates on the southwestern 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 current list. It is likely that in the southwest 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 1990 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 gazettal and being considered for gazettal.

The WAWRC now has continuing programmes of research and, in addition to the list of gazetted species, has five unofficial priority lists of Reserve Flora 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. Priority Five species are being monitored.

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 Department of Conservation and Land Management (CALM) botanists (see Section 1) The lists are:

- Gazetted Rare Flora (Government Gazette, WA, of 1 June 1990, particularly those of the Metropolitan Region, listed in Table 1 of this report,

- Reserve List Flora of the Metropolitan Region (July 1990; provided by CALM), particularly Priority One, Two and Three Species.

The second list is presented in this report as Table 2. During the Project Area survey, an emphasis was placed on finding the ten Metropolitan Region DRF species listed and described in Table 1. Photographs of some of these species, and others, are shown in Plates 2 and 3, and additional information about them is given in the captions to the plates and in Rye and Hopper (1981), Patrick and Hopper (1982), Hopper *et al.* (1990), Hoffman and Brown (1984), Jones (1988), Lowrie (1989) and the Perth Regional Flora (Marchant *et al.* 1987).

Most of the ten species listed in Table 1 are species of low-lying areas and seasonal wetlands. Most of the species are herbaceous plants and flower in the period between August and November.

The flowering times given in the table suggest the period when a survey for the species could be undertaken most productively. However, in the case of the *Dryandra, t*the Drakaeas and the *Drosera* the leaves are distinctive enough for identification of the species before they flower. Consequently, surveys done in mid-October and early November should have been able to identify any of the species in Table 1 except the early-flowering undescribed *Diuris*, and, possibly, the late-flowering *Diuris drummondii*, if any populations of them had been found.

5.2 Significant Plant Species found in the Project Area

No Endangered Flora (DRF) species was found in the Project Area, although *Drosera occidentalis* plants were found in the Lot 66 firebreak and nearby *Actinostrobus pyramidalis* (swamp cypress) - *Calothamnus hirsutus* communities just across the fence from Lot 68.

However, one Priority Three species and two other significant species were found during the survey. These species are described below, in Sections 5.2.1 to 5.2.3. The descriptions are based upon my notes, field records and observations, upon information in Marchant *et al.* (1987) and upon information from WAWRC and Western Australian Herbarium botanists.

5.2.1 *Evandra pauciflora* (2K: Plate 1G)

According to Marchant *et al.* (1987) the tussock sedge *Evandra pauciflora* occurs on the coastal plain and coastal areas between Forrestdale and Albany, where it is relatively rare and poorly collected. Although it is not on any current Priority Species list, it is listed by Briggs and Leigh (1988) as a 2K species, i.e. a very restricted but poorly known species. In the Project Area it occurs as a small stand at Site 8, under the transmission line.

5.2.2 *Jacksonia sericea* (P3: Plate2)

Jacksonia sericea is apparently restricted to calcareous and sandy soils on the coastal plain between Pinjarra and Wanneroo. It has been recorded over a wide area within this range but apparently is not common anywhere. It was found in the Project Area in the southern corner of Lot 68, in Site 9 Mixed Heath and under the transmission line next to Site 9 in *Kunzea ericifolia* Thicket, and, in much smaller numbers, in the eastern corner of Lot 68.

5.2.3 Other Significant Species

Four other significant species are also worth mentioning, *Conostylis canescens* (Winter Bells, Red Bugles), *Johnsonia acaulis, Restio stenostachyus* and *Cartonema philydroides*. The first species was found at Site 4 on either side of the old track, at Site 12 and elsewhere in the banksia woodland; though not yet rare or endangered, habitats of the species in the metropolitan area have been significantly reduced in the last few years.

The other three species were not found in the Project Area, but possible habitats for them were. The *Johnsonia* was found in banksia woodland in the northern corner of neighbouring Lot 65, in habitat similar to the Lot 68 banksia woodland, while the *Restio* (or a species very similar to it) and the *Cartonema* were found in Oakford in *Kunzea* Thicket and marginal paperbark woodland and banksia woodland habitats similar to those in the Project Area.

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. None of these habitats was found in the Project Area.

The *Caladenia* and the two species of *Drakaea* on the gazetted list are recorded from woodland habitats possibly of the types found in the Project Area.

Native plant habitats in the Project Area considered to be significant are:

- *Regelia ciliata* and *Pericalymma ellipticum* heaths as possible habitat for *Diuris purdiei* , although the specific habitat requirements of the orchid are not known, and there is no way of knowing which of these heaths might support the orchid without putting a hot summer fire through the heath and checking for the orchid the following September and October (Plates 1D, 1F, 1H),
- *Evandra pauciflora* tussock sedge savanna (Site 8; Plate 1G),
- Mixed Heath (Site 9; Plate 1D) and
- the *Kunzea ericifolia* Thicket in the transmission line easement

All of these habitats are represented in the transmission line easement and the corner of the Project Area south of it.

6.0 DISCUSSION

The Project Area is not in an area recommended for conservation by the System 6 Red Book (Environmental Protection Authority 1983) - the nearest recommended site is Forrestdale Lake (M95) - but the Red Book has no recommendations for preserving some of the plant communities found in the Project Area.

These include the the small area of *Evandra pauciflora* tussock sedge savanna and the most interesting areas identified during the survey, Sites 8, 9 and 14. This vegetation constitutes the Significant Habitats Area, essentially the southern corner of the Project Area: the transmission line easement and the area south of it.

Maintaining this Significant Habitats Area in its current state would protect all of the Mixed Heath and *Evandra pauciflora* and most of the *Jacksonia sericea* found in the Project Area.

Although it is not in or near an area recommended for conservation by the Environmental Protection Authority, the Project Area is in an area being looked at by the Department of Planning and Urban Development in connection with the proposed Jandakot Botanic Park.

7.0 ACKNOWLEDGEMENTS

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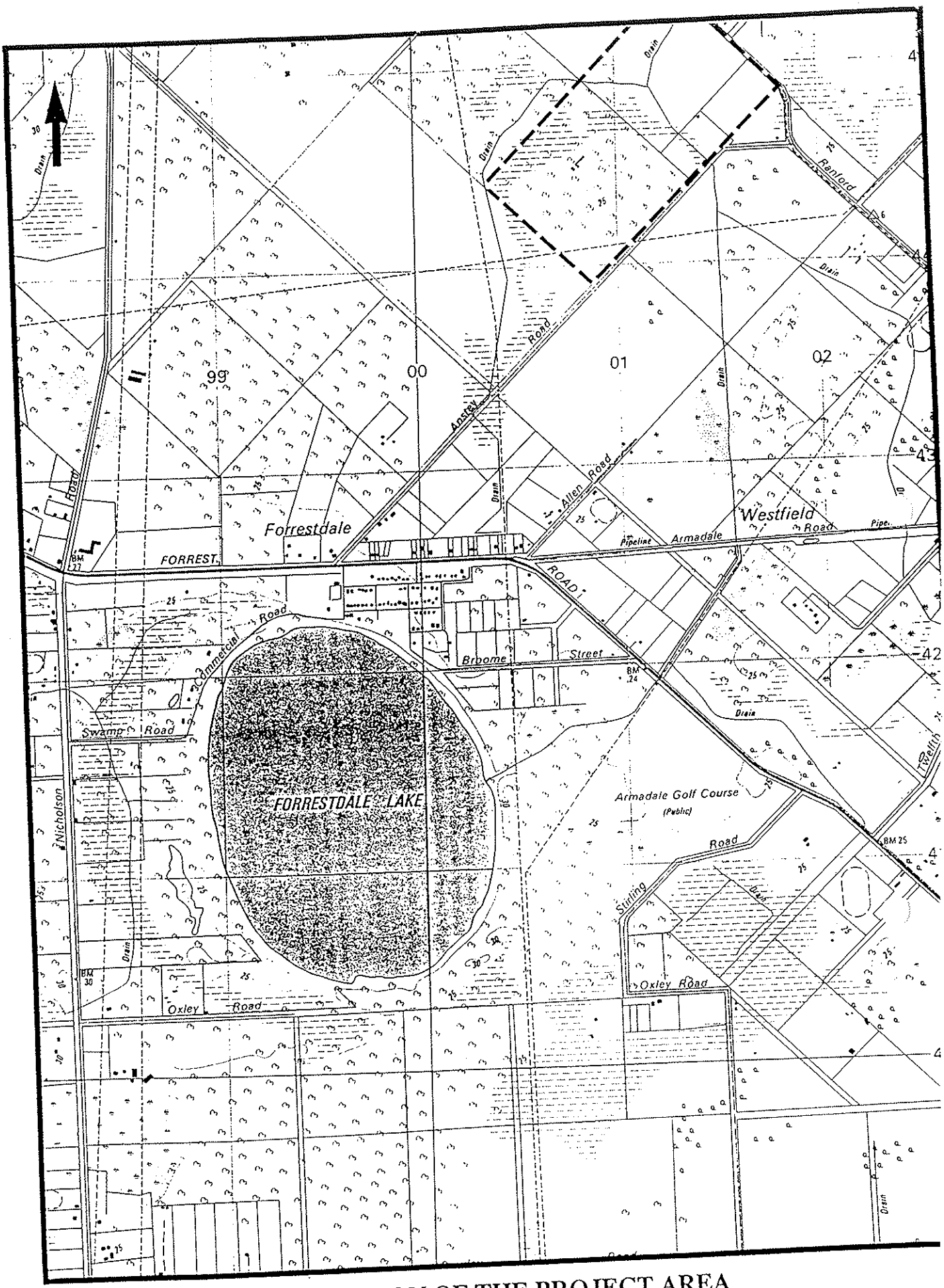
FIGURES



LOCATION OF THE PROJECT AREA

SCALE 1: 25 000

3 Kilometres

500 m 0 1 2

Figu

Forrestdale Project Area Vegetation Units and Survey Sites - Figure 2
(descriptions of units are given in Section 3.2 and captions for Plate 1)

Vegetation Units

B	Banksia Low Forest A to Open Low Woodland A
Cl	Mostly or totally cleared of natural vegetation
E	*Evandra pauciflora* tussock sedge savanna
H	Mixed heath
K	*Kunzea ericifolia* Thicket
L	*Pericalymma ellipticum* Heath B to Dense Heath B
M	*Melaleuca* Thicket
P	Paperbark Low Woodland A to Open Low Woodland A
R	*Regelia ciliata* Heath B to Dense Heath B
-/-/-	Mosaic or mixture of vegetation units

Vegetation Survey Sites

1	
2	Plate 1F
3	
4	
5	
6	
7	Plate 1C
8	Plate 1G
9	Plate 1D
10	Plate 1B
11	Plate 1E
12	Plate 1A
13	
14	Plate 1H

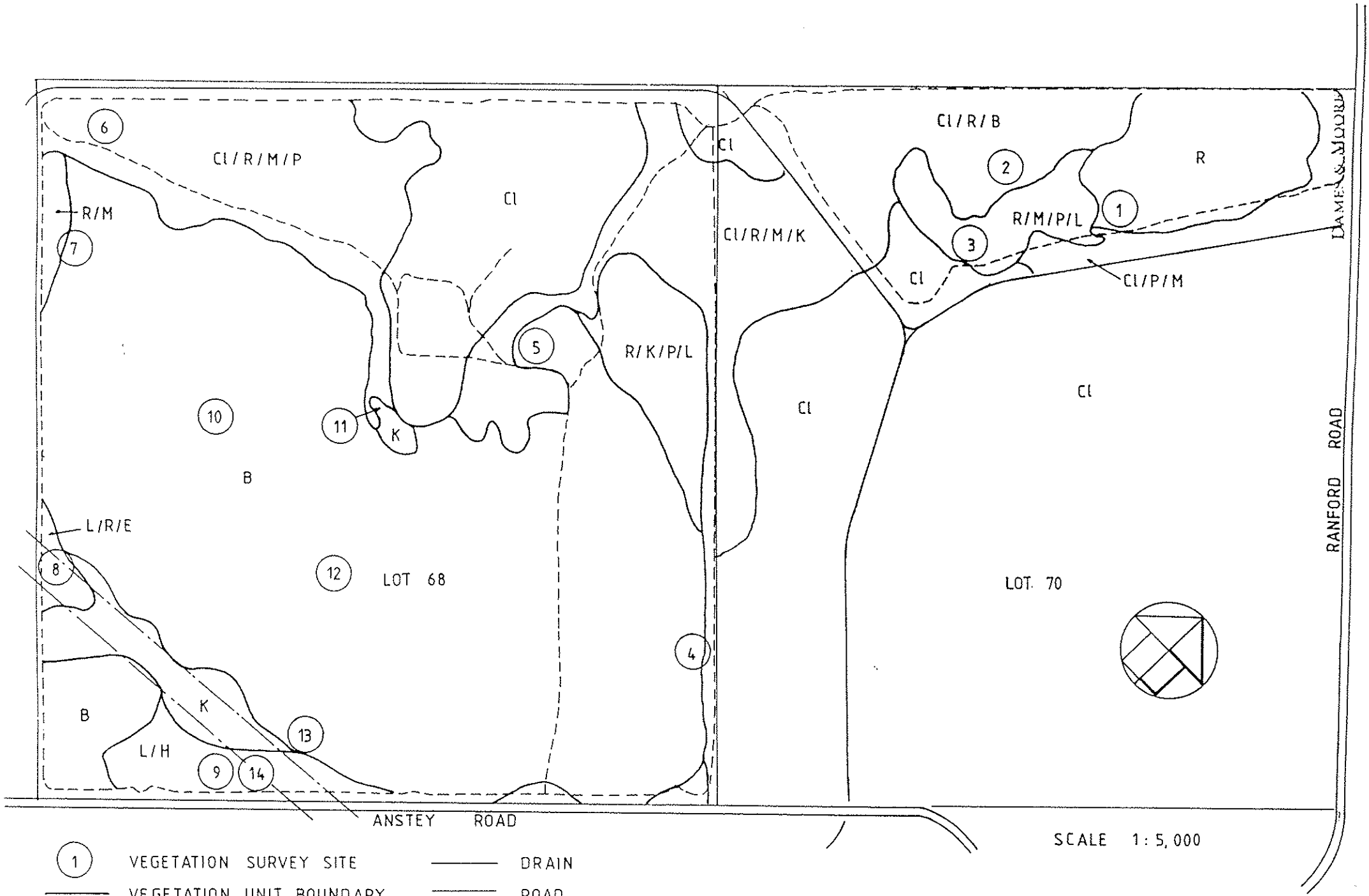


FIGURE 2 : VEGETATION AND SURVEY SITES IN FORRESTDALE PROJECT AREA

TABLES

Table 1

Endangered Flora (DRF) of the Metropolitan Region
(Government Gazette, WA of 1 June 1990)

Localities and Species and Family	Distribution[1]	Habitat[1]	Flowering Times[1]
Aponogeton hexatepalus APONOGETONACEAE	>15: Kenwick-Darradup-Augusta	Shallow winter pools on clayey soils	(May-)Aug-Sept
Caladenia huegelii (=*C.* sp. (coastal plain)) ORCHIDACEAE	>15: Gnangara-Yallingup -Margaret River	Sandy soils in banksia and eucalypt woodlands, often with *Allocasuarina fraseriana* and usually low on the landscape	Aug-Oct(-Nov)
Diuris drummondii ORCHIDACEAE	Rocky Gully-Perth (near Jandakot)	Open swampy areas, particularly during the season following a summer fire	Nov-Dec
Diuris purdiei ORCHIDACEAE	9: southern Perth area-Harvey	Seasonal semi-swamp on sand-over-clay soils, usually in *Regelia* and *Pericalymma* shrublands; flowers in habitats which were burnt the previous dry season	Sept-Oct(-Nov)
Diuris sp. (Kwinana) aff. *laxiflora* A. P. Brown 10/9/84 ORCHIDACEAE	1(-2): Kwinana	Small shallow winter-wet swamps amongst short sedgeland, predominantly of *Lepidosperma ? longitudinale*, on sandy-clayey soils	Aug-Sept
Drakaea elastica (=*D. jeanensis*) ORCHIDACEAE	8: Gingin-Busselton	Sandy soils, often firm and very white, in *Kunzea ericifolia* tall shrubland and banksia woodland, low on the landscape	(Sept-)Oct-Nov
Drakaea sp. (south west) ORCHIDACEAE	5: Canning Vale, Yarloop, Mowen, Bakers Junction	Sandy soils in scrub and woodlands low in the landscape, often near swamps	Sept-Oct
Drosera occidentalis ssp. *occidentalis* DROSERACEAE	>15(?): Gingin-Pinjarra; Darling Range[2]	With short Centrolepidaceae sedges on peaty, sandy soils which are winter-inundated, usually shallowly, in swampy areas	(Oct-)Nov-Dec
Dryandra mimica (=*D.* sp. A in Flora of the Perth Region) PROTEACEAE	3(-4): Mogumber-Wattle Grove (-Whicher Range)	Flowers bright yellow; low sandy flat in heath or scrub in banksia woodland or with *Kingia* and *Byblis*	(Sep-[Type:Dec 17]) Jan-Feb
Hydrocotyle lemnoides APIACEAE	4?: Kenwick-Upper Swan-Bolgart; Darling Range	Shallow winter pools on clayey soils	Sept-Oct

1. The information in this table was compiled from Rye and Hopper (1981), Hoffman and Andrews (1984), Sainsbury (1985), Marchant *et al.* (1987), Lowrie (1989), Hopper *et al.* (1990), information provided by L. Mutter and botanists of the Western Australian Herbarium and the WAWRC, and field work by A. S. Weston during 1989 and 1990. There may be a few more localities for some of the species 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

2. *Drosera occidentalis* is now believed to be more abundant and widespread than Western Australian Herbarium collections indicate (Atkins and Moore pers. comm.; Lowrie (1989)).

Table 2

Reserve Flora Species of the Metropolitan Region (pers. comm. CALM, July 1990)

	PRIORITY CODE	CALM REGIONS	DISTRIBUTION	FLOWERING PERIOD
METROPOLITAN				
Anarita sp. (EM Davison s.n.)	1	M	Perth	-
Asteridea gracilis	1	NF,M	Gosnells, Mt Saddleback	Sep-Oct
Beyeria cygnorum	1	M	Reabold Hill	Nov
Conostephium minus	1	GRE,NF,M	Cataby, Gingin, Bullsbrook, Gnangara, Guildford, Belmont	Jul-Sep
Grevillea thelemanniana ssp. thelemanniana	1	M,NF	Cannington, Kenwick, Wattle Grove	Jun-Sep
Hydatella dioica	1	NF,M	Upper Swan	Sep-Nov
Hydrocotyle hispidula	1	SC,M	Mt Ridley, Garden Island	Sep-Nov
Lepidosperma rostratum	1	M	Cannington	Aug
Mitrasacme palustris	1	W,M	Beaufort River, Midland	Oct
Schoenus andrewsii	1	GRE,M	Carnamah, Cannington	Jan-Feb
Schoenus pennisetis	1	M	Cannington	Aug-Sep
Styli[illegible] utricularioides	1	NF,M	Bullsbrook, Death Adder Creek, Canning Vale	Oct-Dec
Thysanotus glaucus	1	M,GRE	Regans Ford, Forrestdale	Nov-Feb
Verticordia lindleyi	1	M,NF	Forrestdale, Cannington, Guildford, Oakford, Muchea, Gingin	Nov-Jan
Haloragis aculeolata	2	M,SC	Toolbrunup, Cannington	Dec
Hakea myrtoides	2	NF,M	Wannamal, Gooseberry Hill, Helena	
Leucopogon glaucifolius	2	M,SC	Midland, Stirling Range N.P., Kendenup	Oct-Nov
Lysinema elegans	2	M,GRE	Jandakot, Regans Ford	Oct-Nov
Tripterococcus sp. (A.S. George 14234)	2	M,CF	Cannington, Margaret River, Scott River	Nov-Feb
Anthotium junciforme	3	NF,CF,M	Wattle Grove, Midland, Baysvater, Serpentine, Cannington, Kelmscott, Busselton	Dec-Feb
Cartonema philydroides	3	GRE,CF,NF,M	Kalbarri, Midland, Busselton, Bullsbrook	Oct-Jan
Conocarpus pithyoides	3	M,NF	Fremantle, Yanchep, York, Bullsbrook, Gingin	Oct-Nov
Jacksonia sericea	3	M,NF	Wanneroo, Trigg, Perth, Mandurah-Pinjarra	Dec-Feb
Lyriocephalus appendiculatus	3	GRE,M,SC	Eneabba, Midland, Mt Ragged	Sep-Dec
Philydrella drummondii	3	M,NF,SF	Baysvater, Guildford, Chidlow, Helena Valley, Pinjarra, Palgarrup	Oct
Malebocarya filifolia	3	GRE,NF,M	Eneabba, Dandaragan, Mogumber, Gingin, Cannington, Jandakot	Sep-Nov
Restio [illegible]nostachyus	3	NF,M	Gingin, Canning River	Feb-Mar
Sinzia crassifolia	3	GRE,M,W	Watheroo, Perth, Meckering	Aug-Sep
Thysanotus arbuscula	3	NF,GRE,M,CF	Helena Valley, York, Mt Lesueur, Eneabba, Forrestfield, Baysvater, Nannup, Yallingup	Nov-Jan
Triglochin stovardii	3	GRE,W,M,CF	Moora, Koorda, Highbury, Twin Swamps, Busselton	Sep
Villarsia submersa	3	NF,CF,SF,SC,M	Gunapin, Boyanup, Lake Muir, Denmark, Forrestdale Kenwick	Sep-Oct
Alytrix breviseta subsp. breviseta	4	M	Gosnells, Bellevue	Sep-Oct
Borizema varium	4	M	Fremantle	Sep
Boronia xanthocarpum	4	M	Perth	Dec
Haloragis tenuifolia	4	NF,M	Woorooloo, Midland	Nov-Dec
Schoenus natans	4	M	Cannington	-
Tetraria australiensis	4	M,NF	Cannington, Serpentine River	Dec
Viladenia "nobilis"	5	CF,M	Medina, Yalgorup, Australind, Capel	Sep
Leonaea hackettiana	5	M	Wattleup, Thompson Lake, Kings Park, Jandakot	Jul-Oct
Eucalyptus foecunda	5	GRE,NF,M,CF	Lancelin, Seabird, Yanchep, Reabold Hill, Lake Preston	Jan-May
Davidium puberulum	5	M,GRE,GAS	Rottnest Island, Abrolhos Islands, Dorre Island, Boullanger Island	Aug
Waterolasia pallida	6	SC,CF,W,M	Perth to Albany	-
Xanthalsella leucathrix	6	M,GRE	Lake Monger, Wanarra Rock	-
Xipletonia drummondii	6	NF,W,M	Boddington, Williams, Midland	-

PLATES

CAPTIONS - PLATE 1

Vegetation of Forrestdale Project Area
(Lots 68 and 70, Anstey Road)

A Site 12 Banksia Low Forest A, with *Banksia attenuata, B. menziesii* and *Allocasuarina fraseriana* in the overstorey. (ASW90.11.P0-9)

B Site 10 Banksia Open Low Woodland A - Open, scrubby *Banksia attenuata - B. menziesii* woodland with *Adenathos cygnorum*, lower shrubs and many dead banksias, which probably contributes greatly to the open appearance. (ASW90.11.P0-8)

C Site 7 Paperbark Open Woodland remnant, with Banksia Low Woodland A behind it and to the right of it. *Melaleuca preissiana* prominent. (ASW90.11.P3A-4)

D Site 9 Mixed Heath. (ASW90.11.P3A-6)

E Site 11 Dense, northern *Kunzea ericifolia* Ticket. (ASW90.11.P0-12)

F Site 2 *Regelia ciliata* Heath B, with *Pericalymma ellipticum* heath and *Astartea fascicularis* in foreground and *Melaleuca* Thicket in background. (ASW90.11.P3A-1)

G Site 8 *Evandra pauciflora* tussock sedge savanna, with Banksia Low Forest A in background. (ASW90.11.P3A-5)

H Site 14 *Pericalymma ellipticum* heath and Mixed Heath, with Banksia Low Forest A in background. (ASW90.11.P0-11)

A

B

C

D

E

F

G

H

Plate 1

CAPTIONS - PLATE 2

Gazetted Rare Flora (DRF) of the Perth Metropolitan Region

A *Drosera occidentalis* (DRF)

Drosera occidentalis is a minute, almost stemless pygmy sundew which grows on winter-wet firm sand and sandy-peat on the coastal plain. Its stipules are 3-lobed, and the leaf petiole is much longer than the circular, 0.5-1mm broad leaf blade. The cluster of populations near Anstey Road, Forrestdale, where these plants were photographed, is estimated to contain hundreds of sundew plants. Photographed in mid-October, 1989, weeks before flowering (ASW89.10.II-16). (See Hopper *et al.* 1990)

B *Aponogeton hexatepalus* (DRF)

The largest leaves in the centre of the photograph - one green and the other pale brown - belong to *Aponogeton hexatepalus*. The floating blades are much wider than the below-surface part of each leaf. The small round yellow leaves between them are *Hydrocotyle lemnoides*. The plants are growing in a shallow, winter pool in a clay depression near Brixton Road, Kenwick. Photographed in mid-October, weeks after flowering finished (ASW89.10.I-18). (See Hopper *et al.* 1990)

C *Hydrocotyle lemnoides* (DRF)

These floating leaves superficially resemble the slightly smaller leaves of the unrelated Duckweed (*Lemna disperma.*), but the *Hydrocotyle* leaves are often toothed and, in this photograph, have clusters of minute, dark red flowers between them. The long green leaf crossing the centre of the photograph is *Aponogeton hexatepalus*, and the kidney-shaped leaf in the lower right-hand corner belongs to *Villarsia capitata*. Photographed in pool near 'B' in mid-October, 1989 (ASW89.10.II-4). (See Hopper *et al.* 1990)

D *Caladenia huegelii* [=*Caladenia* (coastal plain) and *C.* sp. A] (DRF)

This flower was photographed in a low-lying eucalypt-banksia-sheoak open forest on Warton Road, Canning Vale, that was burnt the previous dry season. Other sites where the plant was found flowering in 1989 had not been burnt for a few years. The flower is large and the hairs on the edge of the labellum are long, yellow and often branched. Photographed in late September, 1989 (ASW89.9.I-11). (See Hopper *et al.* 1990)

E *Diuris* sp. aff. *laxiflora* (Kwinana) A. P. Brown 10/9/84 (DRF)

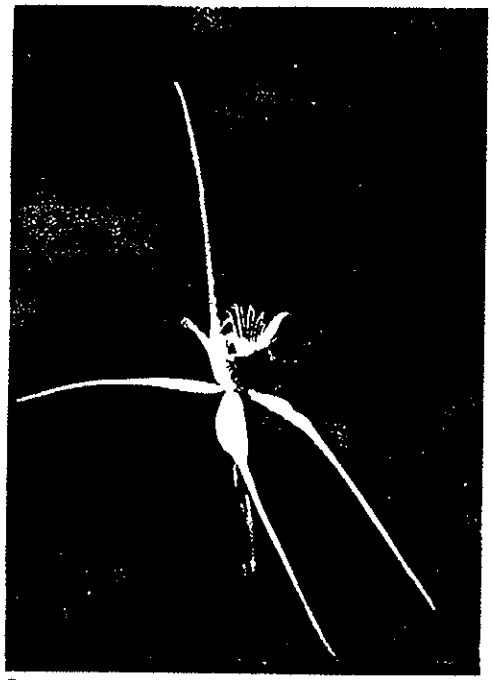
This close relative of *Diuris laxiflora*, and growing with it or nearby, is smaller, paler yellow and flowers earlier. The photographed plant is growing in a short *Lepidosperma* sedge swamp near Johnson Road, Casuarina, that is shallowly inundated in winter. Photographed in mid-September, 1989 (ASW89.9.I-1). (See Hopper *et al.* 1990)

F *Diuris purdiei* (DRF)

A relatively short *Diuris* flowering in what were dense, 1m tall *Regelia ciliata* and *Pericalymma ellipticum* shrublands near Anstey Road, Forrestdale until they were destroyed by fire during the 1988-89 dry season. Photographed in mid-October, 1989 (ASW.89.10.II-13). (See Patrick and Hopper 1982; Hopper *et al.* 1990)

A

B



C

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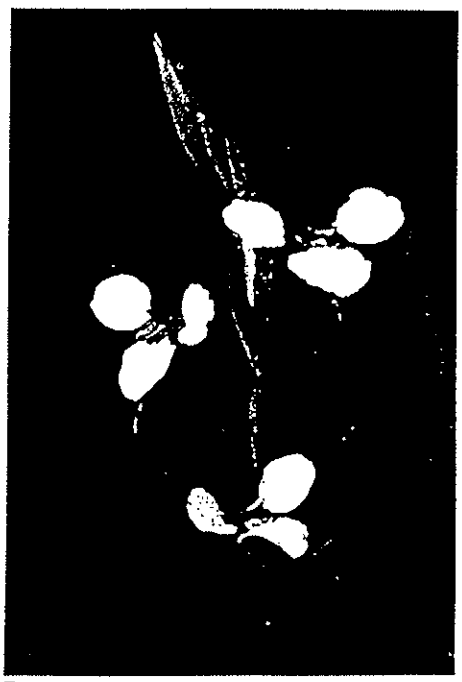


F

Plate 2

Gazetted Rare Flora (DRF) and Some Priority Three Species (P3) of the Perth Metropolitan Region

A1 & A2 *Drakaea elastica* (= *D. jeanensis*) (DRF)

Flower and leaves of *Drakaea jeanensis* plants growing on firm white sandy soil in an old, long-unburnt *Kunzea ericifolia* tall shrubland near Robert Bay, Peel Inlet. Also found, previously, in then recently burnt banksia woodland in Anketell and Canning Vale. Photographed in late September, 1989 (ASW89.9.III-13 & ASW89.9.III-11).

B1 & B2 *Drakaea* sp. (south west) S. D. Hopper 3566 (DRF)

The flower and leaf of this species, unofficially called *Drakaea* 'micrantha', are the smallest of any south-western species of the genus. The whitish leaf with the dark venation, as shown in Plate B2, distinguishes it from other species. This plant was growing on sandy soil in eucalypt woodland next to Mowen Road in Mowen State Forest Block, east of Margaret River. Photographed in late September, 1989 (ASW89.9.III-22 & ASW89.9.III-21).

C *Restio stenostachyus* (P3)

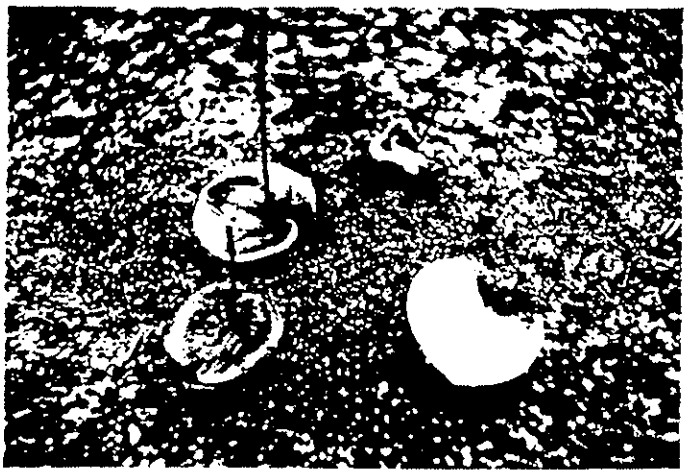
Restio stenostachyus is a restionaceous, perennial, rhizomatous, creeping herbaceous plant recorded on the coastal plain only in the Perth Flora Region. The plant forms dense mats up to several metres broad and 0.6m tall, but where it survives in pastures it is grazed and much shorter. It is found in depressions and low areas that are wet, often with standing or flowing water, during the winter. *Restio stenostachyus* has been recorded between Gingin and a kilometre east of Serpentine River in the Lowlands area. It is more common and widespread than the Western Australian Herbarium collections indicate. Photographed near Thomas Road and Anketell Road, Oakford, in late September, 1989 (ASW89.9.II-14).

D *Villarsia submersa* (P3)

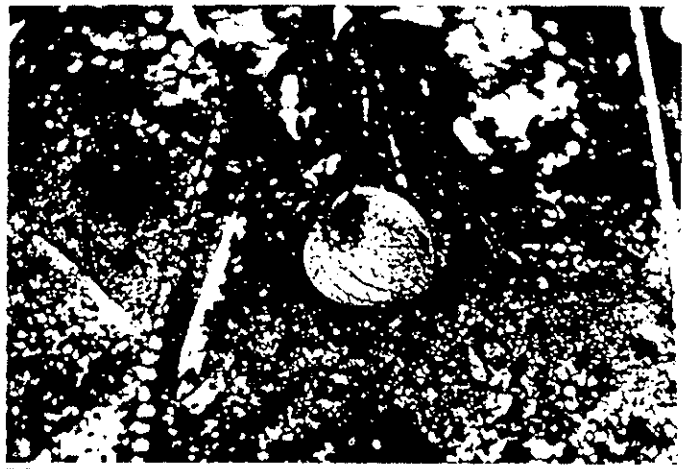
Like *Aponogeton hexatepalus*, with which the species sometimes occurs, *Villarsia submersa* grows in shallow, winter pools in clay depressions. It is, however, rarer than *Aponogeton hexatepalus*. Contrary to the description in the Perth Regional Flora (Marchant *et al.* 1987), the leaf blades as well as the white flowers float on the water surface. Normally the plant flowers in August and September, but in 1989 it was found still flowering in late October and early November. Until spring 1989 the species was believed to be restricted to a few localities in the south-west in the Boyanup-to-Busselton area, east of Manjimup and between Albany and Denmark (where it was found in the mid-1980s by Greg Keighery). In September 1989 the known range of *Villarsia submersa* was extended northward to the Perth Metropolitan Area, where it was found near Anstey Road, Forrestdale (by Arthur Weston) and near Brixton Road, Kenwick (by Peter Lambert). The Anstey Road populations, in which the photographed plant was growing, appear to be the largest yet recorded. Photographed in mid-September, 1989 (ASW89.9.I-21).

A1

B1

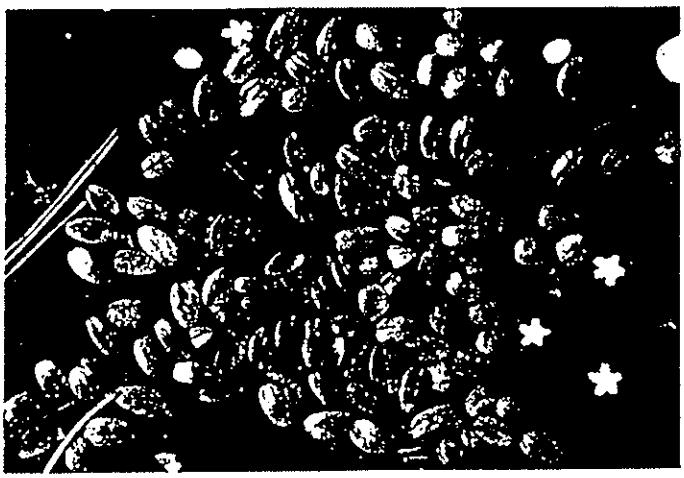


A2



B2

C



D

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Plate 3

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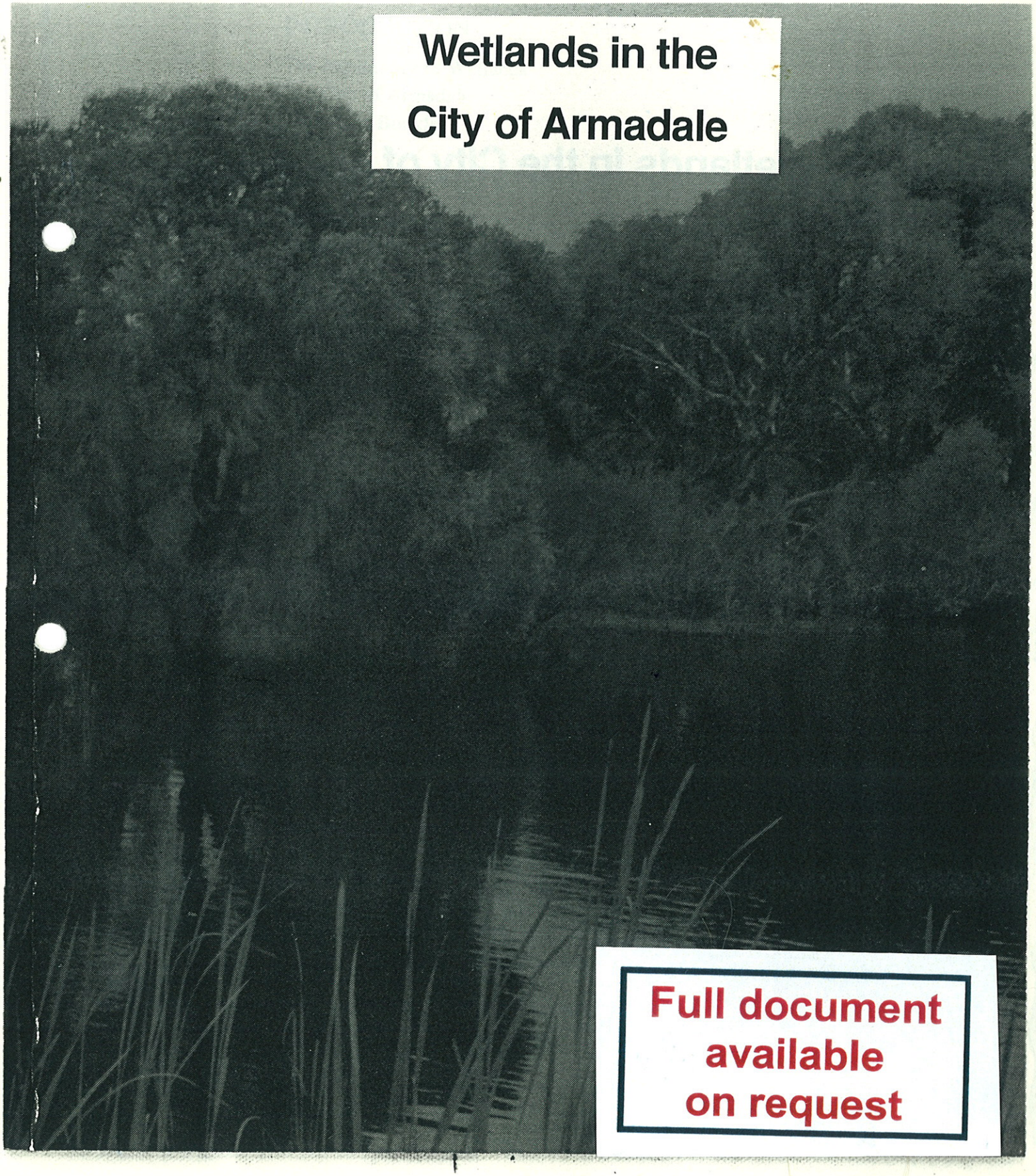
Water Authority
of Western Australia

Wetlands in the City of Armadale



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Flora of Lots 65/66 and Reserve 32926, Anstey Road, Forrestdale

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WESTERN AUSTRALIA

G.J. Keighery

June 1991

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Summary

1.0 Despite recent fire and disturbance, the vegetation of the site remains in excellent condition.

2.0 The *Evandra pauciflora* sedgeland is unique for the northern Swan Coastal Plain.

3.0 The emphemeral wetland vegetation is of extremely high conservation value, especially the *Actinostrobus* heathland which is not found elsewhere in the study area. The *Regelia - Pericalymma* heath and the *Melaleuca* woodland and shrublands are wetland communities which are now rare on the Swan Coastal Plain.

4.0 A total of 294 native species have been recorded from the site (383 are recorded from the whole study area), approximately 80% of that which will be recorded. This is a very species rich site (greatest for any site under 200 ha on the coastal plain).

5.0 The site contains declared endangered flora, and 5 priority taxa.

6.0 The site contains 72 species not previously recorded for the Jandakot study area, illustrating how poorly documented the flora of the study area is at this time.

7.0 Several taxa not on the endangered or priority lists of CALM, but of significant conservation value were listed. These being *Tricoryne ? tenella, Tribonanthes* sp., *Petrophile media* var. *juncifolia* and *Jacksonia* aff. *sericea.*

8.0 The record of *Leptocarpus tenellus* is a northward range extension of *c.* 200 km.

Introduction

The study area comprises approximately 150 ha. of low ridges supporting *Banksia* woodland with flats of emphemeral wetlands between. Most of the vegetation has been mapped by Weston (1989), and the aim of this report was to concentrate on the flora present within the area.

The region was covered by extensive foot traverse in January 1991.

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Proposals for the

Jandakot Botanic Park

Final

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BS 342
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BS 344
BASS. S
DE YOUNG

Prepared for the Western Australian Planning Commission
by the Ministry for Planning
Albert Facey House
469 Wellington Street
Perth 6000 Western Australia

Ministry for Planning

March 1995

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Proposed Jandakot Botanical Park; Overview of Botanical Communities and their Significance I Anstey Road Wetlands

Greg Keighery
1992

Department of Conservation and Land Management

Background

The Jandakot Botanical Park was proposed to conserve the *Banksia* woodlands of the Bassendean Dunes, and their associated wetlands (Bassendean Complex - Central and South).

However, the eastern margin of the study area delineated by the Department of Planning and Urban Development, impinges on on the Pinjarra Plain (Southern River Complex). Lots 65/66 and Reserve 32926 Anstey Road is the only uncleared remnant of this complex in the region.

Because of the significance of this area, and the land use conflicts which have arisen over the location(s), a separate report has been prepared. Other reports will deal in detail with Forrestdale Lake, the Banksia woodlands, Bassendean (Jandakot) Wetlands and significant flora of the proposed park.

Geomorphological Setting

Van Gool (1990) has mapped the geomorphology of the study area up to Forrest Road, at a scale of 1:50 000. Most of the study area lies within the Bassendean Dune Systems, whereas the wetlands around Forrestdale Lake are placed in the Pinjarra Plain. Anstey Road, directly nort
boundary of the Bassendean Dunes a

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Lot 68 Anstey rd Forrestdale Banksia Bushland 7-6-93

Lot 68 Anstey rd Forrestdale Red Bugles 7-6-93.