CANNING RIVER REGIONAL PARK AND ADJACENT BUSHLAND, RIVERTON TO LANGFORD

Boundary Definition: protected area/bushland taken to zoning and cadastre boundary (Areas of bushland/native vegetation within the boundaries of the Site are not accurately mapped; Boundary adjusted from that in draft *Perth's Bushplan.*)

SECTION 1: LOCATION INFORMATION

Bush Forever Site no. 224
Area (ha): bushland 161.2 (Site also includes open water.)
Map no. 54
Map sheet series ref. no. 2033–I NE
Other Names: not known
Local Authorities (Suburb): City of Canning (Wilson, Cannington, Langford, Ferndale), City of Gosnells (Beckenham)
System 6 (1983): M68, part M75 area of bushland goes beyond System area boundaries, all bushland described

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS
Pinjarra Plain
Guildford Formation (Qpa: Cs) (Qha: Msp, Msc1)
Bassendean Dunes
Bassendean Sands (Qpb: S8)
Bassendean Dunes/Pinjarra Plain
Bassendean Sands over Guildford Formation (Qpb/Qpa: S10)
Wetlands (within the Bassendean Dunes)
Holocene Swamp Deposits (Qrw: Sp2)

VEGETATION AND FLORA
Vegetation Complex
Pinjarra Plain
Guildford Complex
Swan Complex
Bassendean Dunes
Bassendean Complex — Central and South
Combinations of Bassendean Dunes/Pinjarra Plain
Southern River Complex
Floristic Community Types: not sampled, types not inferred

WETLANDS
Wetland Types: sumpland, floodplain, palusplain, river, creek, artificial channel, estuary (waterbody), estuary (shoreline and peripheral)
Natural Wetland Groups
Bassendean—Pinjarra transition OR Bassendean with fluvial features
Bennet Brook (B/P.4)
Swan Coastal Plain Rivers
Swan River (R.2)
Estuaries
Swan River (E.2)
Wetland Management Objectives: Conservation (258.6ha, 545m), Resource Enhancement, Multiple Use
Swan Coastal Plain Lakes EPP: 32.1ha

THREATENED ECOLOGICAL COMMUNITIES
Not determined

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: open water, vegetated wetland, creek, river, estuary, island, vegetated uplands
Vegetation and Flora: limited survey (CALM *et al.* 1997, Connell 1995, Pen 1983); detailed survey (Brock and Pen 1984, State Planning Commission 1989)
Structural Units: mapping (State Planning Commission 1989, Brock and Pen 1984)
Uplands: Scattered *Banksia menziesii, B. attenuata* and *Eucalyptus marginata* Low Woodland over Mixed Shrublands of *Acacia stenoptera,* A. *saligna, Jacksonia furcellata* and *J. sternbergiana*
Wetlands (wetflats): *Eucalyptus rudis* and *Melaleuca rhaphiophylla* Low Woodland to Closed Forest; *Eucalyptus rudis* Woodland to Open Forest; *Casuarina obesa* and *Melaleuca rhaphiophylla* Woodland; *Melaleuca*

rhaphiophylla Woodland; Open Low Heath to closed Heath dominated by *Sarcocornia quinqueflora* or *Halosarcia* species with occasional sedges of *Bolboschoenus caldwellii;* Sedgelands dominated by *Juncus kraussii, Samolus repens, Baumea juncea* or *Typha domingensis*

Scattered Native Plants: *Eucalyptus rudis* Open Woodland; *Melaleuca rhaphiophylla* Open Woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla* Open Woodland

Vegetation Condition: varies from patches in Excellent Condition to Completely Degraded

Total Flora: 96 native taxa, 58 introduced taxa (Brock and Pen 1984) (estimated <50% of expected flora)

Significant Flora: none recorded

Fauna: multiple surveys for birds (97 species) (Brock and Pen 1984; RAOU 1996 D, several visits) and native fish (33 species) (Brock and Pen 1984). Important feeding area for large assemblage of waterbirds and wading birds. Significant bird species: category 1 (6), category 2 (2), category 3 (5) and category 4 (2). Significant mammal species: Quenda (Friend 1996 D)

Linkage: no adjacent bushland; part of Greenways 71, 72, 79 (Tingay, Alan & Associates 1998a); part of a regionally significant contiguous bushland/wetland linkage (Part A, Map 7)

Other Special Attributes: National Trust of Australia (WA) Classification; bushland/naturally vegetated estuarine/riverine areas have particular conservation value in providing habitat for fauna and linkage between larger more intact areas of bushland; contains open space of regional significance (DCE 1983); part Site included in Canning River Regional Park (CALM *et al.* 1997); contains 1181m of regionally significant river (WRC 1996a GIS)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Directory of Important Wetlands in Australia; Entered in the Register of the National Estate; location for JAMBA/CAMBA species; subject to protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Criteria: Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation, Criteria not relevant to determination of regional significance, but which may be applied when evaluating areas having similar values

Recommendation: Part A: Site with Some Existing Protection; the care, control and management of this Site for conservation purposes within Canning River Regional Park is endorsed. Part B: Regional Creekline Mechanism (with mapped vegetation) (see Table 3, Volume 1).

CANNING RIVER REGIONAL PARK AND ADJACENT BUSHLAND, RIVERTON TO LANGFORD

Boundary Definition: protected area/bushland taken to zoning and cadastre boundary (Areas of bushland/native vegetation within the boundaries of the Bushplan Site are not accurately mapped.)

SECTION 1: CADASTRAL INFORMATION

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

Bushplan Site no. 224 **Map no.** 62, 63 **Map sheet series ref. no.** 2033–I NE

System 6 (1983): M68, part M75 area of bushland goes beyond System area boundaries, all bushland described

Other Names: not known

Area (ha): total 379.1 (includes open water); bushland 161.2

Local Authorities (Suburb)

City of Canning (Wilson, Cannington, Langford, Ferndale), City of Gosnells (Beckenham)

Zoning

MRS: Urban, Waterways, Parks and Recreation, Important Regional Roads

TPS: Landscape, Local Park and Recreation Area, Public Purposes, Residential, Residential A, Rural, Special Use

Ownership Categories

Local Government, State Government, Private (including commercial organisation), Not identified

Lot/Location/Reserve numbers (Purpose), Street name

1, 2, 3, 4, 7, 31, 32, 33, 62, 63, 64 Fern Rd; 0, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 25, 27, 28, 29, 30 Queens Park Rd; 5, 6, Kent St; 21, 22, 23, 24, 25, 26, 3431, 3447 Wharf St; 58, 100 Mason St; 15, 16, 17 Rupert St; 13, 14, 18, 19 Greenfield St; 12 Richmond St; 0, 1, 2, 3, 15, 100, 101, 925, 1786 Nicholson Rd; 2, 3, 4, 16 Spencer Rd; 139, 141, 150, 2588, 2784, 2969 Ellison Dr; 3559, 3826 Machin Pl; 55, 502 Hester St; 6, 7, 43, 70, 71, 358, 259, 360, 361, 362, 367 Wimbledon St; 0, 1, 2, 7, 11 Harris St; 1, 2, 500 Packer St; 2023, 2758, 3412 Highbury Cr; 0, 2, 48, 49, 1572 Lofoten Wy; 62 Willcock St; 0, 2, Marmot Way; 1201 Hybanthus Rd; 1974; 70, 2530, 3833 Bywater Way; 12, 923 Ferndale Cr; 9, 10, 11, 41, 314, 500, 933 Ferndale Cr; 1 Duff Rd; 0, 4, 5, 42, 44, 1744 Champlin Way; 31, 47 Liseron Wy; 30 Lofoten Wy; 102, 500 Watts Rd; 1, 2, 5, 9, 10, 75, 98, 100, 101, 103, 181, 500, 501, 701, 703 Surrey Rd; 3753 Hollis Rd; 5 Eastfield Ct; 3, 1988 Bridgeway Ave; 61 Camsell Wy; 20, 21, 35, 36 Greenfield St; 23, 24, 25, 26, 27, 40, 46, 47, 48, 49, 50, 700, 3692 Marriamup St; 32, 33 Cockram St; 1, 43 River Rd; 3, 14, 15, 16, 42, 43, 50, 200, 205, 2090 Woodloes St; 990, 1616 Riverton Dr; 1616 Barbican St; 3785, 4040 Vervain Wy; 52, 199, 920, 921 Riley Rd; 202 Rivermoor Loop; 0, 199, 201, 275 Adenia Rd; 2, 2575, 2596 Metcalfe Rd; 5 Merino Ct; 69, 2815, 2816 Latimer Wy; 500 Hester St; 2575 Jaccard Wy; 1, 2630 Iveson Rd; 701, 702 Bradford St; 0, 924, 2882, 2885, 4089 street not identified; Road

Crown Reserve

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

Pinjarra Plain

Guildford Formation (Qpa: Cs) (Qha: Msp, Msc1)

Bassendean Dunes

Bassendean Sands (Qpb: S8)

Bassendean Dunes/Pinjarra Plain

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

Wetlands (within the Bassendean Dunes)

Holocene Swamp Deposits (Qrw: Sp2)

VEGETATION AND FLORA

Vegetation Complex

Pinjarra Plain

Guildford Complex

Swan Complex

Bassendean Dunes

Bassendean Complex - Central and South

Combinations of Bassendean Dunes/Pinjarra Plain

Southern River Complex

Floristic Community Types: not sampled, types not inferred

WETLANDS

Wetland Types: sumpland, floodplain, palusplain, river, creek, artificial channel, estuary (waterbody), estuary (shoreline and peripheral)

Natural Wetland Groups

Bassendean—Pinjarra transition OR Bassendean with fluvial features

Bennet Brook (B/P.4)

Swan Coastal Plain Rivers

Swan River (R.2)

Estuaries

Swan River (E.2)

Wetland Management Objectives: Conservation (258.5ha, 545m), Resource Enhancement, Multiple Use

Swan Coastal Plain Lakes EPP: 32.1ha

THREATENED ECOLOGICAL COMMUNITIES

Not determined

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: open water, vegetated wetland, creek, river, estuary, island, vegetated uplands

Vegetation and Flora: detailed survey (Brock and Pen 1984, State Planning Commission 1989); limited survey (CALM *et al.* 1997, Connell 1995, Pen 1983)

Structural Units: mapping (State Planning Commission 1989, Brock and Pen 1984)

Uplands: Scattered *Banksia menziesii, B. attenuata* and *Eucalyptus marginata* Low Woodland over Mixed Shrublands of *Acacia stenoptera*, A. *saligna, Jacksonia furcellata* and *J. sternbergiana*

Wetlands (wetflats): *Eucalyptus rudis* and *Melaleuca rhaphiophylla* Low Woodland to Closed Forest; *Eucalyptus rudis* Woodland to Open Forest; *Casuarina obesa* and *Melaleuca rhaphiophylla* Woodland; *Melaleuca rhaphiophylla* Woodland; Open Low Heath to closed Heath dominated by *Sarcocornia quinqueflora* or *Halosarcia* species with occasional sedges of *Bolboschoenus caldwellii;* Sedgelands dominated by *Juncus kraussii, Samolus repens, Baumea juncea* or *Typha domingensis*

Scattered Native Plants: *Eucalyptus rudis* Open Woodland; *Melaleuca rhaphiophylla* Open Woodland; *Eucalyptus rudis* and *Melaleuca rhaphiophylla* Open Woodland

Vegetation Condition: varies from patches in Excellent Condition to Completely Degraded

Total Flora: 96 native taxa, 58 introduced taxa (Brock and Pen 1984) (estimated <50% of expected flora)

Significant Flora: none recorded

Fauna: surveyed by RAOU (1996 D), several visits, and Brock and Pen (1984) for birds (97) and Brock and Pen (1984) for fish (35). Important feeding area for large assemblage of waterbirds and wading birds. Significant bird species: category 1 (6), category 2 (2), category 3 (5) and category 4 (2). Significant mammal species: Quenda (Friend 1996 D)

Linkage: no adjacent bushland; part of proposed Greenway 94, 87 (Tingay, Alan & Associates 1997a); part of a regionally significant contiguous bushland/wetland linkage (Volume 2A, Map 8)

Other Special Attributes: National Trust of Australia (WA) Classification; bushland/naturally vegetated estuarine/riverine areas have particular conservation value in providing habitat for fauna and linkage between larger more intact areas of bushland; contains open space of regional significance (DCE 1983); part Bushplan Site included in Canning River Regional Park (CALM *et al.* 1997); contains 1181m of regionally significant river (WRC 1996a GIS)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Directory of Important Wetlands in Australia; Listed on the Register of the National Estate; Location for JAMBA/CAMBA species

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

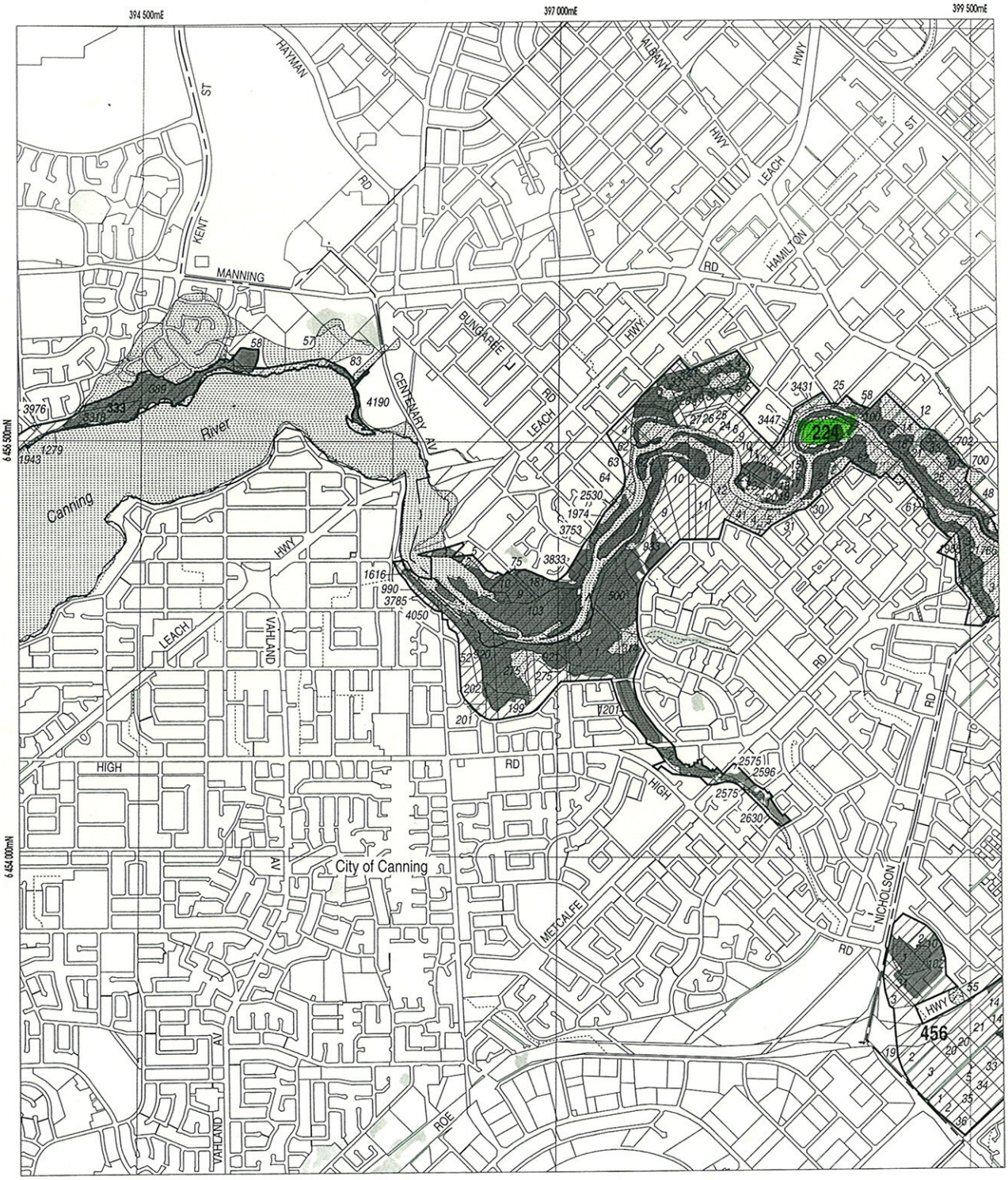
Criteria: Representation of ecological communities, Rarity, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation, Criteria not relevant to determination of conservation value, but which may be applied when evaluating areas having similar values

Opportunities and/or Constraints

Opportunities: Bushplan Site/part Bushplan Site subject to Swan Coastal Plain Lakes EPP, Swan and Canning Rivers EPP; location of Scheduled Fauna, conservation category wetlands; under MRS Parks and Recreation Reservation, TPS Landscape Zoning and Local Park and Recreation Area Zoning, Crown Reserve

Constraints: private land; under MRS Urban Zoning, MRD regional road requirements

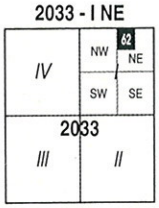
Recommendation: The care, control and management of parts of this Bushplan Site for conservation purposes within Canning River Regional Park is endorsed. The most appropriate mechanism for the protection of the remainder of this Bushplan Site to be considered through the public comment period in consultation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



LEGEND

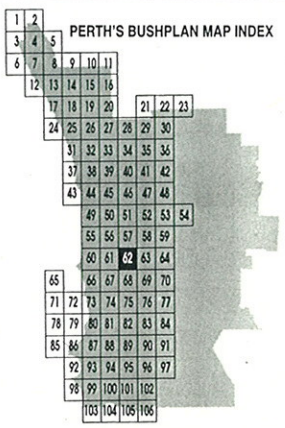
- 472 — Bushplan Sites With Regionally Significant Bushland
- Other Native Vegetation
- Conservation Category Wetlands
- Bushplan Sites With Some Existing Protection
- 696 — Lot Number, Location Number
- Channel Wetlands
- Local Government Boundary

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_62.dgn

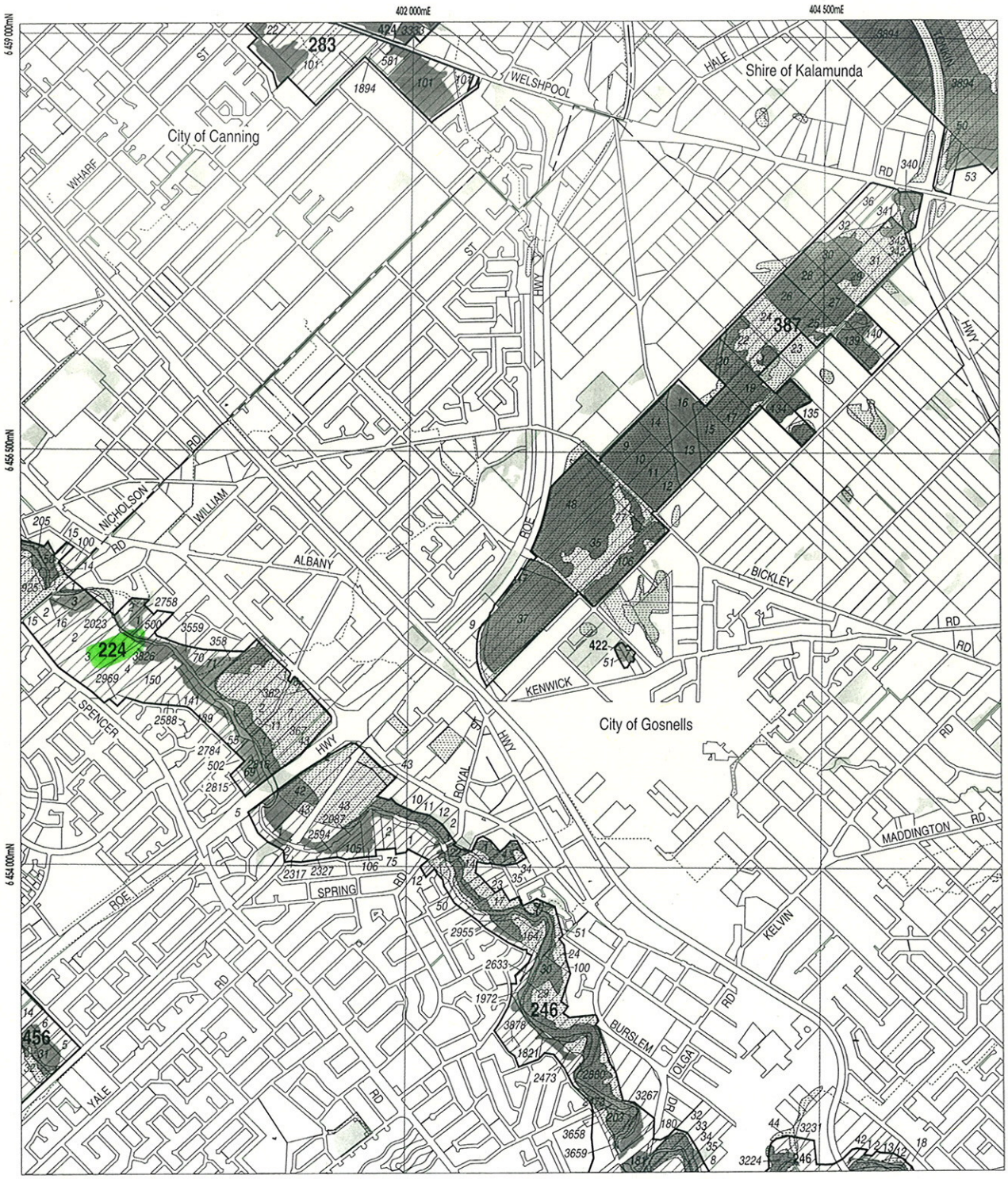
Cadastral Data supplied by Department of Land Administration, W.A.

Wetlands Data supplied by Water and Rivers Commission

Native Vegetation Extent for Study Area supplied by Agriculture Western Australia

Bushplan Site Map

Map 62



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

IV | NW 63 NE / SW SE
2033
III | II

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

PERTH'S BUSHPLAN MAP INDEX

1	2							
3	4	5						
6	7	8	9	10	11			
12	13	14	15	16				
17	18	19	20		21	22	23	
24	25	26	27	28	29	30		
	31	32	33	34	35	36		
	37	38	39	40	41	42		
	43	44	45	46	47	48		
		49	50	51	52	53	54	
		55	56	57	58	59		
		60	61	62	63	64		
65		66	67	68	69	70		
71	72	73	74	75	76	77		
78	79	80	81	82	83	84		
85	86	87	88	89	90	91		
	92	93	94	95	96	97		
	98	99	100	101	102			
		103	104	105	106			

N

SCALE

0 — 500 — 1000
Metres

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

ntw-map//environ/bushplan//bushvol2_63.dgn

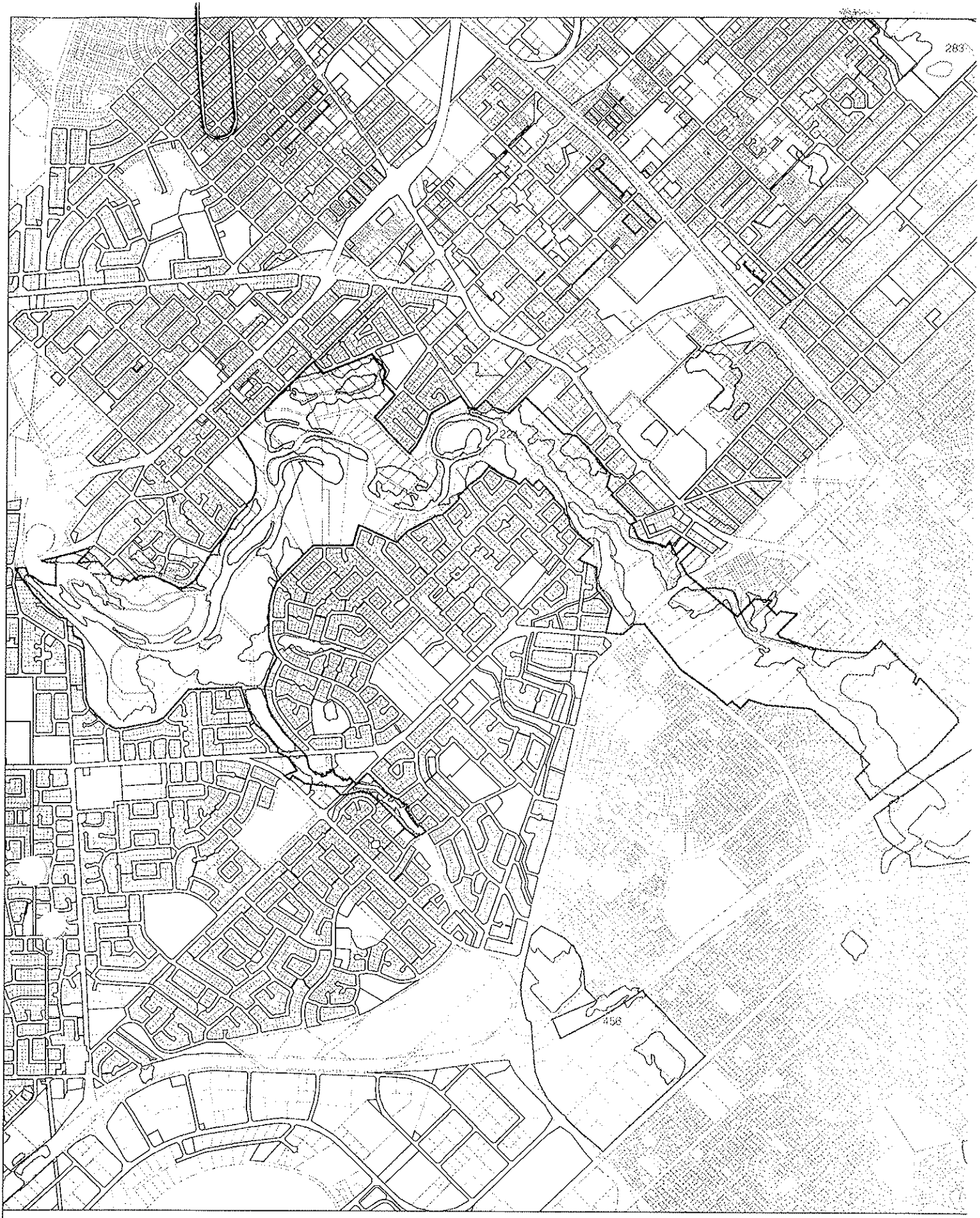
Cadastral Data supplied by Department of Land Administration, W.A.

Wetlands Data supplied by Water and Rivers Commission

Native Vegetation Extent for Study Area supplied by Agriculture Western Australia

Bushplan Site Map

Map 63



224.

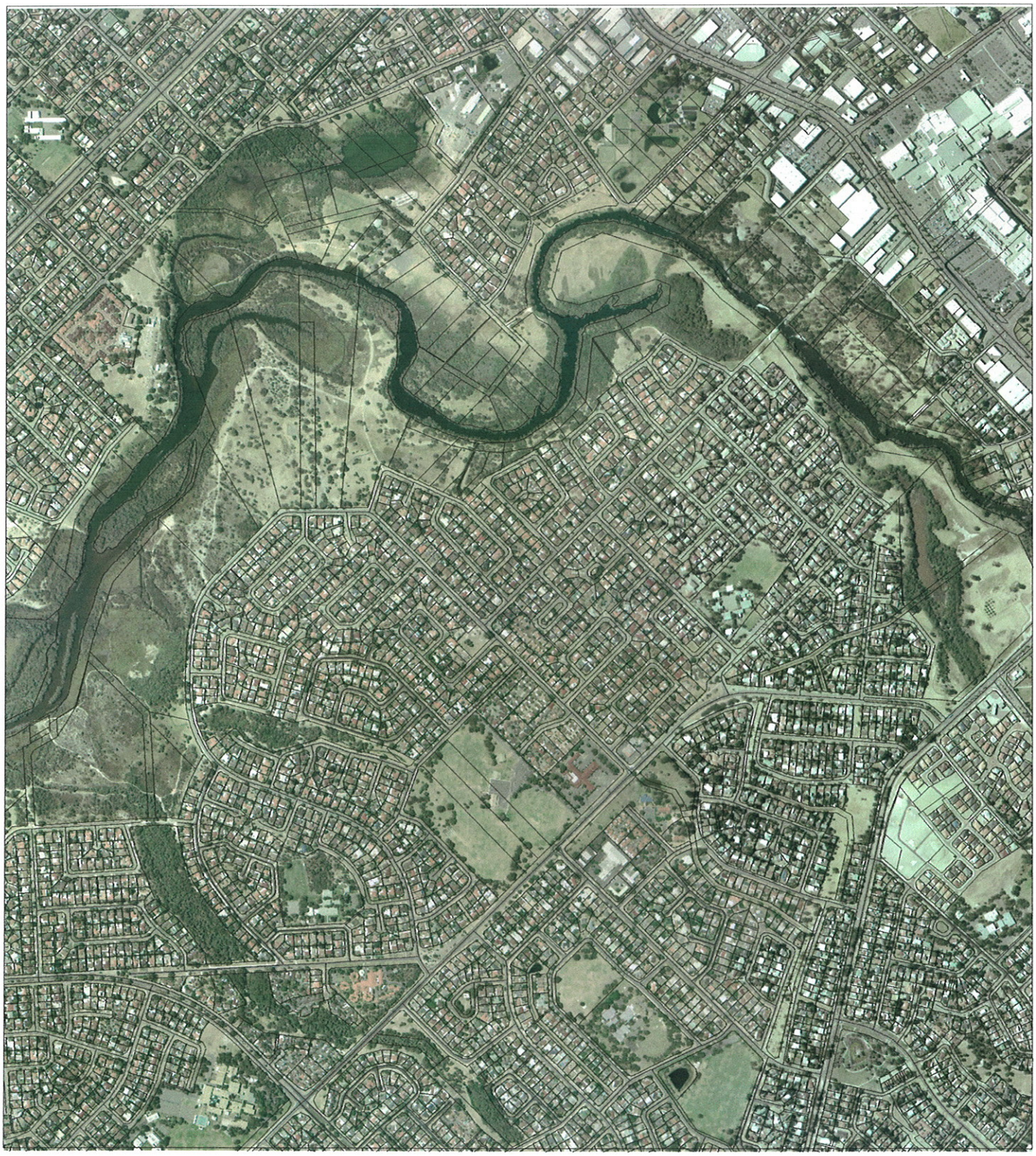
BUSHPLAN SITES CORRECTED

WESTERN AUSTRALIAN PLANNING COMMISSION

CUSTOMER FOCUS WESTERN AUSTRALIA

TC 28/10/98

N



Floristic Survey Sites of the Southern Swan Coastal Plain
- GJKENV (Keighery 1996)
- GRIFFIN (Griffen 1994)
- SCP (Gibson et al 1994)
- SYS6ENV (DEP 1996 and Trudgen & Keighery 1995)
- SYS6ENV2 (DEP 1996 and Trudgen & Keighery 1995)
- CALM Threatened Ecological Communities 2002
- Roads - Perth Metropolitan

Bush Forever Site 224: Canning River Regional Park and Adjacent Bushland, Riverton to Langford

0 100 200 300 400 500 600 700 800 900 1000 Meters

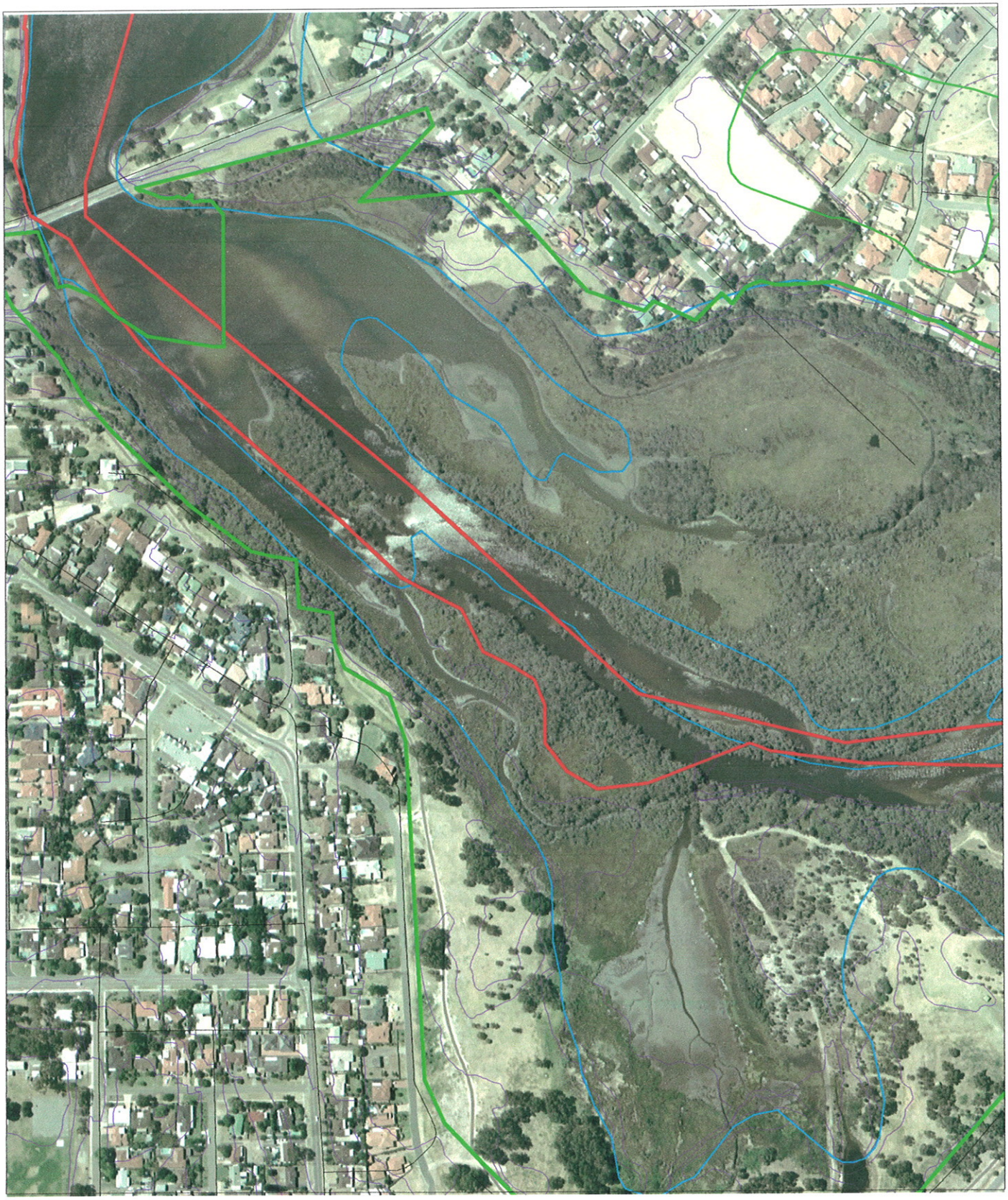
N

1:15000

Datum: GDA - Projection: MGA Zone 50

Department of Environment

Data Sources:
Cadastre DLI
Aerial Phototography : Skyview DLI



Bush Forever Sites
Local Government Authority Boundaries
Geomorphic Wetlands Feb04 by Evaluation
Conservation
Resource Enhancement
Multiple Use
Floristic Survey Sites of the Southern Swan Coastal Plain
GJKENV (Keighery 1996)
GRIFFIN (Griffen 1994)
SCP (Gibson et al 1994)
SYS6ENV (DEP 1996 and Trudgen & Keighery 1995)
SYS6ENV2 (DEP 1996 and Trudgen & Keighery 1995)
CALM Threatened Ecological Communities 2002
Roads - Perth Metropolitan

Bush Forever Site 224: Canning River Regional Park and Adjacent Bushland, Riverton to Langford

0 100 200 300 400 Meters

N

1:5000

Department of Environment

Data Sources:
Cadastre DLI
Aerial Phototography : Skyview DLI

Datum: GDA - Projection: MGA Zone 50

R. A. O. U. T R A C K I N G D A T A B A S E

23/06/96 PARK SIGHTINGS REPORT Page No. 1

Canning Regional Park (M68)

ORDER:	REF:	BIRD NAME	NO. SIGHTINGS
0019	0217	Musk Duck	2
0025	0207	Australian Shelduck	1
0028	0202	Australian Wood Duck	2
0031	0948	Mallard	2
0032	0208	Pacific Black Duck	4
0035	0211	Grey Teal	5
0041	0061	Australasian Grebe	3
0042	0062	Hoary-headed Grebe	1
0128	0101	Darter	2
0129	0100	Little Pied Cormorant	4
0132	0097	Little Black Cormorant	3
0133	0096	Great Cormorant	2
0135	0106	Australian Pelican	3
0139	0188	White-faced Heron	5
0140	0185	Little Egret	1
0145	0187	Great Egret	2
0157	0179	Australian White Ibis	4
0160	0182	Yellow-billed Spoonbill	3
0175	0221	Brown Goshawk	1
0183	0235	Australian Hobby	1
0204	0058	Purple Swamphen	3
0205	0056	Dusky Moorhen	3
0208	0059	Eurasian Coot	3
0231	0158	Common Greenshank	3
0235	0157	Common Sandpiper	1
0267	0146	Black-winged Stilt	2
0269	0148	Red-necked Avocet	2
0282	0144	Black-fronted Dotterel	1
0297	0125	Silver Gull	3
0303	0112	Caspian Tern	1
0305	0115	Crested Tern	1
0326	0988	Laughing Turtle-Dove	5
0327	0989	Spotted Turtle-Dove	4
0359	0273	Galah	3
0360	0272	Long-billed Corella	1
0364	0269	Sulphur-crested Cockatoo	1
0386	0294	Australian Ringneck	3
0387	0290	Red-capped Parrot	2
0446	0322	Laughing Kookaburra	1
0451	0326	Sacred Kingfisher	2
0453	0329	Rainbow Bee-eater	2
0492	0976	Striated Pardalote	3
0517	0463	Western Gerygone	1

0524	0476	Inland Thornbill	3	1
0528	0472	Western Thornbill	3	1
0531	0486	Yellow-rumped Thornbill	3	2
0537	0638	Red Wattlebird		5
0561	0608	Singing Honeyeater		5
0583	0597	Brown Honeyeater		5
0587	0631	New Holland Honeyeater	4	1
0653	0401	Rufous Whistler		2
0671	0415	Magpie-Lark		4
0673	0361	Grey Fantail		1
0676	0364	Willie Wagtail		5
0678	0424	Black-faced Cuckoo-shrike		2
0695	0702	Grey Butcherbird		2
0698	0705	Australian Magpie		5
0706	0930	Australian Raven		4
0[illegible]5	0647	Richard's Pipit		2
0760	0564	Mistletoebird		4
0763	0357	Welcome Swallow		4
0765	0359	Tree Martin		5
0768	0524	Clamorous Reed-Warbler		3
0781	0574	Silvereye		5

*** END OF REPORT ***

(1)
(2) 2
(3) 5
(4) 2

SUMMARY REPORT

TOTAL BIRDS SIGHTED	:	64
TOTAL NUMBER OF CARDS	:	5

*** END OF SUMMARY ***

from old files found 1/99
BS 224
PB072

1.0 Reserve Number 20265.

2.0 Date of Survey.

18 July, 1978.

3.0 Current Vesting and Purpose.

No. 20265	District CANNING	Lot or Locn. No. 933	Corres. No. 1068/87
Road District CANNING TOWN COUNCIL		Area ~~11a 0r 25p~~ 4.5147	Pth 16,16 Plan 1D/20 SE
Purpose PUBLIC UTILITY			OP or Dia.

Remarks		Gazette Date
	ORIGINAL GAZETTE	1.11.29/2436
CA :	Official Metric Conversion 4.5147ha Corr: 1068/87 p 148	

4.0 Wetland Classification.

LO. foreshore.

5.0 Description of Reserve.

5.1 Specific Locality.

The reserve is situated on the Canning River foreshore in the suburb of Ferndale (Town of Canning). It lies between the river and Ferndale Crescent (Map 1).

5.2 Physical Features.

Within the reserve, lying beside the river is a small, low lying area subject to both tidal and winter flooding (Plates 1, 2 and 3).

Most of the reserve, however, is sufficiently elevated to prevent flooding (Plates 5 and 6).

The reserve is situated on a riverine plain, with grey sandy soils. Cutting across the reserve, proceeding down to the river, are two drains. One is a natural creek which is lined with natural wetland vegetation whilst the other is a deep, man-made storm-water drain.

5.3 Vegetation.

Melaleuca rhaphyiophylla and *Casuarina* spp are the dominant species of vegetation that fringe the Canning River (Plate 1). In those areas away from the areas subject to inundation, *Eucalyptus rudis* is dominant. The understorey is predominantly cleared, with the exception of a small number of *Banksia* spp.

5.4 Fauna.

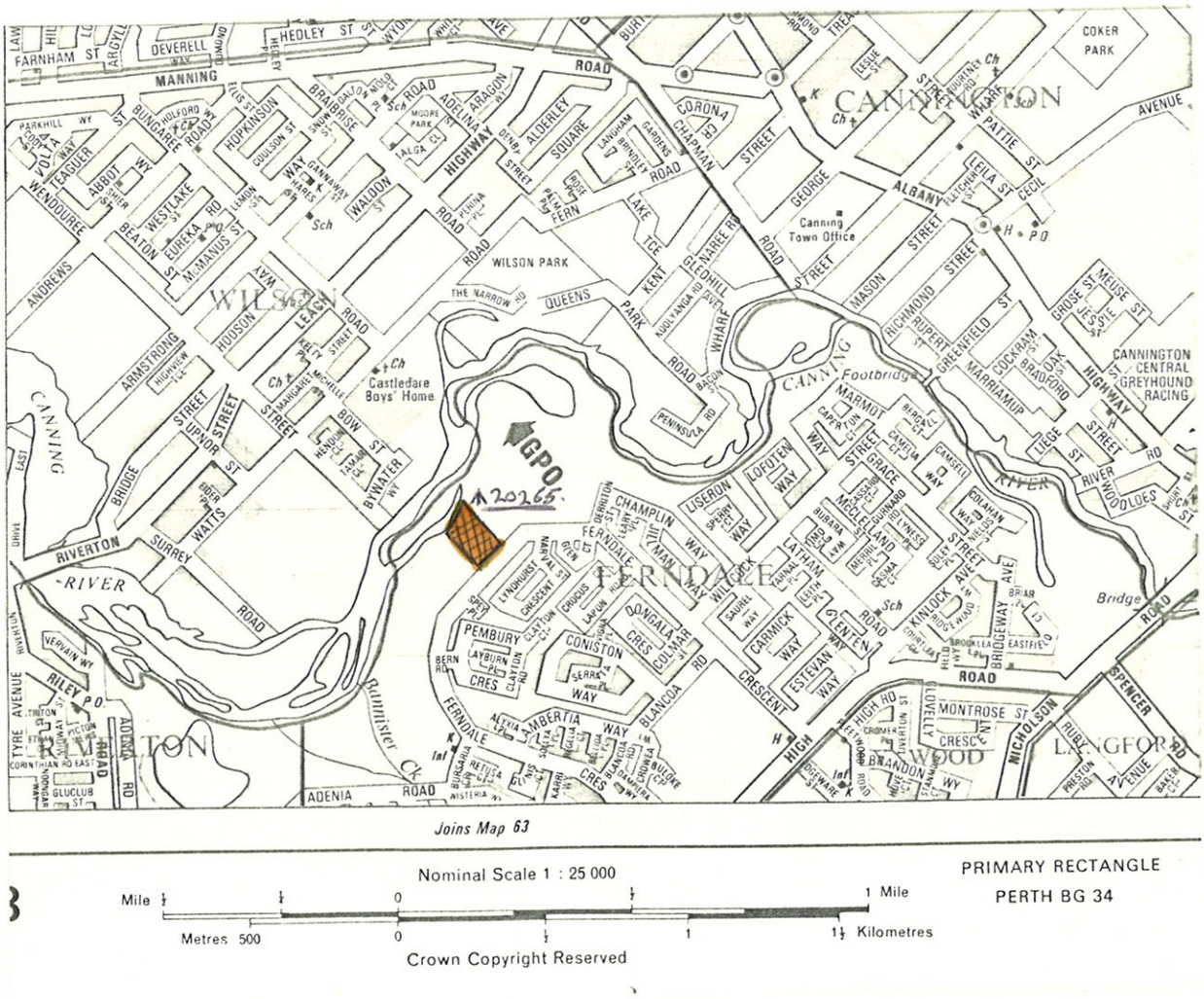
During the brief survey period, no fauna was observed.

6.0 Discussion.

The condition of the immediate foreshore area is generally good, although, it could be enhanced if a number of car bodies, etc. were removed (Plate 1). The elevated region, however, will require much more attention. The quantity of rubbish is more extensive (Plate 6) and the condition of the vegetation is much worse

Large areas of the Canning River foreshore upstream from the Riverton Bridge are now under the control of the MRPA and have been designated for Parks and Recreation.

Reserve 20265 is within this area, it has no outstanding features and is typical of the region. The future of the reserve will be determined by the MRPA.



Map 1 Location of Reserve 20265 taken from Perth Metropolitan Street Directory Map 53.

Plate 1 Winter flood plain and tidal area in foreground with river fringing vegetation (*Melaleuca* and *Casuarina* spps) behind.

Plate 2 Winter flood plain and tide affected area fringing Canning River.

Plate 3 Winter flood and tide affected area with isolated *E. rudis* trees in fore and mid grounds.

Plate 4 Higher ground (looking away from river) showing *E. rudis* and *Banksia* spp with grassed understorey.

Plate 5 *E. rudis* open woodland looking towards river with flooded areas in midground.

Plate 6 An example of the refuse distributed over the reserve.

WATER RESOURCES MANAGEMENT PLAN

MIDDLE CANNING CATCHMENT

(STAGE 1 - VOLUME 1)

Prepared for the

Water Authority of Western Australia

By

Evangelisti & Associates
Consulting Engineers and Project Managers

in association with

Landvision
Consultants in Urban and Environmental Planning

and

The V & C Semeniuk Research Group
Environmental Scientists

October 1995

Public input will be sought by inviting people to submit to the programme areas that they think have special conservation values that should be considered for inclusion in the System recommendations. These submitted areas will be assessed against a detailed set of criteria developed through the Technical Working Group and Steering Committee and where appropriate will be surveyed to determine the ecological communities they contain and confirm their conservation value. If the submitted area meets the detailed criteria it will be added to a list of possible areas for inclusion in the proposed conservation estate.

The specific recommendations for System 6 and System 1 will then be updated using this list. Any issues that might constrain the implementation of the updated recommendations would be resolved as far as possible prior to finalisation of the draft report.

As well as these specific recommendations, the update programme will also review the general recommendations in Part 1 of the original System 6 report that provide some broader policy guidelines for achieving conservation in this region.

The specific recommendations will be released with the general recommendations as a draft report for public comment. Public submissions will be collated and reviewed and the report finalised for consideration by the EPA.

It is envisaged that the final report would be submitted to Cabinet for endorsement, as were the original EPA Systems reports.

This approach is intended to provide wide involvement, while maintaining an effective and efficient process for resolving issues. The objective is to develop a well argued set of recommendations for conservation in the study area that are supported by government and the community.

PUBLIC ENVIRONMENTAL REVIEW

ROE HIGHWAY EXTENSION

WELSHPOOL ROAD TO SOUTH STREET

MAIN ROADS, WESTERN AUSTRALIA

April 1993.

LIST OF FIGURES

LIST OF ATTACHMENTS

History of the Reserve

The Bannister Creek Reserve, from Brampton Way to the Canning River, was originally a series of wetlands. In the 1960's and 1970's the surrounding area was subdivided, leading to the formation of Lynwood and Ferndale.

Since 1979, the creek has been used as a main drain, carrying large quantities of storm water from the urban catchment through the Canning River Regional Park to the Canning River.

The reserve now combines conservation and recreation and is still used as a main drain for the surrounding suburbs.

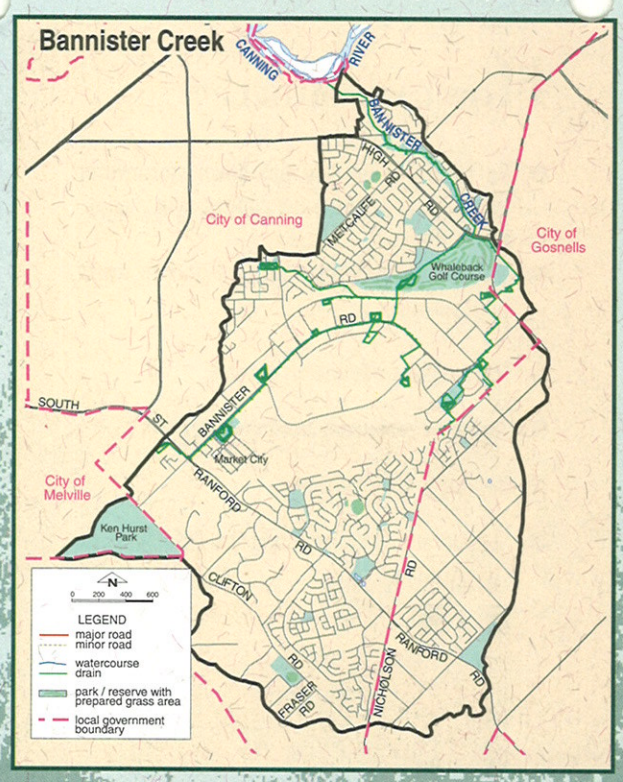
WHO IS LOOKING AFTER THE CREEK ?

Many different organisations are working together in the reserve:

- Bannister Creek Catchment Group
- City of Canning
- Water and Rivers Commission
- Water Corporation
- Local community
- Schools and scouts/cubs

These groups have a common goal and are working together to recreate a Living Stream.

By restoring Bannister Creek Reserve to a more natural state, the community and the environment will share the benefits.



The Catchment Area

A catchment is the area from which Bannister Creek collects its water.

The suburbs of Canning Vale, its industrial area, Lynwood, Ferndale and Parkwood are included in the 2300 hectares of the catchment.

This means that anything which goes into a stormwater drain or onto a road in these areas will end up in Bannister Creek.

Flora and Fauna

The Bannister Creek Reserve is important for local plants and animals. Weeds cause harm to their habitat. The Bannister Creek Catchment Group and the City of Canning are slowly removing these aliens and introducing local plants. This provides food and shelter for our native animals.

JUVENILE NIGHT HERON

The reserve provides breeding and feeding grounds, stopover spots and homes for a large number of animals including water birds, bush birds, frogs, reptiles, insects, water animals, common brushtail possums and long necked turtles.

Bannister Creek Reserve is currently home to a diverse number of weed species, these are slowly being removed by the Bannister Creek Catchment Group and the City of Canning.

Local plants are being reintroduced to revegetate the reserve in the hope that it will eventually be returned to a natural form. This will create larger amounts of food and shelter for our native animals.

About the Bannister Creek Catchment Group

Local residents, concerned about the pollution events and the use of chemical weed control in the Bannister Creek waterway, formed a group in 1996. The Bannister Creek Catchment Group (BCCG) become incorporated in July 1997.

The BCCG and the City of Canning are now working together and have shared great success in the restoration and care of the Bannister Creek Reserve.

The BCCG has received financial support (to Sept 1999) from: Agriculture Dept WA, ALCOA, City of Canning, DEETYA & WADOT, Dept of Environment Protection, Greening WA, Natural Heritage Trust, Swan Catchment Centre, Water Corporation.

Funding from Natural Heritage Trust and the City of Canning has enabled the Group to employ a part-time Co-ordinator, and a full time Landcare Trainee.

The BCCG is involved in several important activities including:

- Community events
- Community and School involvement / education
- Stakeholder meetings
- Project planning
- Revegetation works
- Weed removal
- River restoration

How can you help ?

- Be careful what you put down stormwater drains or on roads - it all ends up in the creek.
- Dispose of lawn clippings and garden waste properly.
- Use paths provided when possible.
- Join in on community work days.
- Become a BCCG member.
- Support school groups using the Reserve as an educational resource.

FRINGED LILY

For further information contact:

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City of Canning

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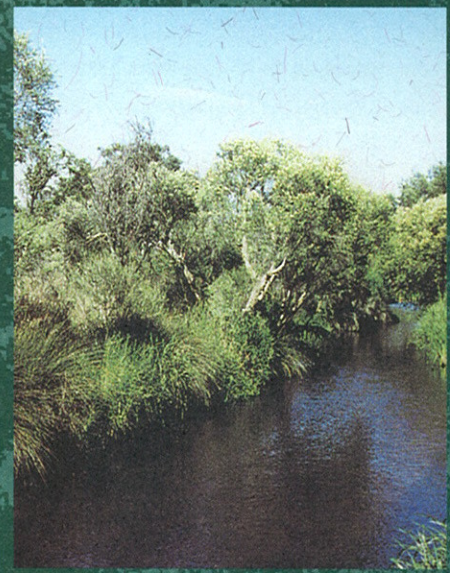
Bannister Creek Reserve



Working Together to Restore an Urban Creek

Bannister Creek CATCHMENT GROUP

Supported by the National Rivercare Program of the Natural Heritage Trust

Appendix 2

SUMMARY TABLE OF PLANT COMMUNITIES

FOUND WITHIN THE CANNING RIVER WETLAND

This table summarises the composition of each community. Communities were produced by grouping similar quadrats using floristic criteria. The figures represent the presence of each species within each community, as shown below:

+ = found in 1-5% of the quadrats of the communities
1 = found in 6-20% of the quadrats of the communities
3 = found in 41-60% of the quadrats of the communities
4 = found in 61-80% of the quadrats of the communities
5 = found in 81-100% of the quadrats of the communities

Communities

S = Samphire
H = Shrubby Samphire
B = Club-rush
J = Shore-rush
CM = Saltwater-Sheoak-Paperbark
To = Bulrush
Td = Narrow-leaf Bulrush
M = Paperbark
ME = Paperbark-Flooded Gum
Er = Flooded Gum
Ec = Veldt Grass

Species	Communities										
	S	H	B	J	CM	To	Td	M	ME	Er	Ec
Halosarcia indica subsp. *bidens*	+	4									
Halosarcia halocnemoides	+	4									
Angianthus preissianus		4									
Angianthus micropoides		2									
Suaeda australis	5	3	2	1	2						
Sarcocornia quinqueflora	5	5	3		+						
Samolus repens	4	3	5	5	4						
**Bulboschoenus caldwellii*	5	1	5	1	3	4			1		
Juncus kraussii	2	2	3	5	5		1	3	2	1	
Casuarina obesa	1	2		1	4			1		1	
Melaleuca rhaphiophylla	1			1	5	2	3	5	5	1	
**Paspalum distichum*	1	1		2	1		4		5	+	
**Typha orientalis*				1	1	5		2	5		
**Paspalum dilatatum*						3	2	2	3	1	
**Rumex crispus*				1	4	5	3		4		
Typha domingensis							5				
Centella cordifolia					+		4	2	3		
Lepidosperma longitudinale					+			4		1	
Juncus pallidus						3	2		4		

Appendix 2 (cont.)

Species	Communities										
	S	H	B	J	CM	To	Td	M	Me	Er	Ec
Eucalyptus rudis					+		2	3	4	5	3
Jacksonia sternbergiana									+	4	3
**Briza maxima*									1	4	5
**Romulea rosea*								1	+	3	4
Schoenus subfascicularis										3	1
**Ehrharta calycina*										2	5
Brachycome iberidifolia										1	4
Jacksonia furcellata										2	5
Cotula coronopifolia	4	4	2		1	3			1		
**Atriplex hastata*	3	3	5	1	4				1		
Triglochin striata	2	1	2		+				+		
**Polypogon monspeliensis*	3	3			1				1		
Isolepis marginata	2	3			1				1		
Triglochin mucronata	2	3			+						
**Parapholis incurva*	1	3									
**Lolium multiflorum*	2	3			3	2	2		2	+	
**Aster subulatus*	+		2	1	3	2			1		
Apium prostratum		1			3				+		
Myoporum caproarioides								2	+	+	
Acacia pulchella								3			
Melaleuca leptoclada								3			
Acacia saligna							1	2	+	3	2
**Hypochoeris radicata*								1		3	
Samolus junceus		1			+						
**Homeria collina*	+	2			1			1	1	1	
**Juncus bufonius*	1	1							+		
**Irridaceae sp.*	+	4			2				1	1	
Lythrum hyssopifolia	+	1									
Cyperus laevigatus	+	1						1	2		1
Melaleuca hamulosa	1	1		1	1					+	
**Nasturtium officinale*	+						2				
Hordeum leporinum		1			+			1		1	
**Watsonia bulbilifera*		1						1	2	1	2
Cassytha glabella		1			2			1	1	1	2
Centrolepis aristata		1									
Cotula cotuloides		1			1						
Isotoma scapigera		1									
Spergularia rubia		1								1	
**Vulpia bromoides*		1							2		1
Lobelia alata		1								+	
**Lolium perenne*		1									
Lawrencia spicata		1									
**Hypochoeris glabra*		1									
Agrostis avenacea		1			1	1					
Melaleuca cuticularis		1				+		1		1	
**Eragrostis curvula*		1				+					
Atriplex hypoleuca		1				+					
**Briza minor*		1									+
Angianthus humifusus					1	1				2	
**Sonchus oleraceus*											

Appendix 2 (cont.)

Species	S	H	B	J	Communities CM	To	Td	M	Me	Er	Ec
Baumea juncea					2		1		2		
Gahnia trifida					1						
**Pennisetum clandestinum*					1		1	1	1	1	
**Ehrharta longiflora*					1				+	+	
**Oxalis pes-caprae*					1				+		
Cynodon dactylon					1		1	1	3	1	
Carex inversa					+	2	1		1		
Lotus uliginosus					+		1		2	+	
**Poa annua*					+						
**Vicia sativa*					+				+		
**Raphanus raphanistrum*					+						
Callitriche hamulata					+	2			1		
Dampiera trigona					+				1		
**Shinus terebinthifolius*					+				+		
Lepidosperma effusum					+				1		
**Ranunculus muricatus*					+						
Sporobolus virginicus					+						
**Stenotaphrum secundatum*					+		1		+		
**Sonchus asper*					+		1		2	+	
**Medicago polymorpha*							1		+		
**Trifolium* sp.							2		+		
**Juncus acutus*							2			1	
**Avena barbata*							1		1	+	
Alternanthera nodiflora							1		1		
**Cortaderia selloana*							1	1		+	
**Rubus fruticosus*							1				
Oxylobium linearifolium								2			
Melaleuca preissiana								1		2	
Viminaria juncea								2		1	
Astartea fascicularis								1		1	
Leptocarpus canas								2		1	
Pericalymma ellipticum								1		1	
Dillwynia dillwynioides								1		1	
Melaleuca laterita								2	1		
**Zantedeschia aethiopica*								1	1	+	
**Solanum nigram*								1	+		1
**Ricinis cordmunis*								1			
Agonis linearifolium								1			
Pteridium aquilinum								1			
Polygonum minus								1			
**Anagallis arvensis*								1			
Cyperus alterniflorus									1		
Orabanche australiana									1		
**Bromus diandrus*									1		
Lepyrodea glauca									+		
**Bromus madritensis*									+		
**Bromus hordeaceus*									+		
**Bromus rubens*									+		
**Holcus lanatus*									+		

Appendix 2 (cont.)

Species	Communities S	H	B	J	CM	To	Td	M	Me	Er	Ec
Microlaena stipoides									+		
**Rumex acetosella*									+		
Triglochin procera									1		
**Populus* sp.									+		
**Arctotheca calendula*									1	+	
Restio stenostachyus										3	
Hakea prostrata										2	2
Kennedia prostrata										2	1
Lepidosperma angustatum										2	2
Schoenus grandiflorus										2	3
Lyginia barbata										1	1
Gomphalobium tomentosum										1	1
Corynotheca micrantha										2	3
Adenanthos sericeus										2	1
Leucopogon capitatus										2	1
**Gladiolus* sp.										+	2
Patersonia occidentalis										1	1
Dryandria nivea										+	1
Conospermum stoechadis										+	1
Banksia attenuata										+	1
Banksia grandis										+	1
Schultzii sp.										1	
Laxammannia squarrosa										1	
Helipterum cotula										1	
Drosera erythrorhiza										1	
Conostylis aculeata										1	
Mesomelaena preissii										1	
Lepidosperma stabrum										1	
Hypocalyma angustifolia										1	
**Dittrichia graveolens*										1	
Haemodoruna simplex										1	
Haemodorum spicatum										1	
Kunzea recurva										1	
Kunzea ericiofolia										1	
Stylidium amoenum										1	
**Conyza bonariensis*										1	
Mesomelaena tetragona										+	
Opercularia vaginata										+	
Gomphocarpus fruticosus										+	
Acacia stanoptera										+	
Acacia heigellii										+	
Schultzia involucrata										+	
Hemiandra pungens										+	
Stylidium canaliculatum										+	
Myrtaceae sp.										+	
**Rhynchelytrum repens*										+	
Verticordia densiflora										+	
Drosera menziesii										+	
Loxocarya flexuosa										1	

Appendix 2 (cont.)

Species	Communities										
	S	H	B	J	CM	To	Td	M	Me	Er	Ec
**Silene gallica*										+	
Thysanotus dichotomus										+	
**Dischisma capitatum*										+	
Lomandra sp.											1
Banksia menziessii											1
Casuarina fraserana											1
Hibbertia hypericoides											1
Casuarina humilis											1
Xanthorrhoea preisii											1
Restionaceae sp.											1
Hovea trisperma											1
Drosera micrantha											1
Macrozamia riedlei											1
Eucalyptus gomphocephalla											1
Bossiasea eriocarpa											1

* Denotes exotic species

APPENDIX 3

Latin Names, Vernacular Names and Short Descriptions of Plant Species of the Canning River Wetland Reserve

A

Acacia huegellii - small shrub
Acacia pulchella - Prickly Moses, shrub
Acacia saligna - Port Jackson, small tree
Acacia stanoptera - small shrub
Adenanthos sericeus - Woolly Bush, large shrub
Agonis linearifolia - Ti-tree, large shrub - small tree
Agrostis avanacea - Blown Grass, annual grass
**Aira cupaniana* - Silvery Hairgrass, grass
Alternanthera nodiflora -Joyweed, creeping herb
Amyema preissii - parasitic mistletoe
**Anagallis arvensis* - Scarlet Pimpernel, annual tiny herb
**Anagallis pumila* - Blue Pipernel, annual tiny herb
Angianthus humifusus - Procumbent Angianthus, annual tiny herb
Angianthus preissianus - Angianthus, annual tiny herb
Angianthus micropoides - tiny herb
Anigosanthos manglesii - Mangle's Kangaroo Paw, herb
Apium prostratum - Sea Celery, herb
**Arctotheca calendula* - Capeweed, small herb
**Arundo donax* - Giant Reed, tall grass
Astartea fascicularis - large shrub
**Aster subulatus* - Wild Aster, annual herb
**Atriplex hastata* - Marsh Saltbush, annual herb
Atriplex hypoleuca - perennial herb
**Avena barbata* - Bearded Oat, annual grass

B

Banksia attenuata - Banksia, small tree
Banksia grandis - Bull Banksia, small tree
Banksia menziesii - Banksia, small tree
Baumea juncea - Twig Rush, sedge
**Bellardia trixago* - annual herb
Bossiaea eriocarpa - shrub
Brachycome iberidifolia - Swan River Daisy, annual herb
**Brassica tournefortii* - Wild Turnip, herb
**Briza maxima* - Quaking Grass, annual grass
**Briza minor* - Lesser Quaking Grass, annual grass
**Bromus diandrus* - Great Brome, annual grass
**Bromus hordeaceus* - Barley Brome, Soft Brome, annual grass
**Bromus madritensis* - Madrid Brome, annual grass
**Bromus rubens* - Red Brome, annual grass
**Bulboschoenus caldwelli* - Club-rush, sedge
Burchardia umbellata - Milk Maids, herb

C

Caladenia deformis - Blue Fairy Orchid, tiny herb
Caladenia discordia - Bee Orchid, small herb
Caladenia flava - Cowslip Orchid, small herb
Caladenia patersonii - White Spider Orchid, herb
Callitriche hamulata - Water Starwort, emergent aquatic herb
**Callitriche stagnalis* - emergent aquatic herb
Carex inversa - Knob Sedge, sedge
**Carpobrotus edulis* - Pigface, creeping herb
Cassytha glabella - Doda, parasitic vine
Casuarina fraserana - small tree
Casuarina humilis - Scrub Sheoak, shrub
Casuarina obesa - Saltwater Sheoak, small tree
**Centranthus ruber* -
Centrolepis aristata - Pointed Centrolepis, tiny herb
**Chenopodium glaucum* - Dale Goosefoot, herb
Conospermum stoechadis - Common Smokebush, shrub
Conostylis aruleata - swordgrass
**Conyza bonariensis* - Tall Fleabone, annual herb
**Cortaderia selloana* - Pampas Grass, tall grass
Corynotheca micrantha -
Cotula coronopifolia - Waterbuttons, tiny herb
Cotula cotuloides - Waterbuttons, tiny herb
Crassula colorata - Dense Stonecrop, small herb
**Crassula decumbens* - Swamp Stonecrop, small herb
**Crassula natans* - emergent aquatic herb
Cyathochaeta arvenacea - tall grass
Cynodon dactylon - Couch, perennial creeping grass
Cyperus alterniflorus - sedge
Cyperus laevigatus - sedge
**Cyperus tenellus* - Delicate Leaf Rush, tiny sedge
**Cytisus proliferus* - Tree Lucerne, large shrub
**Cucumis myriocarpus* - Paddy Mellon, creeping herb

D

Dampiera trigona - climbing herb
Dillwynia dillwynioides - medium shrub
**Dischisma capitatum* -
**Dittrichia graveolens* - Stinkwort, small annual herb
Diurus laxiflora - Swamp Donkey Orchid, small herb
Drosera erythrorhiza - Red Ink Sundew, tiny herb
Drosera gigantea - Giant Sundew, small herb
Drosera glanduligera - Common Scarlet Sundew, tiny herb
Drosera leucoblasta - Wheel Sundew, tiny herb
Drosera macrantha - Bridal Rainbow, tiny herb
Drosera menziesii - Pink Rainbow, tiny herb
Drosera stolonifera - Leafy Sundew, tiny herb
Dryandra nivea - small shrub

E

**Echium plantagineum* - Paterson's Curse, large annual herb
**Ehrharta calycina* - Perennial Veldt Grass, tufted grass
**Ehrharta erecta* - Panic Veldt Grass, annual grass
**Ehrharta longiflora* - Veldt Grass, annual grass
**Epilobium hirtigerum* - small shrub

Eragrostis curvula - African Lovegrass, tufted grass
Erodium botrys - Long Storkbill, annual tiny herb
Erodium cicutarium - Common Crowfoot, annual tiny herb
Eriostemon spicatus - Pepper and Salt, herb
Erythrina caffra - Coral Tree, medium tree
Eucalyptus botryoides - Southern Mahogany, medium tree
Eucalyptus calophylla - Marri, medium to large tree
Eucalyptus citriodoria - Lemon Scented Gum, medium to large tree
Eucalyptus cladocalyx - Sugar Gum, large tree
Eucalyptus gomphocephala - Tuart, large tree
Eucalyptus marginata - Jarrah, medium tree
Eucalyptus rudis - Flooded Gum, medium to large tree
Eutaxia virgata - small shrub

F
Ficus sp - Fig Tree, small tree
Foeniculum vulgare - Fennel, large herb
Fumaria capreolata - White-flower fumitory, small herb
Fumaria officinale - Fumitory, small herb

G
Gahnia trifida - Coastal Saw Sedge, tall sedge
Genista linifolia -
Gladiolus angustus - annual herb
Gladiolus undulatus - annual herb
Gnaphalium indutum - Jersey Cudweed, small herb
Gomphocarpus fruticosa - Narrow-leaf Cottonbush, herb
Gompholobium tomentosum - medium shrub
Goodenia filiformis - climbing herb

H
Haemodorum paniculatum - annual herb
Haemodorum spicatum - annual herb
Haemodorum simplex - annual herb
Hakea prostrata - Harsh Hakea, large shrub - small tree
Hakea trifuriata - large shrub - small tree
Hakea varia - Variable Leaf Hakea, large shrub - small tree
Halosarcia indica subsp. *bidens* - Shrubby Glasswort, medium shrub
Halocarcia halocnemoides - Glasswort, small shrub
Halosarcia pergranulata - small shrub
Helipterum corymbosum - Corymbose Sunray, annual herb
Helipterum cotula - Mayweed Sunray, annual herb
Hemarthria uncinata - Mat Grass, creeping grass
Hemiandra pungens - Snake Bush, decumbent shrub
Hibbertia hypericoides - Buttercup, medium shrub
Holcus lanatus - Yorkshire Fog, annual grass
Homeria collina - Cape Tulip, annual herb
Hordeum glaucum - Dryland Barley Grass, annual grass
Hordeum leporinum - Barley Grass, annual grass
Hovea trisperma - Common Hovea, shrub
Hydrilla verticillata - submergent aquatic herb
Hypocalymma angustifolium - White Myrtle, shrub
Hypochoeris glabra - Smooth Cat's Ear, small herb
Hypochoeris radicata - Flatweed, small herb
Hypolaena exsulca - small sedge

I

Isolepis cernua - Grassy Club-rush, small sedge
Isolepis marginata - small sedge
Isotoma scapigera - Long-scaped Isotome, annual herb
**Ixia maculata* - herb

J

Jacksonia furcellata - large shrub
Jacksonia sternbergiana - large shrub
**Juncus acutus* - Spiny Rush, rush
**Juncus bufonius* - Toad Rush, annual small rush
Juncus capitatus - Capitate Rush, annual small rush
Juncus kraussii - Shore-rush, rush
Juncus pallidus - Giant Rush, rush
Juncus pauciflorus - Loose Flower Rush, rush
Juncus planifolius - Broad-leaf Rush, rush

K

Kennedia prostrata - Red Runner, ground creeping shrub
Kunzea ericifolia - large shrub - small tree
Kunzea recurva - large shrub

L

**Lactuca serriola* - Prickly Lettuce, annual herb
**Lagurus ovatus* - Hairs Tail, annual grass
Lavatera plebeia -
Lawrencia spicata -
Laxmannia squarrosa - small shrub
Lepidosperma angustatum - sedge
Lepidosperma effusum - Sword Sedge, sedge
Lepidosperma longitudinale - Common Sword Sedge, sedge
Lepidosperma scabrum - sedge
Leptocarpus canas - small sedge
Leptocarpus coangustatus - small sedge
Lepyrodea glauca - sedge
Leucopogon capitellatus - shrub
**Linim trigynum* - herb
Lobelia alata - Angled Lobelia, herb
Lobelia rhombifolia - Tufted Lobelia, annual herb
**Lolium multiflorum* - Italian Rye Grass, annual grass
**Lolium perenne* - Perennial Rye Grass, grass
**Lolium rigidum* - Wimmera Rye Grass, annual grass
Lomandra sp. - perennial herb
Lotus australis - Austral Trefoil, annual herb
Lotus uliginosus - Bird's Foot Trefoil, perennial herb
Loxocarya flexuosa - small sedge
**Lupinus angustifolius* - New Zealand Blue Lupin, annual herb
**Lupinus cosentinii* - annual herb
Lygina barbata - sedge
Lythrum hyssopifolia - Hyssop Loosestrife, annual herb

M

Macrozamia riedlei - Zamia Palm, palm
**Medicago arabica* - Spotted Medic, annual herb
**Medicago polymorpha* - Burr Medic, annual herb

Melaleuca species (?*acerosa*) - shrub
Melaleuca cuticularis - Saltwater Paperbark, large shrub - small tree
Melaleuca hamulosa - Paperbark, small tree
Melaleuca laterita - Robin Red-breast Bush, medium - large shrub
Melaleuca preissiana - Moonah Paperbark, medium tree
Melaleuca rhaphiophylla - Swamp Paperbark, small - medium tree
**Melilotus indica* - King Island Melilot, annual herb
Mesomelaena preissii - sedge
Mesomelaena tetragona - Semaphore Sedge, sedge
Microlaena stipoides - Weeping Grass, grass
Myoporum caprarioides - shrub

N

**Nasturtium officinale* - Watercress, emergent aquatic herb
Neurachne alepecuroidea - grass
Nuytsia floribunda - Christmas Tree, small tree

O

Opercularia spermacocea - annual herb
**Opuntia stricta* - Prickly Pear, cactus
Ornithopus sativus - tiny herb
Orobanche australiana - Australian Broom-rape, small herb
**Osteospermum clandestinum* - Stinking Roger, annual herb
**Oxalis latifolia* - Oxalis, perennial herb
**Oxalis pes-caprae* - Soursob, perennial herb
**Oxalis purpurea* - Large-flower Wood Sorrel, perennial herb
Oxylobium capitatum - Bacon and Eggs, shrub
Oxylobium linearifolium - Narrow-leaved Oxylobium, large shrub

P

**Parapholis incurva* - Curly Barb Grass, annual grass
**Parentucellia latifolia* - Common Bartsia, annual small herb
**Parentucellia viscosa* - Sticky Bartsia, annual small herb
**Paspalum dilatatum* - Paspalum Grass, perennial tufted grass
**Paspalum distichum* - Water Couch, perennial creeping grass
Patersonia occidentalis - Western Patersonia
**Pelargonium capitatum* - Wild Geranium, shrub
**Pennisetum clandestinum* - Kykuyu, perennial creeping grass
Pennisetum species (?*purpureum*) - Elephant Grass, perennial creeping grass
Pericalymma ellipticum - Swamp Tea-tree, shrub
**Petrorhagia velutina* - annual herb
Philydrella pygmaea - tiny herb
Pimelea rosea - Rose Bangine, shrub
**Plantago lanceolata* - Ribwort, perennial herb
**Plantago major* - Large Plantain, perennial herb
**Poa annua* - Winter Grass, annual grass
Poa poiformis - Blue Tussock Grass, perennial grass
Poa serpentum - Bulbous Poa, perennial grass
Podelepis gracilis - Slender Podolepis, annual herb
Polygonum minus - Persicaria, perennial herb
**Polypogon monspeliensis* - Annual Beardgrass, annual grass
Polypogon tenellus - Lesser Beardgrass, annual grass
Polypompholyx multifida - Pink Petticoats, tiny insectivorous herb
**Populus* species - Poplar Tree, medium tree
Pteridium aquilinum - Bracken Fern, fern

Q

R

**Ranunculus muricatus* - Sharp Buttercup, herb
**Raphanus raphanistrum* - Wild Radish, annual herb
Restio stenostachyus - sedge
Restionaceae species - sedge
**Rhynchelytrum repens* - Natal Red Top, annual grass
**Romulea rosea* - Guildford Grass, annual bulbous herb
**Ricinus communis* - Caster Oil Bush, small tree
**Rubus fruticosus* - Blackberry, thorny shrub
**Rumex acetosella* - Sorrel, annual herb
**Rumex conglomeratus* - perennial herb
**Rumex crispus* - Dock, perennial herb
Ruppia polycarpa - submergent aquatic herb

S

**Salix* species - Willow Tree, medium tree
Samolus repens - perennial small herb
Samolus junceus - small perennial herb
Sarcocornia quinqueflora - Samphire, decumbent small shrub
Schoenoplectus validus - tall sedge
Schoenus armeria - sedge
Schoenus grandiflorus - large-flowered Bog-rush, sedge
Schoenus subfasicularis - sedge
Scholtzii involucrata - shrub
**Shinus terebinthifolius* - Pepper Tree, small tree
**Silene gallica* - French Catchfly, annual herb
Siloxerus filifolius
**Solanum nigram* - Black Nightshade, annual herb
**Sonchus asper* - Prickly Sow Thistle, annual herb
**Sonchus oleraceus* - Common Sow Thistle, annual herb
Sowerbaea laxiflora - Purple Tassels, perennial herb
Spergularia rubra - Sand Spurry, tiny herb
Sporobolus virginicus - Saltwater Couch, perennial creeping grass
**Stenotaphrum secundatum* - Buffalo Grass, perennial creeping grass
Stylidium amoenum - Lovely Trigger Plant, annual small herb
Stylidium brunonianum - Pink Fountain Trigger Plant, annual herb
Stylidium calcaratum - Book Trigger Plant, annual tiny herb
Stylidium canaliculatum - Delicate Trigger Plant, annual small herb
Stylidium utricularioides - Pink Fan Trigger Plant, annual tiny herb
Suaeda australis - Seablite, small shrub

T

**Taraxacum officinale* - Dandelion, herb
Thysanotus dichotomus - perennial herb
Thysanotus multiflorus - perennial herb
Thysanotus triandrus - perennial herb
Trachymene pilosa - Native Parsnip, herb
Tricoryne elatior - Yellow Autumn Lily, herb
Tribonanthes variabilis - perennial herb
**Trifolium angustifolium* - Narrow-leaf Clover, annual herb
**Trifolium arvense* - Haresfoot Clover, annual herb
**Trifolium campestre* - Hop Clover, annual herb
**Trifolium cernuum* - Drooping-flowered Clover, annual herb
**Trifolium dubium* - Yellow Suckling Clover, annual herb
**Trifolium subterraneum* - Subterranean Clover, annual

Triglochin calcitrapa - Spurred Arrowgrass, annual tiny herb
Triglochin mucronata - Prickly Arrowgrass, annual tiny herb
Triglochin procera - Water Ribbons, annual emergent aquatic herb
Triglochin striata - Streaked Arrowgrass, small herb
Typha domingensis - Narrow-leaf Bulrush, bulrush
**Typha orientalis* - Bulrush, bulrush

U
Ursinia anthemoides - Ursinia, annual herb

V
Vellereophyton dealbatum - small herb
Verticordia densiflora - shrub
Verticordia linleyi - shrub
**Vicia sativa* - Common Vetch, annual herb
Villarsia albiflora - submergent aquatic herb
Viminaria juncea - Golden Spray, large shrub
**Vulpia bromoides* - Silver Grass, annual grass
**Vulpia myuros* - Ratstail Fescue, annual grass

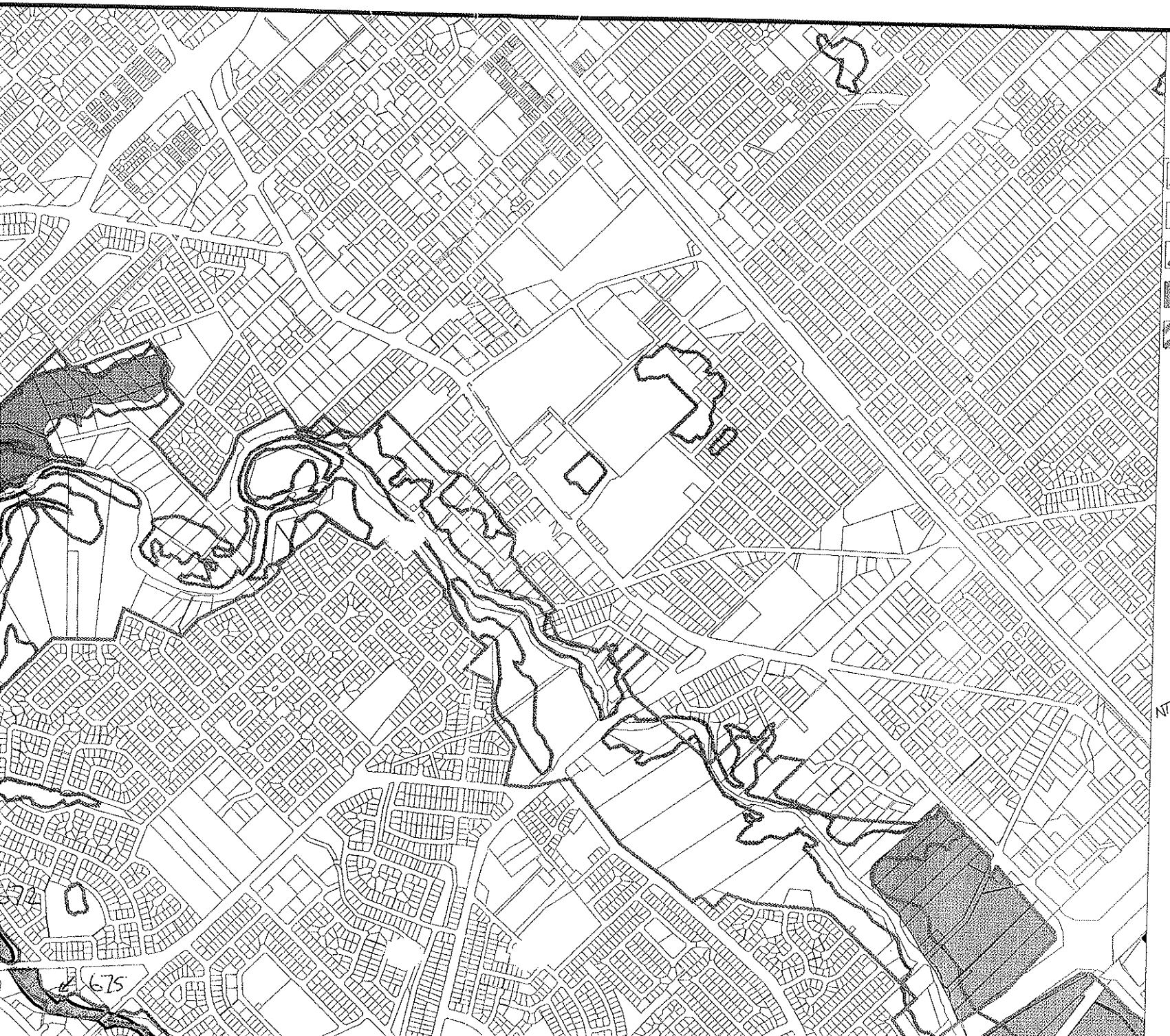
W
**Watsonia bulbillifera* - Wild Watsonia, bulbous herb

X
Xanthorrhoea preissii - Blackboy, large shrub

Y
Z
**Zantedeschia aethiopica* - Arum Lily, herb

* Denotes exotic species

Size	Scale
Small tree	<10 m
Medium tree	10-30 m
Large tree	>30 m
Small shrub	<0.25 m
Shrub (medium)	0.25-2 m
Large shrub	2 m
Herb	0.25-1 m
Small herb	0.1-0.25 m
Tiny herb	<0.1 m
Small sedge	<0.5 m
Sedge	0.5-1 m
Tall sedge	>1 m
Rush	<1 m
Large rush	>1 m
Grass	<1 m
Tall grass	>1 m



CREEKLINE

bp site 224 & 225

- AG VEG 1998 BOUNDARY THEME
- Cadastre
- Bushplan sites refno 1-500 SCP BOUNDARY TH
- cons category wetlands
- Verified CCWs

224 ??

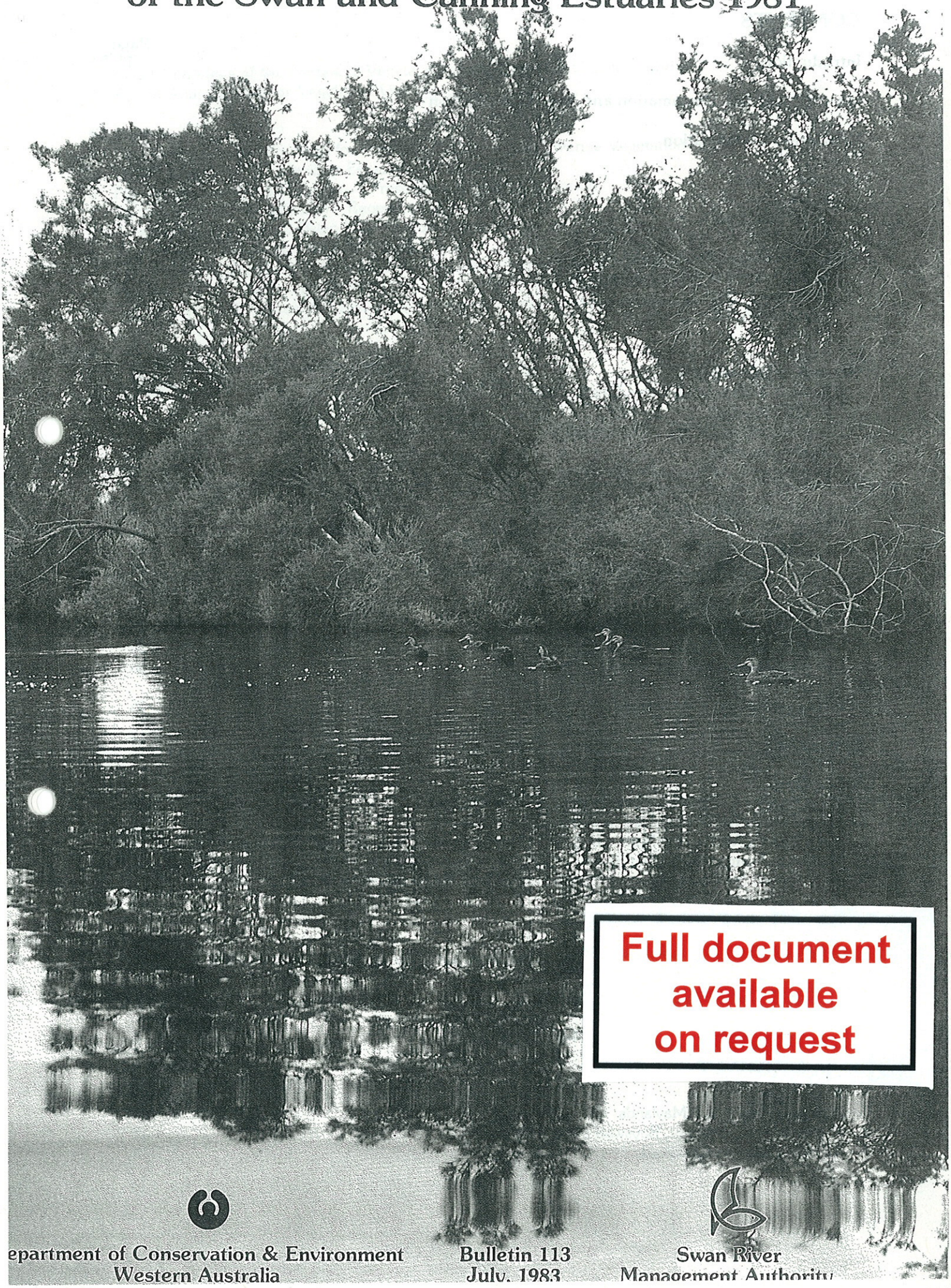
225 ?? other

NT/JA 30/9 (add to 333 with adjacent veg see 333 map)

NT/JA 30/9

- add ccw 672 + 675 using combination of ccw + AG Veg mapping to get larger area

PERIPHERAL VEGETATION
of the Swan and Canning Estuaries 1981

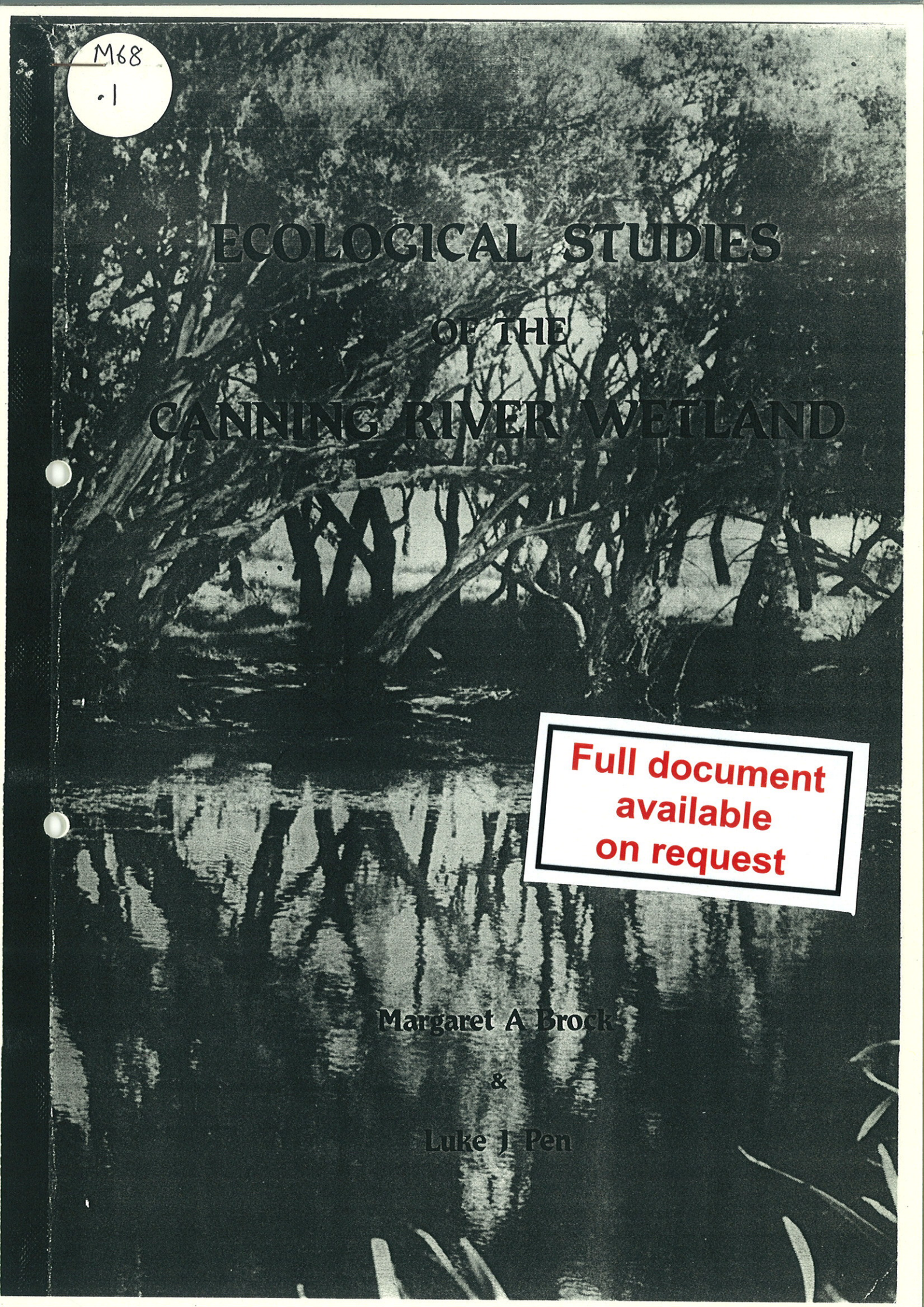


epartment of Conservation & Environment
Western Australia

Bulletin 113
July, 1983

Swan River
Management Authority

ECOLOGICAL STUDIES OF THE CANNING RIVER WETLAND

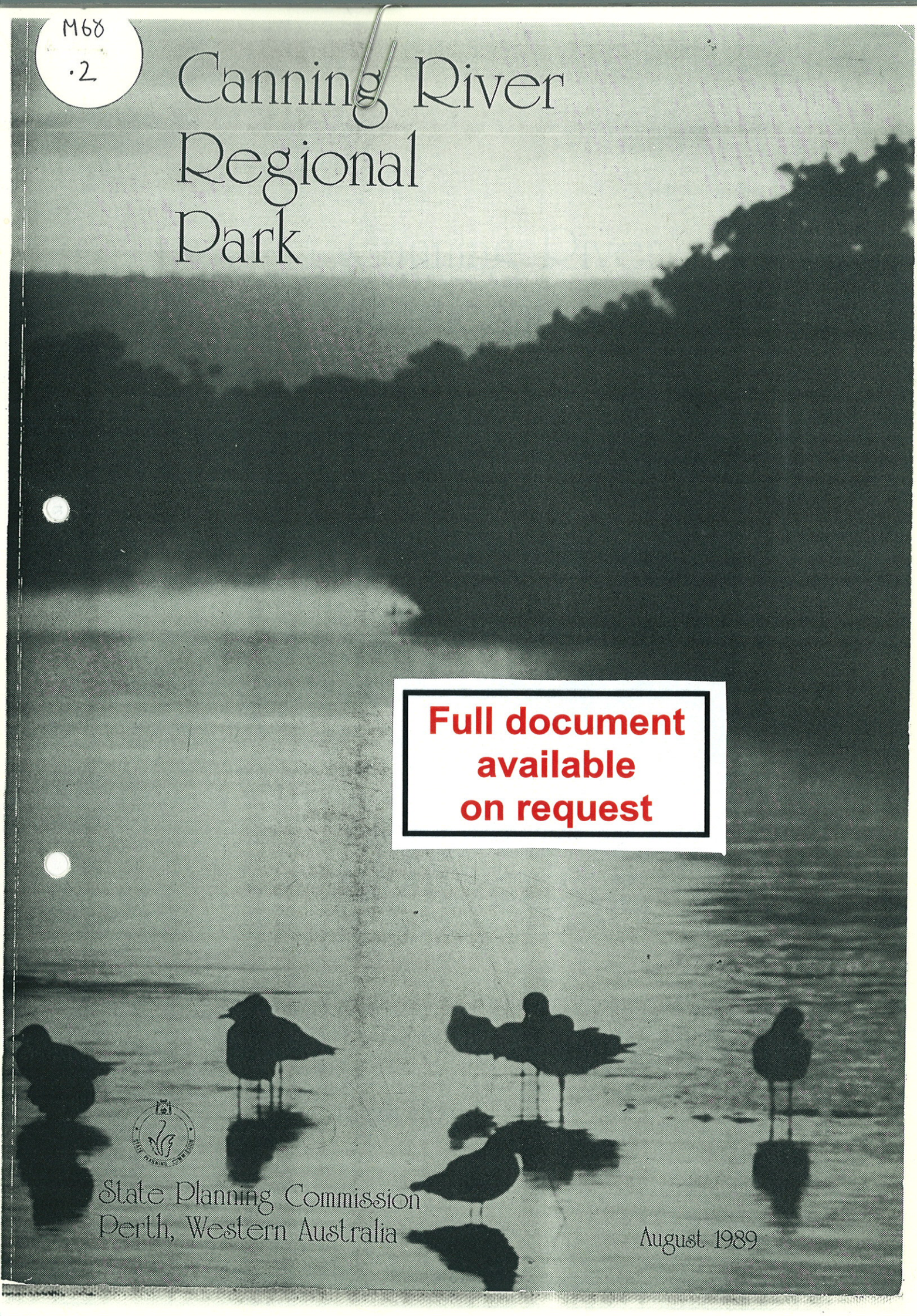


Margaret A Brock

&

Luke J Pen

Canning River Regional Park



State Planning Commission
Perth, Western Australia

August 1989

COPY see file 12/99/9

47

WILSON WETLANDS ACTION GROUP (WWAG)

PB072

(WITHOUT PREJUDICE)

SUBMISSION

ON

PERTH'S BUSHPLAN (BS 224)

"KEEPING THE BUSH IN THE CITY"

SUBMISSION NO 217

February 1999

Contact: Gary Gorton
4 Caghill Court
Wilson WA 6107

COMMENT TO PERTH'S BUSHPLAN

SINCE BS224 HAS NON-BUSHLAND AREAS WITHIN IT'S SITE BOUNDARY THAT ARE CURRENTLY OFFERED PROTECTION UNDER THE SYSTEM 6 M68 (CANNING RIVER REGIONAL PARK) WE ASK THAT CONSIDERATION OF PROTECTION BE GIVEN TO LOTS 4, 62, 63, 64 FERN ROAD WILSON, BECAUSE OF THE RARE CIRCUMSTANCES THAT RELATE TO THIS SITE (REFER TO PERTH'S BUSHPLAN VOL. 1, 2.4 AREAS RECOMMENDED FOR PROTECTION P. 29).

MISSION STATEMENT

TO ENSURE THE CONSERVATION OF THE CANNING RIVER REGIONAL PARK WITHIN IT'S EXISTING BOUNDARY FOR THE PEOPLE OF WESTERN AUSTRALIA NOW AND FOR FUTURE GENERATIONS.

GOALS & OBJECTIVES

Lots 4, 62, 63 & 64 also known as Lots 4 & 501 Fern Road, Wilson (WAPC) referred to hereafter as "the site"

1. Prevent fragmentation of the Canning River Regional Park and maintain a buffer zone to ensure a viable corridor (restored natives) exists along edges of the Canning River.

2. To ensure conservation of biological diversity.

3. To conserve recreational value of the site by means of protecting all existing trees; preserving railway and retaining public open space.

4. To revegetate the site establishing an Arboretum of trees and shrubs that are endemic to this region.

5. To establish the site as an Educational Resource.

6. To remediate the drains to living streams :
   1) Mill Street Drain
   2) Wilson Main Drain.

7. To retain and restore Heritage buildings, structures and vistas.

8. To encourage relevant agencies to provide :
   1) Adequate parking; and
   2) Ablution facilities (with disabled access) connected to deep sewerage.

TABLE OF CONTENTS

FIGURES

TABLES

ABBREVIATIONS

"the site"	means (Lots 4, 62, 63 & 64 also known as Lots 4 & 501 Fern Road, Wilson)
BS224	means Bushplan Site 224
CALM	Department of Conservation and Land Management
CRRP	Canning River Regional Park
CRRPAC	Canning River Regional Park Advisory Committee
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DOLA	Department of Land Administration
EPA	Department of Environmental Protection
MRS	Metropolitan Region Scheme
NPNCA	National Park and Nature Conservation Authority
POS	Public Open Space
WA	Western Australia
WAPC	Western Australian Planning Commission
WWAG	Wilson Wetlands Action Group

SUMMARY OF RECOMMENDATIONS

FOR WWAG SUBMISSION ON PERTH'S BUSHPLAN (BS224)

HISTORY, WETLANDS, WEEDS, TREES & FIRE, POLLUTION, SALINITY, CAR-PARKING, AMPHIBIANS, BIRDS, FISH, MOSQUITOES, MIDGES, CATS

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- System 6 Implementation Status within Perth's Bushplan Vol 2, Part A, Appendix 2 p110, M68 Canning River, Riverton Bridge to Nicholson Road Bridge should be changed from Implemented to Largely Implemented as there is still privately owned sites within the CRRP that are recommended for Progressive Acquisition (CALM *et al.* 1997, refer to Tenure and Park Boundary Map 2, Private Property)

- Lot 18 Woodloes Street be included in Perth's Bushplan Vol 2, Part B, Descriptions, p.396. as it appears to have been omitted when comparing to CALM *et al.* (1997, refer to Tenure and Park Boundary Map 2 – Private Property).

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- 'Niana' (Castledare Homestead, Lot 63 Fern Road) be restored and provided as a learning centre that the community and future generations may use for historical and educational purposes as recommended by Hocking (1996). Refer to Perth's Bushplan Vol 1 page 38, Bushland Management.

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) thereby creating a well-vegetated buffer zone, providing a physical barrier to adult midges and mosquitoes, improving ground water quality, providing additional habitat to wildlife and thus enhancing this sites linkage potential. Refer to Perth's Bushplan Vol 1, 2.5 Protecting Bushland p.31 and Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

- Wilson Wetlands Action Group in consultation with and assistance from CALM, City of Canning, and the CRRPAC will assist in weed control, reinstatement and management of the CRRP.

- A coordinated and comprehensive approach, which takes into consideration previously published recommendations, should be undertaken by relevant organisations and departments to ensure maximum benefit to the CRRP and its surrounds.

- Remediation of the Mill Street drain and Wilson Main drain to living streams should occur to encourage natural aquatic invertebrate predators of midge and mosquito larvae and to improve the quality of the water with reduced nutrient enrichment, such that these drains are a benign contributor to the river.

- Restoration and reinstatement of wetland areas, including drains should be a priority within the Canning catchment. The drains entering the Canning River and associated buffer zones should be integrated into the fabric of the CRRP.

- Continue sampling of the Canning catchment to assess water quality enabling detrimental impacts such as algal blooms to be identified and acted upon. Refer to Perth's Bushplan Vol 2 Part A Vegetation Condition p.39.

- An integrated approach involving biological, physical, cultural and chemical controls should be adopted in controlling mosquito and midge populations. At all times these should be environmentally sensitive.

- Residents, industry and commercial owners should be encouraged to participate in remediation and informed of it's progress.

- Education programs directed at residents, industry and commercial owners within the Canning catchment, should be assessed as to their effectiveness in reducing pollution from non point sources.

- Assess education programs regarding the excessive use of fertilisers and mosquito control within the Canning catchment.

- We recommend that a full Environmental Impact Assessment be carried out by the EPA on Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) within the CRRP.

- Relevant authorities investigate an education program regarding management of domestic cats for suburbs abutting the CRRP. Refer to Perth's Bushplan Vol 2 Part A Vegetation Condition p. 39.

- That a NO CAT Policy be considered at the planning stage of any new development (MRS Urban Zoning) abutting the Canning River Regional Park. Refer to Perth's Bushplan Vol 2 Part A Vegetation Condition p. 39.

- City of Canning to liaise with appropriate agencies concerning parking requirements and their development. It is recommended an 80 car-space car park be constructed with an allowance for overflow onto grassed area for an extra 20 vehicles. The site recommended is outlined in Appendix 1, Map Lot 62 also known as Lot 501 Fern Road, Wilson. (WAPC). Refer to Perth's Bushplan Vol 1 Statutory Protection for Conservation Reserves, p. 34; The Role of Local Government p. 40)

- City of Canning liaise with CALM, CRRPAC, Castledare Church and Castledare Miniature Railway regarding the establishment of a public ablution facility with disabled access connected to deep sewerage. Refer to Perth's Bushplan Vol 1 Statutory Protection for Conservation Reserves, p. 34; The Role of Local Government p. 40)

- In consultation with Castledare Miniature Railway and other relevant parties, demolition of existing ablution facilities (septic system) and unwanted buildings should occur (Conservation Plan Report Summary Attachment PD-299-96). Refer to Perth's Bushplan Vol 1 Statutory Protection for Conservation Reserves, p. 34; The Role of Local Government p. 40)

SUBMISSION ON PERTH'S BUSHPLAN
NOVEMBER 1998 - MARCH 26, 1999

Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

1. HISTORY

We have concerns that if Lots 4 & 62 Fern Road, Wilson of the CRRP are not acquired by the Western Australian Planning Commission (WAPC) within 12 months as recommended by the Canning River Regional Park Management Plan 1997-2007, the owners of the site may attempt to have the Metropolitan Region Scheme (MRS) changed to allow for a subdivision. Concerns were raised because a representative from Richard Noble & Company (Consultants) canvassed residents of Wilson (1998) with a site map of a proposed subdivision within Lots 4 & 62 Fern Road, Wilson within the CRRP. If a housing development occurs it will result in the historical, heritage and educational value of the site being lost for future generations.

1.1 History

The CRRP covers an area of 266 hectares and spans approximately six kilometres either side of the Canning River from Nicholson Road Bridge Cannington to Shelley Bridge in Rossmoyne (CALM *et al.* 1997).

The CRRP represents the Governments commitment to a regional open space system for the Perth Metropolitan Region. This concept, of a linear park system extending along the Swan and Canning River foreshores, was first proposed by Stephenson and Hepburn (1955; cited in Richards 1991). The Perth Metropolitan Scheme adopted the recommendations in 1963 with the intention of protecting open space of regional significance for conservation of the wetland ecosystem and public recreation (CALM *et al.* 1997; Richards 1991). Consequently, a long-term program of land acquisition under private ownership was undertaken by the Metropolitan Region Planning Authority in anticipation of the time when Regional Parks would be formally created (CALM *et al.* 1997). In addition to the purchase of privately owned land a policy was introduced whereby the approval of any subdivision with a river frontage depended on land abutting the river being surrendered (without compensation) as public open space (Richards 1991).

The environmental significance of the wetland areas in the lower reaches of the Canning River were highlighted in the System 6 Study Report (Department of Conservation and Environment, 1981). It was recommended (M68) that the purpose of the open space reservation for the area between the Riverton Bridge and Greenfield Street footbridge be changed and the area be declared a Class A Reserve for flora and fauna conservation (Richards 1991). The Environmental Protection Authority endorsed the recommendations made in the System 6 Study Report (Department of Conservation and Environment 1983) and these were adopted by the Government in 1984 (Richards 1991).

In 1983 a Community Advisory Committee was formed and recommendations for Park development and management were made. A number of proposals including the construction of a cycle way system and picnic facilities in addition to landscaping were made with the redevelopment of some reserves within the Regional Park eventuating (CALM *et al.* 1997).

Various reserves within the Regional Park contain sites of historical interest. In 1988 The Canning River Region Open Space was nominated for the Australian Heritage Commission's National Estate Register (Richards 1991). The area was subsequently registered for its heritage value (CALM *et al.* 1997).

The CRRP is a unique place of great conservation and recreational value set within a highly urbanised environment. It is a highly fragile system which must be managed to meet the growing demands of conservation, recreation and education.

> "The vision is that the park is recognised as an important natural resource of land and waters, where sustainable habitats and ecosystems are protected, where a wide range of appropriate recreational activities can take place, where degraded areas are restored and protected, where the community and management agencies share the stewardship and educational tasks for park users and the community" (CALM *et al.* 1997, p.4).

This vision is nearing fruition but depends on the continued commitment of the Government to acquire the last remaining areas of privately owned land. "The objective is to ensure that the value of the park is protected by security of tenure and its gazetted purpose" (CALM *et al.* 1997, pg 4). At present 10 hectares or less than 5% of the park is privately owned with the remainder being vested in a number of different government agencies. As previously stated the WAPC and its predecessors have been progressively acquiring land to meet open space goals. However, negotiated settlements are necessary for the acquisition of the remaining private land within the park boundary (CALM *et al.* 1997).

1.2 Heritage

Castledare	- Register of Heritage Place	27 June 1997
	- Municipal Inventory	08 August 1995

Castledare is situated at 114-134 Fern Road, Wilson, in the City of Canning approximately 10 kilometres from the Perth Central Business District. The land area of Castledare runs between Fern Road (formerly Watts Road) and the Canning River and consists of 10 hectares (23 and ¾ acres) in Lots 4, 62, 63 and 64.

In 1843 this site was part of a much larger property but was subdivided in the late 1890's and gradually sold. Land uses at this time included dairying, orchards and general farming.

In 1907 the first building was established by the Flemings who built the homestead 'Niana' and associated farm buildings. In 1928 the site was sold to the Catholic Archbishop of Perth. As part of the conversion of the site into a school for intellectually handicapped boys the cottage homes, classrooms and a small cottage were built (Hocking 1996).

The Castledare Miniature Railway on site at the edge of the Canning River, was constructed in 1962, and has a membership of approximately 80 people. The railway is still open to the public on the first Sunday of every month.

The Castledare site is one of the earlier settlements in the Canning district and the homestead 'Niana' is of state and local significance. The Federation Queen Anne style of the house is uncommon in the City of Canning and is representative of the growing wealth of the district at the turn of the Century, it is both aesthetically pleasing and a valued heritage resource. This area remains an important landmark within the region and is closely associated with local identities such as the Flemings and Meares (Hocking 1996).

1.3 Aboriginal History

At the time of European settlement the Swan and Canning River Basins supported a considerably large population of aborigines. In fact the density of the aboriginal population has been suggested to have been the highest of any in Australia. The hunting and gathering lifestyle of the Aboriginal people would have been greatly facilitated by the wetlands of the coastal plain, the estuaries, rivers and their floodplains and the chain of swamps and lagoons which provided a wide variety of foods and other resources (Richards 1991).

At the time of European settlement, the south west corner of Western Australia was home to the Nyungar Aborigines. They are now thought to have lived there for at least 40,000 years. Tribes or family groups are thought to have ranged in size from 20 to 100 people and comprised the male head of the family with his wives, daughters and sons. Each family group was independent and claimed territorial ownership of a particular tract of land. Movements of groups within their territories was dictated by the seasonal availability of food. At least six family groups are thought to have claimed territorial rights to the land which is now the metropolitan area (Richards 1991).

The Canning River Region was the traditional homeland of the Beelo and Beelair people. The expanse of land from the river to the hills was the traditional land of Munday, leader of the Beelo, while the area between the river and the coast belonged to Midgegooroo and his son Yagan (Hocking 1996). Midgegooroo, Munday and Yagan were proclaimed outlaws in 1833 wanted for the murders of Thomas and John Velvick. Midgegooroo was soon captured, tried and sentenced to death.

There are numerous stories about the impressive character of Yagan who continuously eluded authorities. It was during this tense period that he achieved lasting fame as an outlaw and patriot (Richards 1991). His struggle to stem the continuing expansion of the settlers into his peoples land culminated in his death in July 1833. Yagan's tribal tattoo was flayed from his shoulder by one settler, and his head was suspended in a hollow tree for three months. It was later preserved and exhibited in England as that of a Swan River Chieftain. The Beelair tribe came under the leadership of Yagan's two brothers, but the history of what followed is less clear (Hocking 1996).

RECOMMENDATIONS :

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- System 6 Implementation Status within Perth's Bushplan Vol 2, Part A, Appendix 2 p110, M68 Canning River, Riverton Bridge to Nicholson Road Bridge should be changed from Implemented to Largely Implemented as there is still privately owned sites within the CRRP that are recommended for Progressive Acquisition (CALM *et al.* 1997, refer to Tenure and Park Boundary Map 2, Private Property)

- Lot 18 Woodloes Street be included in Perth's Bushplan Vol 2, Part B, Descriptions, p.396. as it appears to have been omitted when comparing to CALM *et al.* (1997, refer to Tenure and Park Boundary Map 2 – Private Property).

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- 'Niana' (Castledare Homestead, Lot 63 Fern Road) be restored and provided as a learning centre that the community and future generations may use for historical and educational purposes as recommended by Hocking (1996). Refer to Perth's Bushplan Vol 1 page 38, Bushland Management.

REFERENCES :

CALM, City of Canning and the National Parks and Nature Conservation Authority (1997). Canning River Regional Park Management Plan 1997-2007. Management Plan No. 36. Western Australia.

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Department of Conservation and Environment (1983). The Darling System- System 6: Part 1, General principles and recommendations; Part 2, Recommendations for specific localities. Report No. 13. Department of Conservation and Environment, Perth, Western Australia.

Hocking, A (1996). Conservation Plan- Former Castledare Boys Home, Wilson. Unpublished report (Extract Only).

Richards, O. (1991). Canning River Regional Park Western Australia: Historical Survey. Department of Planning and Urban Development, Perth, Western Australia.

REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

VOLUME 1
2.2 Assessment of Regional Significance p.21.
Bushland Management p.38.
Other Special Attributes p.55

VOLUME 2
VOLUME 2 PART A
4.5.6 Other Special Attributes p.67
4.6.4 Register of the National Estate p.71, Table 17 Criteria for the National Estate p.72.
Criteria not relevant to determination of regional significance, but which may be applied when evaluation areas having similar value p.79.
4.7.3. Specific Site Recommendations - Category 1, Recommendation 1a, p.85
- Category 5, Recommendation 5, p.87
Appendix 2 Implementation Status of System 6 Recommendation Areas pp.105 & 110.

VOLUME 2 PART B
Canning River Regional Park and Adjacent Bushland Riverton to Langford pp.395-397
Other Special Attributes, p.397
References p.414.

VOLUME 2 PART C
Site Index No p.14
Bushplan Site Maps 62 & 63

Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

2. WETLANDS

Wetlands are highly complex ecosystems and are "the most biologically active areas on the Swan Coastal Plain" (Balla 1994 pg11). Numerous mammal, bird, reptile, amphibian, fish and invertebrate species are dependent on wetland habitats for their survival, with many being endemic to their environment.

Central to all wetland processes are the associated plant communities which form the basis of all wetland food webs (Balla 1994). Vegetation surrounding a wetland area, when managed to minimise human impact, acts as a buffer zone to protect the integrity of the wetland. Whilst providing shelter for many animals, vegetation buffers improve water quality, mitigate wind erosion and stabilise sediment (Sainty & Jacobs 1981). Vegetation and peat surrounds of wetlands can also assist (to a certain extent) as filters, aiding in the removal of runoff pollutants such as nitrogen and phosphorous from fertilisers, pesticides and heavy metals derived from car emissions and industrial effluent discharges (Department of Conservation and Environment 1980). Nutrients, salt and sediment from the surface catchment runoff are also filtered by buffer zones (Growns 1992). Any particulate matter trapped by the vegetation, is incorporated into the plant/soil nutrient cycle. A buffer enables plant communities to expand and contract in response to changes in the water level, thereby increasing the probability of persistence of an intact wetland community.

Urban intrusion into a wetland area can be blocked by a vegetation buffer, thus enhancing the recreational value of the area (Williamson and Hoare 1987). They also act as a physical barrier to the movement of airborne invertebrates such as midges, which are attracted to suburban lights (Lane 1991). In addition to protecting the integrity of a wetland, these buffers provide important wildlife habitat (Erwin 1990), and create corridors increasing the connectivity of bushland remnants, enabling animal movements for feeding and breeding. Thus vegetation buffers play a critical role in the preservation of species diversity and abundance within wetland ecosystems (Balla 1994).

With the expansion of the Perth metropolitan area, wetlands have been filled, drained or the vegetation cleared, resulting in the destruction or degradation of the vast majority of these ecosystems. It is estimated that at least three-quarters of these wetlands may have been destroyed since European settlement, by various forms of development. Of those remaining, many are degraded and/or under continuing threat from development (Western Australian Resources Council 1988).

The hydrology of wetlands and their catchments are altered by urban development. The construction of impervious surfaces such as roads etc increases surface runoff and the speed at which the water travels over the land. Stormwater drains and basins are intended to accommodate for this and also enable pollutant removal from runoff via prolonged detention, retention or infiltration. Where plants are present the effectiveness is greatly enhanced. The water that flows out of a suitably designed stormwater basin can have reduced levels of nutrients, particulate organic matter, sediment and heavy metals, thereby aiding the control of non-point source pollution. However, stormwater discharges into wetlands due to basins becoming inundated with excess surface runoff or never having been constructed, damages the natural ecosystem. These discharges can increase the extent and duration of flood levels, influencing the distribution and productivity of vegetation and macroinvertebrate community structure. These alterations can have a cascading effect (Balla 1994).

In addition to hydrological changes, stormwater contains contaminants such as nutrients from garden fertilisers, pesticides, organic material (leaves, twig, etc.), petrol, oils and rubber compounds. Many of these contaminants are discharged into the wetland with the first flush of winter rains. This can result in nutrient enrichment, death of fauna, insect pests, noxious smells from decaying algae and heavy metal poisoning (Chambers and Davis 1989; Balla 1994).

Other sources of degradation to wetlands include some forms of recreational use, the removal of fringing vegetation, fire, invasion by weeds and exotic fauna and the use of pesticides in insect control programmes (Western Australian Resources Council 1988). These have resulted in the disruption of natural processes (e.g. food webs) within wetland ecosystems.

A well designed stormwater basin and vegetation buffer can eleviate many of the problems resulting from the disturbance of natural processes within wetland ecosystems. Careful consideration must be given to the particular purpose with which the above are intended and will depend on locality and other mitigating factors. The effectiveness of both the storm water basin and buffer zone is enhanced by the restoration of the surrounding vegetation. In short, the conservation and rehabilitation of plant communities has far reaching influences on the health of wetland ecosystems.

Given wetlands are among the most threatened of all habitats within the Perth metropolitan area they are of significant conservation value. They "are considered to be a valuable asset in Western Australia, worthy of respect and exclusion from any resource planning which would lead to their destruction or indirect deterioration" (Riggert Consulting Ecologists 1979, p.10). In general, wetlands have aesthetic, recreational, tourism, educational, economic and scientific values.

The CRRP is situated in the City of Canning and spans six kilometres along either side of the Canning River from the Nicholson Road Bridge in Cannington to the Shelley Bridge in Rossmoyne (Richards 1991, p.1). The section downstream from the Kent Street Weir is thought to contain the best estuarine vegetation of the Canning and Swan Rivers (Department of Conservation and Environment 1983).

The environmental significance of the wetland areas in the lower reaches of the Canning River were highlighted in the System 6 Study Report (1981). It was recommended (M68) that the purpose of the open space reservation for the area between the Riverton Bridge and Greenfield Street footbridge be changed and the area be declared a Class A Reserve for flora and fauna conservation (Richards 1991). The Environmental Protection Authority endorsed the recommendations made in the System 6 Study Report (Department of Conservation and Environment 1983) and these were adopted by the Government in 1984 (Richards 1991).

We have concerns that if Lots 4 & 62 Fern Road, Wilson of the CRRP are not acquired by the WAPC within 12 months as recommended by CALM *et al.* (1997), the owners of the site may attempt to have the MRS changed to allow for a subdivision. Concerns were raised because a representative from Richard Noble & Company (Consultants) canvassed residents of Wilson (1998) with a site map of a proposed subdivision within Lots 4 & 62 Fern Road, Wilson within the CRRP.

RECOMMENDATIONS :

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) thereby creating a well-vegetated buffer zone. Refer to Perth's Bushplan Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- A coordinated and comprehensive approach, which takes into consideration previously published recommendations, should be undertaken by relevant organisations and departments to ensure maximum benefit to the CRRP and its surrounds.

- Continue sampling of the Canning catchment to assess water quality enabling detrimental impacts to be identified and acted upon before serious ramifications to the wetland occur.

- Education programs directed at residents, industry and commercial owners within the Canning catchment, should be assessed as to their effectiveness in reducing pollution from non point sources.

- Restoration and reinstatement of wetland areas, including remediation of the Mill Street drain and Wilson Main drain to living streams should occur so that the quality of the water they contain is such that it is a benign contributor to the river. The drains entering the Canning River and associated buffer zones should be integrated into the fabric of the CRRP.

- Residents, industry and commercial owners should be encouraged to participate in remediation and informed of it's progress.

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REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

VOLUME 1

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Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4 & 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

3. WEEDS, TREES & FIRE

We have concerns that if Lots 4 & 62 Fern Road Wilson are not acquired by the WAPC, it will not be possible for CALM, City of Canning, Canning River Regional Park Advisory Committee (CRRPAC) and interested Community Groups, to plan and progressively reinstate this site for future generations to enjoy.

3.1 Weeds

There are many exotic garden plants and aquatic waste plants that have been dumped in the park and drains, and along the river edge. These exotic plants impact on the park and river system. The spread of these exotic plants are causing additional damage to the natural environment. The CRRP must be protected and not destroyed by invasive weeds.

The following exotic weeds and trees are only some of the species found in the CRRP :

Bulrushes (*Typha orientalis*)
Watsonias Gladioli (*Gladiolus spp or Watsonia spp*)
Arum Lily (*Zantedeschia altheopica*)
Blackberry (*Rubus fruiticosus*) Noxious Weed
Pampus Grass (*Cortraderia sellsana*)
Kikuya Grass
Veldt Grass (*Ehrharta calycina*)
Wild Oats Grass (*Avena fatua*)
Buffalo Grass (*Stenotaphrum secundatum*)
Dock (*Rumex sp*)
Couch (*Cynodon dactylon*)
Giant Reed (*Arunda donax*)
Papyrus (*Cyperus*)
Bamboo (*Bambusa*)
Castor Oil Bush (*Rininus communis*)
Freesias (*Freesia spp*)
Pelargoniums (*Pelargonium spp*)
Bridal Creeper (*Asparagus asparagoides*)
Soursob (*Oxalis Pes-caprae*)
Golden Dodder (*Cuscuta campestris*)
Japanese Pepper Tree (*Shinus terebinthifolius*)
Fig Tree (*Ficus sp*)
Willow Tree (*Salix sp*)
Poplars (*Populas spp*)
Cape Lilac Tree (*Melia*)
Umbrella Tree (*Brasaia ara liaceae*)
Coral Tree (*Erythrina caffra*)

Introduced weeds compete with native plants for basic resources such as water, nutrients, light and space to become monocultures with reduced soil microbial and invertebrate fauna, thereby compromising ecosystem function. Many weeds also contribute to excessive organic buildup in watercourses because of the rapid decay of their soft and deciduous leaves. Areas surrounding rivers and floodplains dominated by weeds may also be less effective in reducing the energy in stream flows and processes causing shore erosion (Swan River Trust 1998).

3.2 **Aquatic Weeds** (Identified)

Typha domingensis	
Typha orientalis	Bullrushes
Euglena	Green Algae
Cyanobacteria	Blue Green Algae
Hydrocotyle ranunculoids	
Vallisneria	
Hydrella	

(CALM *et al.* 1997; Swan River Trust 1991; Bowling and Mitrovic undated).

Algae are present in all wetlands, often with high species richness. When nutrients are flushed into the river from agricultural and urban catchments then these levels become excessively high, resulting in one or two species of algae becoming dominant causing algal blooms. Death and decomposition of algae reduces oxygen in the water resulting in the suffocation of fish and invertebrates. Algal poisoning is usually associated with algal blooms and presents a health threat to native fauna and people and pets swimming in the river (Balla 1994). The key strategy in reducing algal blooms is in reducing nutrient input into the wetland. Retaining existing natural vegetation around wetlands and rehabilitating degraded areas to provide well vegetated buffer zones aids in nutrient stripping.

3.3 Trees

Past land uses have resulted in modifications to vegetation communities, thus drastically altering the appearance and functioning of our environment. However, rehabilitating degraded areas of the CRRP by planting local native plants, will enable restoration of the area to a state resembling the original natural environment. Balla (1994) suggest that where a wetland does not posses healthy characteristics it should be rehabilitated with the emphasis on reducing nutrient and water input via drains and retaining natural vegetation. The latter of these may require community involvement in revegetating degraded areas.

Lots 4, 62 63 & 64 Fern Road Wilson are degraded areas in need of rehabilitation. Many good sources are available in the literature which can be used to guide revegetation and management of disturbed environments (for example Powell and Emberson 1996). WWAG has a vested interest with planning and maintenance of the CRRP, and this area in particular. Our aim is to establish an arboretum on the aforementioned lots (Appendix 1, Map), with trees and shrubs that are endemic to this region.

A survey of existing trees identifying *genus* and *species* was carried out as listed in Table 1. A number of *Eucaluptus* trees were difficult to identify *species* and will be identified progressively. Table 2 lists endemic taxa that would be suitable for reinstatement of the CRRP and has been collated from lists provided by CALM, City of Canning and APACE of WA. This will encourage native fauna populations to re-inhabit the area and provide a corridor to improve the linkage of bushland sites. We envisage that this area be managed by CALM and Local Government with advice from other agencies.

If this site is developed as an arboretum, it will create "biological diversity; providing a place in which to walk, play, learn and find peace. It will enable city dwelling children to grow up with the opportunity to enjoy bushland experiences and develop an appreciation of the natural world." (Perth's Bushplan Vol 1 p. ix).

Within the CRRP a number of exotic or introduced plants have been planted for amenity purpose in recreation areas, or are remnants of previous landuse. CALM *et al.* (1997) suggest that these plants should be retained for their heritage value unless they are invasive or a liability to the conservation value of the CRRP.

A survey, of existing trees on Lots 62, 63 and 64 also known as Lot 500 Fern Road Wilson (WAPC) Retirement Village, was carried out on 30 January 1999 in conjunction with the Wilson Rate Payers Association. All trees that were listed as Exceptional and Considerable Significance (Hocking 1996 Attachment PD-299-96) were highlighted (Appendix 2, Map). All items of Exceptional and Considerable Significance were recommended for conservation (City of Canning Report, Summary of Hocking 1996 Conservation Plan Attachment PD-299-96). It appears that 13 trees of Exceptional Significance and 20 trees of Considerable Significance have been removed (Appendix 2, Map).

3.4 Fire

There has been two fires in the Wilson Wetlands area in the past 15 years. Many exotic weeds and trees have been regenerated following damage to the wetlands by fire. The Park is covered in Veldt Grass (*Enrharta Calycina*) and Wild Oats (*Avena Fatua*) which grow down to the wetlands and river edge. Many weeds are annuals (or perennials that die off above ground in summer such as Veldt Grass), and their straw-like remains ignite easily. Within the wetland area there is extensive growth of Bulrushes (*Typha Orientalis*). These species are an extreme fire risk.

Fire can have a dramatic effect on bushland areas, impoverishing vegetation, making it lower and more open, enabling weed invasion and decimating animal populations. Fire is a great threat to any large area of vegetation. When in close proximity to urban development, this threat is exacerbated by human activities, whether accidental or deliberate.

TABLE 1 : Existing Trees on Site(Refer Appendix 1, Map)

NO.	EXISTING TREES ON SITE	
1.	*Eucalyptus*	*camaldulensis* River Gum
2.	*Eucalyptus*	*camaldulensis*
3.	*Melia*	*azidarca* India or Australis
4.	*Tipuana*	*"Pride of Balivia"*
5.	*Eucalyptus*	*camaldulensis*
6.	*Eucalyptus*	*camaldulensis*
7.	*Eucalyptus*	*citriodora* Lemon Scented Gum
8.	*Eucalyptus*	*camaldulensis*
9.	*Eucalyptus*	
10.	*Eucalyptus*	
11.	*Eucalyptus*	
12.	*Eucalyptus*	
13.	*Eucalyptus*	
14.	*Eucalyptus*	
15.	*Eucalyptus*	
16.	*Eucalyptus*	
17.	*Eucalyptus*	
18.	*Eucalyptus*	*ptychocarpa* Swamp Blood Wood
19.	*Eucalyptus*	*camaldulensis*
20.	*Eucalyptus*	
21.	*Eucalyptus*	
22.	*Eucalyptus*	
23.	*Eucalyptus*	
24.	*Eucalyptus*	
25.	*Eucalyptus*	
26.	*Eucalyptus*	
27.	*Eucalyptus*	
28.	*Eucalyptus*	
29.	*Eucalyptus*	
30.	*Eucalyptus*	
31.	*Ficus*	*rubiginosa* Morton or Port Jackson Fig
32.	*Eugenia*	*smithii*
33.	*Citharescylum*	*spinosum*
34.	*Eucalyptus*	*gomphocephala* Tuart Tree
35.	*Eugenia*	*smithii*
36.	*Lophonteman*	*confertus*
37.	*Citharescylum*	*spinosum*
38.	*Eugenia*	*smithii*
39.	*Lophonteman*	*confertus*
40.	*Erythrina*	*indica*
41.	*Eugenia*	*smithii*
42.	*Lophonteman*	*confertus*
43.	*Erythrina*	*indica*
44.	*Agonio*	*flerduoda*

N.B. The majority of the Eucalypt trees are difficult to determine the species unless the flowers or gum nuts are present, hence, default to *Eucalyptus* when unsure or unable to locate flowers etc.

TABLE 1 (Cont'd) : Existing Trees on Site

ASSEMBLAGE OF TREE SPECIES

Bottle Brushes, 3
Peppermint Willows
Lemon Scented Gum, 3
Liquid Ambers, several
Flooded Gums *(Eucalyptus grandis)*, several
Paper Barks (*Melaleuca spp*), several
River Gums *(E. Camaldulensis)*, several

TABLE 2 : Endemic Taxa List (CALM, City of Canning, APACE of WA)

TREES	
Melaleuca	*rhaphiophyll*
Eucalyptus	*rudis*
Eucaluptus	*calophylia*
Melaleuca	*preissian*
Banksia	*attenuata*
Banksia	*grandis*
Banksia	*littoralis*
Acacia	*saligna*
Allocasurina	*fraseriana*
Casurina	*obesa*
LARGE SHRUBS	
Hakea	*prostrata*
Hakea	*varia*
Hakea	*trifurcata*
Jacksonia	*furcellata*
Jacksonia	*sternbergiana*
Kunzea	*ericifolia*
Regelia	*ciliala*
Melaleuca	*teretifolia*
Melaleuca	*incarana*
Melaleuca	*pauciflora*
Allocasurina	*humilis*
Calothamnus	*quadrifidus*
Daviesia	*decurrens*
SHRUBS	
Astartea	*faxcirculars*
Melaleuca	*lateritia*
Melaleuca	*rhaphiophylla*
Myoporum	*caprarioides*
Pericalymma	*ellipricum*
Viminaria	*juncea*
Acacia	*pulchella*
Acacia	*cyclops*
Acacia	*steoptera*
Acacia	*huegelli*
Acacia	*saligna*
Acacia	*sessillis*
Acacia	*willoenowiana*
Agonis	*linearifolia*
Hypocalymma	*angustifolium*
Kunzea	*recurva*
Allocasuarina	*humilis*
Ocylobium	*lineare*
Actinostrobus	*acuminatus*

TABLE 2 (Cont'd) : Endemic Taxa List (CALM, City of Canning, APACE of WA)

LOW SHRUB		
Anigozanthus	*viridus*	Kangaroo Paw
Baumea	*juncea*	Rush
Juncus	*krausii*	}
Juncus	*pallidus*	} Rush
Juncus	*pauciflorus*	}
Calothamnus	*lateralis*	
GROUNDCOVER		
Centella	*asialica*	
Centella	*cordifolia*	
Lobella	*alata*	
Conostylis	*aculeata*	
Dryandra	*nivea*	
Hemiandra	*pungens*	
Kennedia	*prostrata*	
Patersonia	*occidentalis*	
Patersonia	*umbrosa*	
Restio	*stenostachyus*	
Gompholobium	*tomentosum*	
Dampiera	*linearis*	
Isolepis	*cernus*	

There are many more species of endemic Taxa that would be suitable for reinstatement of the CRRP that are not included in the above list.

Wilson Wetlands Action Group will consult with vested groups, interested in the re-establishment of the CRRP for information regarding other species.

RECOMMENDATIONS :

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare). Refer to Perth's Bushplan Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

- Wilson Wetlands Action Group in consultation with and assistance from CALM, City of Canning, and the CRRPAC will assist in weed control, reinstatement and management of the CRRP.

- Continue sampling of the Canning catchment to assess water quality with the aim of minimising potential algal blooms.

- Assess education programs regarding the excessive use of fertilisers within the Canning catchment.

- Remediation of the Mill Street drain and Wilson Main drain to living streams should occur so that the quality of the water they contain is such that it is a benign contributor to the river and does not impinge on the biota of the river.

- Residents, industry and commercial owners should be encouraged to participate in remediation and informed of it's progress.

- Restoration and reinstatement of wetland areas, including drains should be a priority within the Canning catchment. The drains entering the Canning River and associated buffer zones should be integrated into the fabric of the CRRP.

Wetland Protection
State Legislation
The WA Environmental Protection Act 1986 can be used to control specific development proposals and influence land use. Parts III & IV of the Act provide for environmental protection policies and environmental impact assessment. The statutory environmental impact assessment procedures provide a mechanism where a proposal for any activity which could result in unacceptable impacts on a wetland (or any other environment) can be assessed in detail by the Department of Environmental Protection (Balla 1994, p.38).

- We recommend that a full Environmental Impact Assessment be carried out by the EPA on Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) within the CRRP.

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REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

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REFERENCE TO PERTH'S BUSHPLAN (CONTINUED)

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Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

4. POLLUTION

Soils, ground water, surface water, wetlands and their associated vegetation and animal and human communities are all integral aspects of the ecosystems within the Canning River area . Given the interrelated nature of these facets changes to any one gives rise to changes within other parts and the system causing imbalances to natural processes to occur, sometimes with dire consequences.

The water quality within the river is largely dependent on the levels of heavy metals, salts, nutrients, dissolved gases, algae, bacteria and other materials. The area in which the Wilson wetlands occur consists of Bassendean sands or Bassendean sands over Guildford formation. Such soils contain little iron or aluminium and therefore have poor nutrient binding properties thus allowing for the rapid leaching of nutrients through the soil in dissolved form. Surface and ground waters eventually drain into the river and so these nutrients and other leachates affect the river's water quality.

Within a natural, balanced ecosystem there is a cycling of nutrients such as phosphorus and Nitrogen, which ensures the continuation of the system and the balance of substances is maintained. Phosphorus and nitrogen are necessary elements in the natural environment. But Ewel (1990, Wetlands Loss and Degradation - internet site) and others note that wetland ecosystems can become saturated with nutrients and heavy metals and over time result "in reduced effectiveness and degradation of the wetland" and they can alter the ecology as "extended eutrophication and metals cause plant and animal toxicity." With eutrophication many changes occur such as algae thriving, oxygen levels decreasing, sunlight penetration for plant growth is reduced, fish may die, etc, and so the delicate balance is upset.

Different land uses create varying types and amounts of pollutants and human habitation has had a profound and continuing effect on this balance. Human and animal wastes and inorganic fertilisers accumulate in the soil and are readily leached through the adjacent soils into the river. "The pollutants that enter water bodies from urban catchments are generally more varied and complex compounds than those in rural catchments" (Mouritz Environmental Services, 1995a, p.39). Urbanisation causes degradation due to changes in water quality and flow rates, increases pollution inputs, changes species composition due to introduction of non-native species and disturbance and often results in a reduction in biodiversity.

Furthermore, the Water and Rivers Commission Perth Groundwater Atlas (1997, p.iii) notes that "urbanisation means... the introduction of hard surfaces such as houses and roads and this has caused an increase in aquifer recharge and a rise in the local water table." Also the "paved surfaces alter the balance between runoff, infiltration and

percolation and evapo-transpiration. Urban drainage is designed to remove stormwater runoff quickly" hence increasing flow velocities and also dislodging and transporting pollutants that continue to degrade the wetlands (Fisher 1998, p.46)

Water quality is also linked to the effect of various activities/land uses throughout the adjacent catchment areas. Nutrient and other pollution sources can be traced back to "urban stormwater, garden fertiliser runoff, excessive watering, domestic pet faeces, impervious surfaces, industrial waste discharge, road sweeping, motor vehicle residues, land fill and leakage from underground tanks and pipes" (Fisher 1998, p.46).

At present the area adjacent to the Canning River in Wilson has been reticulated for sewerage but not all residents have linked in to the system so it would be expected in the future that this source of nutrient input would be decreased. However most residences have high quality lawns which have been shown to have a strongly increasing input of nutrients and which if further development (e.g.. on Lots 4 & 62 Fern Road, Wilson) occurs would be expected to further increase (Gerritse 1998, p.4)

Gerritse 1998, p.5) also notes the quite significant effects of domestic animals faecal material as a source of nutrient input, particularly noticeable in sewered areas, contributing up to 10% of the total. Domestic pets alone can provide damaging concentrations of nitrogen and phosphorus even if no fertilisers are applied to sandy soils and so Gerritse (1998) strongly recommends that areas close to the river/wetlands should not be developed but used as natural reserves and act as buffer zones between high nutrient inputs and rivers and lakes. Further, the practice of humans feeding bread to birds in wetlands considerably increases the phosphorus content in the water.

Urbanisation has an unbalancing effect on the natural ecosystem, this is the case in the Canning River and its adjacent environs as can be seen from the algal blooms both above and below the Kent Street Weir.

In addition to non-point sources of pollution Mills St. Drain and Wilson Main Drain which enter the river in this area are direct sources of pollution to the Canning River. Swan River Trust (1998) identifies the Mills St. drain, running from the Kewdale industrial area through to the Canning River, as a heavily polluted stream. The Mills Street drain contributes one of the highest concentrations of dissolved phosphorus and nitrogen in it's runoff. Thus it is a major nutrient contributor to this area of the river, having nitrogen levels of 2 - 3 mg/L in 1995-7 and phosphorus levels of 0.2-0.3 mg/L, both levels being classed as high and exceeding the Australian and New Zealand Environment and Conservation Council (ANZECC) water quality guidelines, making it a priority area for action (Swan River Trust 1998). Other pollutants which could also be transported through this drain are hydrocarbons, solvents and inorganic and organic chemicals. Typically because this drain services industrial and commercial areas higher levels of phosphorus, nitrogen, oxygen demanding material, nitrates, zinc and cadmium could be expected than if it serviced only residential areas. This aspect is currently under investigation by the Swan River Trust.

The Wilson Main drain is also of concern to the water quality of the Canning River. Although this drain primarily services residential areas its nutrient input from fertilisers applied to lawns and gardens etc. is of concern. Recent data from the Water and Rivers Commission (pers. com.) suggest that nutrient concentrations for total nitrogen and total phosphorus are elevated based on guidelines set out by Swan River Trust in their booklet "Understanding Water Quality on the Swan Coastal Plain" and the Australian

Water Quality Guidelines for Fresh and Marine Waters. When compared to historical data total phosphorus can be seen to have reduced from an average of 0.75 mg/L to approximately 0.3 mg/L, whereas total nitrogen has remained fairly consistent with an average of 2.17 mg/L compared to approximately 2.0 mg/L. However, the data are inconclusive to verify these trends. It is therefore necessary that sampling of water quality is continued. This is especially so given that the Wilson Main Drain and surrounding wetlands are shallow waterbodies, which are ideal for promoting various algal and weed infestations given the current nutrient levels. The Waters and Rivers Commission (pers. com.) suggests revegetation of the drain with local natives is needed to strip out available nutrients thereby improving water quality and minimising the outbreak of toxic algal bloom and weed infestation.

Converting Mills Street drain and the Wilson Main drain into living streams (refer to Mouritz Environmental Service 1995b) would have a significant impact on the river. This feature was reinforced by the City of Canning when it adopted Recommendation 288-95 (22/8/95) which included a goal that reaffirmed the point that open drains be "converted into named 'living streams and creeks' where practicable so that they can be an integral part of the urban landscape and carry better quality water to the Canning River". Appendix 1, Map shows a general view of the area that the Wilson main drain passes through since the drain has been relocated due to asbestos dumping. Figure 1 shows a photograph of the existing site and Figure 2 is a sketch of an idea showing a possible result following rehabilitation.

Figure 3 shows the condition existing after rains in the Wilson drain which has stormwater flowing through it and shows algal and aquatic plant growth. Figure 4 shows the drain under normal conditions containing groundwater seepage and the algal and plant growth. Figure 5 shows the continuation of the drain , from the top of the photo, looking down toward Figure 3. These figures all show the need for treatment of the drains and remediation of the site to turn the drain into a living stream surrounded by buffers.

By altering the design of these drains and improving the vegetation would improve the nutrient stripping capacity of these drains. This is especially important given that phosphorus and nitrogen are key factors in algal growth, provided there is no other limiting factor. Limiting factors include such things as adequate quantities of nitrogen, silicon, carbon, and iron. Small concentrations of phosphorus (0.02 g/m^3) can give rise to major algal blooms and deterioration of the aquatic ecosystem. Increased phosphorus also accumulates in the sediments and there is an increase in algae which impacts on the whole food web including predators. Wide fluctuations in species numbers occur in these unstable conditions and one major detrimental effect is a decrease in species diversity.

In addition to nutrients, it should be pointed out that pathogens, toxicants, litter and suspended solids are also entering drains and rivers and so effect water quality. In particular the impervious surfaces such as roads which cover a larger proportion of the urban catchment are a major source of heavy metals and hydrocarbons deposited by vehicles (Mouritz Environmental Services 1995a)

The major sources of toxicants are petroleum products, industrial products, pesticides, herbicides, household chemicals and heavy metals with residential areas providing the major sources of heavy metals and pesticides. Toxicants range in effect within the ecosystem but many accumulate in the food chain, and have chronic effects on plant and animal life, cause poisoning and even death.

Some substances such as organophosphates and fungicides, which are readily biodegradable in soil reduce the water quality and are also passed through the food web and can be toxic to fish. These substances enter the water system from run off, illegal dumping, accidental spillage or inappropriate application - all direct results of human activities. Herbicides are generally less toxic but because of their nature are often combined with a surfactant which can affect frogs (another integral organism of the food web).

Heavy metals such as cadmium, chromium, copper, mercury, lead, nickel and zinc accumulate in sediments and in organisms. In most cases they are unable to be metabolised or excreted from organisms and so build up in the food web with highest concentrations occurring in higher order consumers. They have varying effects on the organisms and can cause death which in turn affects the balance in the ecosystem. Within the area concerned most heavy metals would enter the river from road run off, commercial and industrial sites drainage (e.g.. drains such as Mills St.) and stormwater (Mouritz Environmental Services, 1995, Appendix 1, p.4, Table 2 shows common sources of pollutants and types).

Restoration and reinstatement of wetland areas, including drains should be a priority in this area as wetlands perform a vital function in absorbing and processing nutrients and stabilising hydrology, the water is slowed down before it enters the river and sediments are trapped. Such wetlands then enhance the waterbird and other fauna's habitats, increase the potential for greater biodiversity and enhance the riparian ecosystem. The drains entering the Canning River and associated buffer zones should be integrated into the fabric of the park.

With the release of Perth's Bushplan further impetus is given to the restoration of the Wetlands in Wilson (Volume 1, 5.13, p.xviii), when it states that in preparing strategic plans "government agencies should take any opportunities to strengthen the bushland and wetland corridors." This then indicates that the undeveloped area bounded by the river's edge, Castledare Place and Fern Road (Lots 4, 62, 63 & 64 Fern Road, Wilson) should be included in the wetland corridor. For the sake of the ecosystem, to create a viable corridor for fauna movement and habitat development no further residential/urban development should be allowed on this remaining stretch of land.

Figure 1

Figure 2

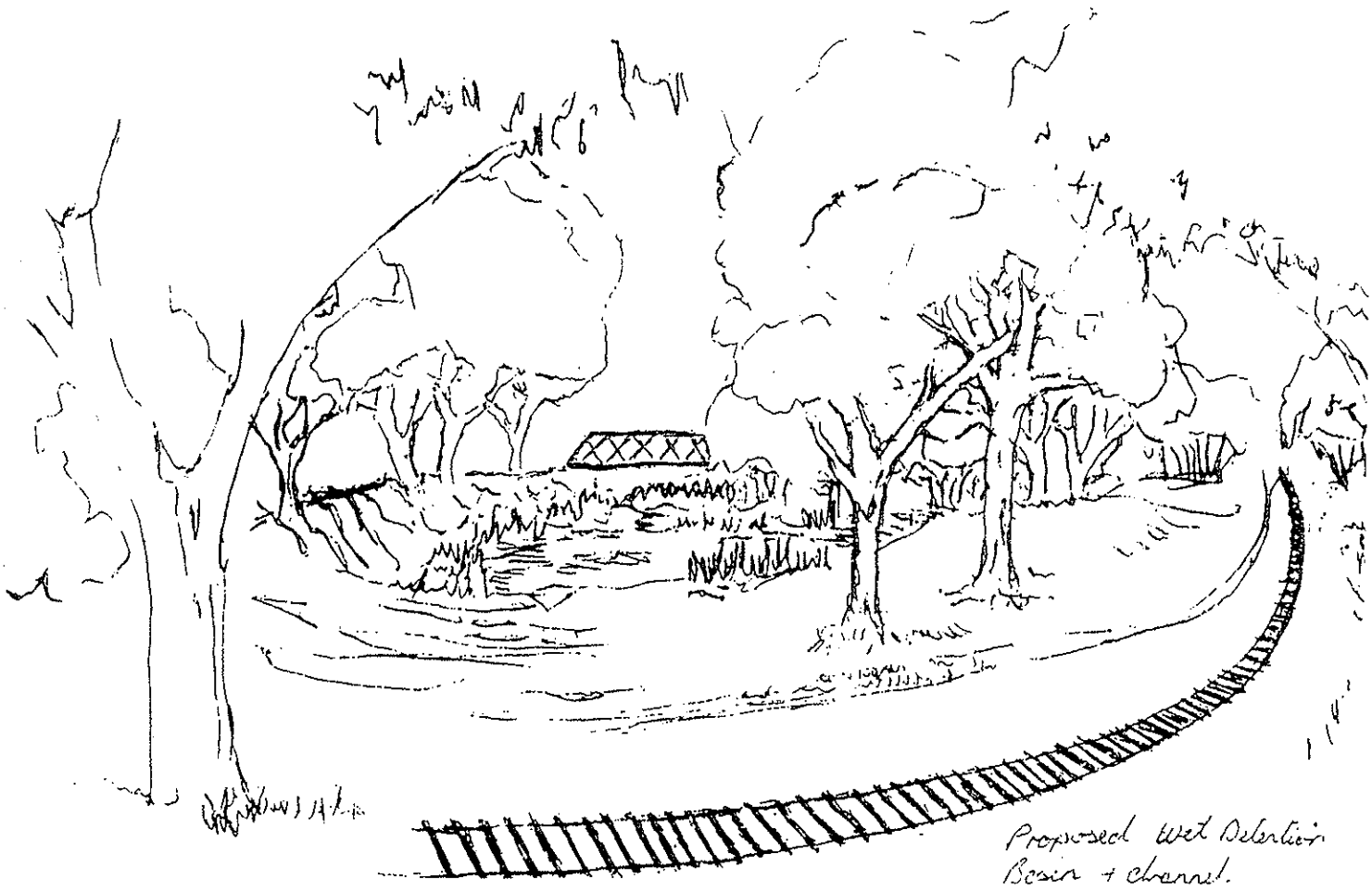

Figure 3

Figure 5

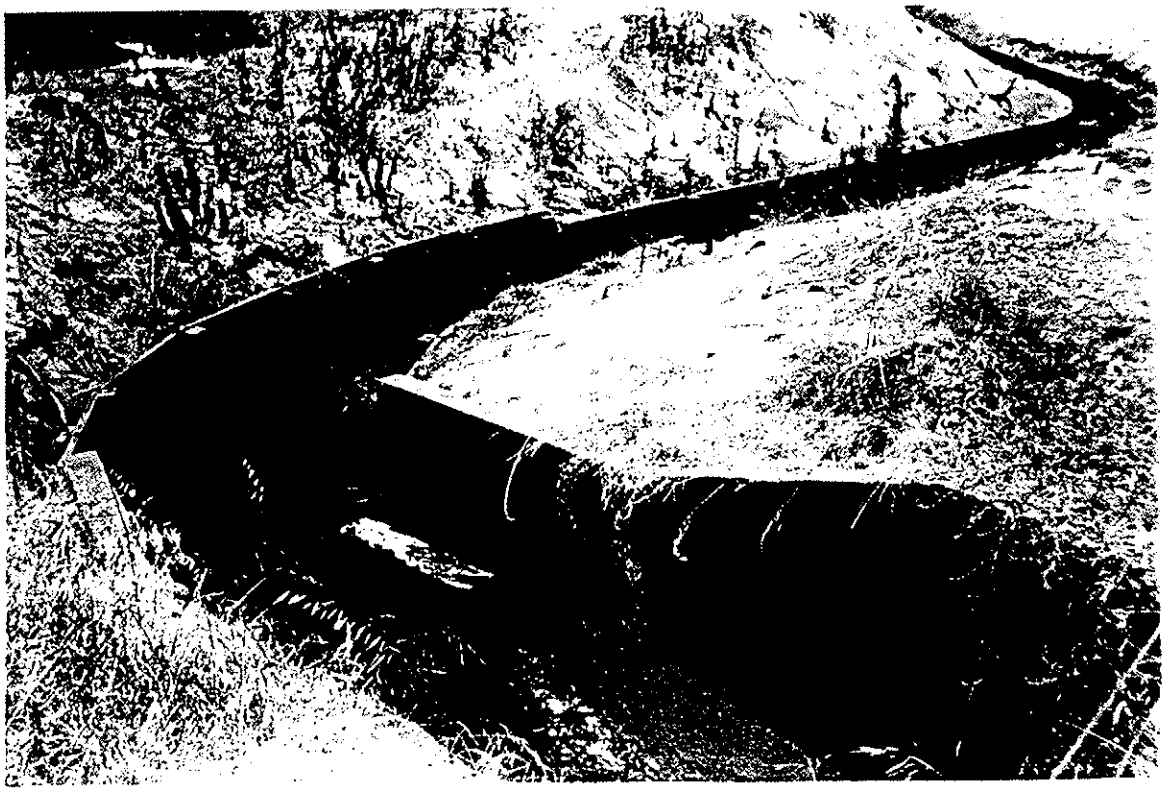

Figure 4

RECOMMENDATIONS :

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- A coordinated and comprehensive approach, which takes into consideration previously published recommendations, should be undertaken by relevant organisations and departments to ensure maximum benefit to the CRRP and its surrounds.

- Continue sampling of the Canning catchment to assess water quality enabling detrimental impacts to be identified and acted upon before serious ramifications to the wetland occur.

- Education programs directed at residents, industry and commercial owners within the Canning catchment, should be assessed as to their effectiveness in reducing pollution from non point sources.

- Remediation of the Mill Street drain and Wilson Main drain to living streams should occur so that the quality of the water they contain is such that it is a benign contributor to the river and does not impinge on the biota of the river.

- Residents, industry and commercial owners should be encouraged to participate in remediation and informed of it's progress.

- Restoration and reinstatement of wetland areas, including drains should be a priority within the Canning catchment. The drains entering the Canning River and associated buffer zones should be integrated into the fabric of the CRRP.

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REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

VOLUME 1
5.13 General Recommendations p.xviii
p.11
p.23
Bushland Management pp.38-39

VOLUME 2

VOLUME 2 PART A
Vegetation Condition p.39
General criteria for protection of Wetland, Streamline and Estuarine Fringing Vegetation and Coastal Vegetation p.78.
Swan and Canning Rivers EPP p.81
4.7.3. Specific Site recommendations
- Category 1, Recommendation 1a, p.85
- Category 5, Recommendation 5, p.87

VOLUME 2 PART B
2.6 Estuaries, Rivers and Creeks, 2.61 Location, Landscape and Soils p.363
Canning River Regional Park and Adjacent Bushland Riverton to Langford pp.395-397

VOLUME 2 PART C
Site Index No. p.14
Bushplan Site Maps 62 & 63

Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

5. SALINITY

We have concerns for the future of the ecosystem within the CRRP because of the possibility of salinisation over many years.

Salinity is a huge problem throughout Australia, it fouls water supplies and kills many of our aquatic ecosystems, in short it destroys our environment.

Agriculture Western Australia *et al* (1996) propose that if land use and management is to continue without significant changes then the area of salt-affected land is likely to double within the next 15 to 25 years. It is also suggested that this area will again double before a new equilibrium is reached. Unless management practices are altered, it is predicted that over 30% of cleared land, and a large proportion of remnant vegetation under private and public ownership, will become moderately to severely salt-affected in the long-term.

Salt in soils across the south-west of Western Australia originates from the ocean. After being carried by prevailing winds, the salt is then deposited in rainfall and dust. CSIRO studies have indicated that the amount of salt in rainfall at a particular location can be estimated from the distance from the coast and the average annual rainfall. It is predicted that Perth receives 341 kg/ha/year of salt (Malcolm *et al.*1978) and that under every hectare of the south-west there are up to 10 000 tonnes of salt stored (Bailey *et al.* 1997).

Salt accumulation in the surface soils during dry periods contribute to tree deaths, as does prolonged waterlogging (Froend & McComb 1991, Froend & Vander Morezel 1994). Urbanisation causes an increase in aquifer recharge and a rise in the local water table bringing salt with it to the surface (Water and Rivers Commission 1997). The key to reducing salinity is to lower water tables so that the stores of salt are no longer mobilised by groundwater (Steering Committee for Research on Land Use and Water Supply 1989). The most effective means of lowering water tables is to plant deep rooted trees that tolerate waterlogging and high salinity. Reforestation of a wetland catchment will reduce salinisation problems but is dependant on the area and density of trees planted (Balla 1994). Steering Committee for Research on Land Use and Water Supply (1989) noted that about 10% of reinstatement was found to prevent further rises in water levels in the 600-900 mm per annum rainfall zone and that "Ground water levels begin to decline 3-4 years after planting seedlings" (Steering Committee for Research on Land Use & Water Supply 1989; Wetlands of the Swan Coastal Plain Vol 1, p.144)

5.1 Bores

We have concerns that if Lots 4 & 62 Fern Road, Wilson of the CRRP are not acquired by the WAPC within 12 months as recommended by the Canning River Regional Park Management Plan 1997-2007, the owners of the site may attempt to have the MRS changed to allow for a subdivision. Concerns were raised because a representative from Richard Noble & Company (Consultants) canvassed residents of Wilson (1998) with a site map of a proposed subdivision within Lots 4 & 62 Fern Road, Wilson within the CRRP.

If any housing development is permitted within 200 metres of the Canning River it is likely to adversely impact on ground water supplies because new developments may introduce more bores into the area. Bores are not required to be registered, therefore control is difficult unless we stop housing developments. We currently have approximately 45% - 60% of houses with garden bores within the suburb of Wilson and on the south side of the Canning River in Ferndale 60% - 75% of households have bores. Bores in Shelley and Riverton are found in more than 75% of all homes (Patterson Market Research 1995, cited in Water and Rivers Commission 1997).

Given the high concentration of salt (1500-3500 mg/L TDS) (Water and Rivers Commission 1997) in the areas surrounding wetlands, borewater is considered unsuitable for irrigation purposes and its use may endanger the natural cycles within the ecosystem and the plants and animals that depend upon it. Areas generally unsuitable for drilling more garden bores include: within 200 metres of the Swan River Estuary (because of Salt water intrusion) and near wetlands (possible excessive lowering of ground water if bores are over pumped) (Water and Rivers Commission 1997). With the number of bores that currently exist in the Canning region, the prospect of future housing developments is of great concern.

RECOMMENDATIONS :

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) thereby creating a well-vegetated buffer zone, improving groundwater quality and enhancing this sites linkage potential. Refer to Perth's Bushplan Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

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REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

VOLUME 1:
2.3 Selection of regionally significant bushland areas p. 23.
Protecting Bushland p. 31.
Bushland Management p. 38.
Appendix 2 Definitions of Terms - Biological Diversity p. 61.
- Regional Parks p. 63.
- Reinstatement p. 63.

VOLUME 2

VOLUME 2 - PART A:
4.5.5 Linkage p. 64, 65 (iii) p. 66 Map 8.
Maintaining ecological processes or natural systems p. 76
General criteria for protection of Wetland, Streamline and Estuarine Fringing Vegetation and Coastal Vegetation p. 78.
State Ground Water Draft EPP p. 82.
4.7.3. Specific Site recommendations - Category 1, Recommendation 1a, p.85
- Category 5, Recommendation 5, p.87

VOLUME 2 - PART B:
2.6. Estuaries, Rivers and Creeks, 2.6.1 Introduction, Location, Landscape and Soils p.363.
Canning River Regional Park and Adjacent Bushland, Riverton to Langford pp.395-397.

VOLUME 2 - PART C:
Site Index No. p. 14.
Bushplan Site Maps 62 & 63

Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

6. CAR-PARKING, ABLUTION FACILITIES

We have concerns that if Lots 4 & 62 Fern Road, Wilson of the CRRP are not acquired by the WAPC within 12 months as recommended by the Canning River Regional Park Management Plan 1997-2007, the owners of the site may attempt to have the MRS changed to allow for a subdivision. Concerns were raised because a representative from Richard Noble & Company (Consultants) canvassed residents of Wilson (1998) with a site map of a proposed subdivision within Lots 4 & 62 Fern Road, Wilson within the CRRP.

Castledare is an integral part of history within the Wilson area. In its past it served as a place to visit by local children and the wider community. It is of concern that a place of local historical significance and a place of great potential could be under threat.

As stated in the Conservation Plan Report Summary Attachment PD-299-96, Castledare has an important role to play in the Canning community, it is a significant place valued by the local community, especially for its church and miniature railway.

The Retirement Village already constructed is an exceptional village for the retired generation. We would recommend correct use of the POS to meet environmental standards and also to suit the needs of the retired and the wider community who would use the nearby parkland to visit on weekends with family and friends.

6.1 Car-parking

Reasons for establishment of a public car-parking facility (refer Appendix 1 Map) :

- Church car-parking requirements
- Miniature Railway car-parking requirements.
- Retirement Village visitor car-parking.
- Parking for special occasions, e.g. Weddings and Funerals.
- Future growth in the local area of Wilson due to rezoning, increasing potential users of the Castledare Miniature Railway, Church and Canning River Regional Park.

As indicated in Table 3 : Attendees -Castledare Church - November 1998, there is a requirement for a car park for 71.5 (approx. figures) car spaces to be provided under current provisions for residential land use parking requirements for "Public Worship - 1 space per 4 persons the building is designed to accommodate" (City of Canning, Residential Land Use Parking Requirements).

It is not clear as to whether the need for a car-parking facility for the Church has been addressed by the City of Canning Planning Department within Lot 62 also known as Lot 501 Fern Road, Wilson

The Castledare Miniature Railway is a unique activity within the City of Canning again It is not clear as to whether the need for a car-parking facility has been addressed by the City of Canning Planning Department within Lot 62 also known as Lot 501 Fern Road, Wilson

TABLE 3 : Attendees - Castledare Church - November 1998

SANCTUARY	FATHER	ALTER BOYS	CHOIR			TOTAL
	1	4	15			**20**
PEWS	NO. OF PEWS	LENGTH OF PEWS (metres)	TOTAL (metres)	ESTIMATED ALLOWANCE/ ATTENDEE (metres)	ESTIMATED ATTENDEES	
	32	3.0	96	0.5	192.0	
	4	2.4	9.6	0.5	19.2	
	1	2.5	2.5	0.5	5.0	216.2
CHAIRS	10	(+ chair stack)				10
STANDING AREA (approx)	40					40
					TOTAL :	286.2
CURRENT PARKING REQUIREMENTS (1 space/4 persons)					TOTAL :	**71.55**

Table 4 provides data from a car count for November 1998, from the results it is clear that there is a need for the City of Canning to liaise with appropriate agencies concerning parking requirements and their development. Based on the figures obtained in Tables 3 & 4 relating to cars physically counted and attendees at Miniature Railways/Church meetings (plus the potential expansion of these figures due to growth of occupants in the area), and under current provisions as outlined by the City of Canning, it is recommended an 80 car-space car park be constructed with an allowance for overflow onto grassed area for an extra 20 vehicles. The site recommended is outlined in Appendix 1, Map Lot 62 also known as Lot 501 Fern Road, Wilson (WAPC) Refer to Perth's Bushplan Vol 1 Statutory Protection for Conservation Reserves, p. 34; The Role of Local Government p. 40).

TABLE 4 : Car Count - November 1998

	DATE	TIME	CARS	AVERAGE
MINIATURE RAILWAY				
(1st Sunday in each month)	Sunday 1-Nov-98	12:00noon	40	
		1:00pm	55	
		2:00pm	57	
		3:00pm	45	
		4:00pm	26	
			223	45
CASTLEDARE CHURCH	Sunday 1-Nov-98	9:30am	78	
	Sunday 8-Nov-98	10:00am	75	
	Saturday 14-Nov-98	7:00pm	60	
	Sunday 15-Nov-98	9:30pm	87	
	Saturday 21-Nov-98	7:00pm	47	
	Sunday 22-Nov-98	10:15am	74	
	Saturday 28-Nov-98	7:00pm	47	
	Sunday 29-Nov-98	10:30am	87	
			555	69
SPECIAL OCCASIONS			150	

6.2 Ablution Facilities

Within the Conservation Plan Report Summary -Attachment PD-299-96 - 3.3.11 Ablution Block states "The ablution block is not important to an understanding of the significance of the site, Grading 4 Little Significance. Retain and re-use or demolish as required."

The current septic ablution facilities available to members and patrons of the Castledare Miniature Railway and the Church are inadequate. The facilities are in disrepair and do not comply with environmental requirements/Town Planning requirements, where there is a deep sewerage line in close proximity then a septic system should be upgraded and connected to deep sewerage. There is a need for establishment of a public ablution facility with disabled access connected to deep sewerage. Another concern is the close proximity of the existing septic ablution facilities to the Canning River.

Reference is made to Table 4 : Car Count November 1998. As Table 4 indicates there could be 114 cars visiting the Castledare Miniature Railway/Church on any one day, potentially (approx. 4 persons per car) over 400 people visiting, this does not include local residents who are able to walk or cycle to this venue.

RECOMMENDATIONS :

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- City of Canning to liaise with appropriate agencies concerning parking requirements and their development. It is recommended an 80 car-space car park be constructed with an allowance for overflow onto grassed area for an extra 20 vehicles. The site recommended is outlined in Appendix 1, Map Lot 62 also known as Lot 501 Fern Road, Wilson. Refer to Perth's Bushplan Vol 1 Statutory Protection for Conservation Reserves, p. 34; The Role of Local Government p. 40)

- City of Canning liaise with CALM, CRRPAC, Castledare Church and Castledare Miniature Railway regarding the establishment of a public ablution facility with disabled access connected to deep sewerage. Refer to Perth's Bushplan Vol 1 Statutory Protection for Conservation Reserves, p. 34; The Role of Local Government p. 40)

- In consultation with Castledare Miniature Railway and other relevant parties, demolition of existing ablution facilities (septic system) and unwanted buildings should occur (Conservation Plan Report Summary Attachment PD-299-96). Refer to Perth's Bushplan Vol 1 Statutory Protection for Conservation Reserves, p. 34; The Role of Local Government p. 40)

REFERENCES :

Appendix 1 Map, Part of Canning River Regional Park and Adjacent Bushland System 6 M68. Bushplan Site No 224

City of Canning, Residential Land Use Parking Requirements

Report No PD-299-96, Ordinary Council Meeting 16 July 1996 - Attachment PD-299-96 Conservation Plan Report Summary

REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

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Statutory Protection for Conservation Reserves p.34
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Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

7. AMPHIBIANS

Frogs have been extant for around 200 million years. Survival over such a long period depends on the process of evolution, whereby species adapt gradually to their changing environment.

Unfortunately, land clearance, urbanisation and chemical pollution are occurring far too rapidly for evolution to guarantee the persistence of species by way of adaptation. The decline in frog species is representative of the loss of biodiversity on a global scale. This loss can largely be attributed to habitat destruction in the wake of human expansion. With the expansion of the Perth metropolitan area, wetlands have been filled, drained or the vegetation cleared, resulting in the destruction or degradation of the vast majority of these ecosystems. It is estimated that at least three-quarters of these wetlands may have been destroyed since European settlement, by various forms of development. Of those remaining many are degraded and/or under continuing threat from development (Western Australian Resources Council 1988). The surviving wetland reserves "are mostly modified and encircled by suburban developments" (Aplin, 1998, p.2). This has not occurred without ramifications to local frog populations.

Frogs known to occur in the Canning region include:

Myobatrachus gouldii	Turtle frog
Limnodynastes dorsalis	Western banjo frog or Pobblebonk
Heleioporus eyrei	Moaning frog
Crinia glauerti	Glauerts froglet
Crinia georgiana	Red-thighed froglet
Crinia insignifera	Sandplain froglet

(Bush *et al.* 1995)

> "In Australia, Hero (1991) and Tyler (1991) reviewed the status of frog populations and confirmed that the demise was occurring at an alarming rate. Cribb (1993) in an address to ANZAAS reported that 29 of 204 known frog species in Australia were in serious decline." (White, 1995 p.49)

White (1995) suggested that the reasons for the decline of amphibians falls into 1 of 3 categories:

1. Acidification of waterways and acid rain.
2. Destruction of breeding and refuge sites.
3. Pollution by heavy metals and pesticides.

Given amphibians sensitivity to human-induced disturbance, biologists often refer to them as environmental indicators. Their decline is symptomatic of environmental vandalism and is indicative that a change in our use of this planet is necessary.

Such changes would include:

1. A change in attitude to halt habitat destruction.

2. A reduction in the activities that reduce global diversity.

3. A reduction in the use of commercial compounds such as pesticides, fertilisers and petro-chemicals.

4. A change in method of waste disposal.

5. The initiation of detailed biological studies into the survival requirements of frogs.

6. An increase in public awareness of the plight of declining species and the implications for humanity.

7. An increase in research to restore habitats and the possible translocation of doomed species.

(White 1993)

In addition to habitat destruction, environmental disturbance by pollution has been directly linked to skeletal abnormalities in natural populations of frogs (Tyler1983).

> "Each year literally thousands of new chemical substances are produced and released upon the market... In an environmental sense, some are harmless, some are harmful yet degrade rapidly, while others leave residues contaminating the atmosphere, soil or water posing a threat to the health of flora and fauna." (Tyler 1983 p.31)

In Australia and overseas frog spawn and tadpoles have been shown to be sensitive to a variety of contaminants at very low concentrations. Following exposures to concentrations as low as .005 ppm deaths have occurred. Fortunately, sensitivity of this extreme is rare. In several countries the increased use of insecticides and herbicides over the last 30 years is thought to have contributed to a decline in frog populations. Some pollutants interfere with the processes of natural growth, producing physical abnormalities such as additional limbs, the fusion of two digits, reduction of the length of one or more fingers or toes or of the complete limb and the presence of additional digits. Almost all abnormalities seen in adult frogs can be traced to events that took place while they were tadpoles in the water (Tyler1983).

In order to prevent the further decline of frogs, environmental disturbances due to pollution and habitat destruction must be addressed. Although frogs are protected under the "Wildlife Conservation Act", the Act does not protect the habitat of animals on private property, so public participation in the recovery of private land in regional parks is critical to its success. Remediation of drains into living streams by means of revegetating etc. would provide additional habitat for wetland species including frogs. The rehabilitation of the banks of drains and provision of well vegetated buffer zones along these watercourses would not only provide a greater variety of habitats for the various life stages of species but would help to increase linkage between bushland remnants. Mouritz Environmental Services (1995) provides a comprehensive guide for the remediation of drains to living streams in the Canning Catchment and has been endorsed by the City of Canning within the City's boundaries.

RECOMMENDATIONS :

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- WWAG and the community, under the direction of and assistance from CALM, City of Canning, CRRPAC, Water Corporation and other parties with a vested interest rehabilitate both the Wilson Main Drain and Mill Street Drain into living streams thereby increasing the area of suitable habitat for wetland species.

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) thereby creating a well-vegetated buffer zone, improving groundwater quality, providing additional habitat for wildlife and thus enhancing this sites linkage potential. Refer to Perth's Bushplan Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

REFERENCES :

Aplin, K. (1998) Alcoa Frogwatch, Newsletter No.2. Western Australian Museum, Perth, WA.

Bush, B., Maryan, B., Browne-Cooper, R. And Robinson, D. (1995) Reptiles and Frogs of the Perth Region. University of Western Australia Press, Nedlands, WA.

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White, A. W. (1995) Disappearing Frogs. Australian Zoologist, Vol. 30(1) pp48-56.

REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

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4.7.3. Specific Site recommendations
- Category 1, Recommendation 1a, p.85
- Category 5, Recommendation 5, p.87

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Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

8. BIRDS

The above mentioned Bushplan site No 224 is generally known as a degraded site (Vol 2, Part A, p.40, Table 12).

Bushplan Vol 2, Part A, Appendix 2, p.110 M68, states that System 6 status has been implemented. This is not the case as the land is privately owned and it has been surveyed and pegged. We have concerns that if Lots 4 & 62 Fern Road, Wilson of the CRRP are not acquired by the WAPC within 12 months as recommended by the Canning River Regional Park Management Plan 1997-2007 (p 5, Item 5, Strategy 2), the owners of the site may attempt to have the MRS changed to allow for a subdivision. Concerns were raised because a representative from Richard Noble & Company (Consultants) canvassed residents of Wilson (1998) with a site map of a proposed subdivision within Lots 4 & 62 Fern Road, Wilson within the CRRP.

This area is essential to fauna habitat, providing specific requirements for breeding, feeding and nursery functions. (Bushplan Vol 1 Page 67).

Brock and Pen (1984) documented a total of 97 bird species known to occur within the CRRP. This constitutes approximately half of the number of bird species recorded on the Swan Coastal Plain (Pizzey, cited in Brock & Pen,1984). The extensive species richness noted for the avian fauna relates to the diversity of habitats within the CRRP. These habitats include open estuarine waters, open riverine waters, beach, mudflat, salt-marsh, rushes, bulrushes, estuarine or riverine fringing forests, forest, woodland and grassland (Brock and Pen, 1984), thus enabling 44 waterbirds, 41 forest birds and 12 common suburban birds to be supported within a relatively small area, with all habitats playing an important role.

The sites pertaining to this submission have many large established trees which are used as nesting, feeding and nursery sites. Nine nesting sites have been identified and photographed. Thirteen species with young have been sighted feeding in trees and on the ground (Table 5). Furthermore, a pair of Peregrine Falcons (considered to be a significant species listed under the Wildlife Conservation Act, 1950 and has a reduced population on the Swan Coastal Plain) have been frequently observed at the Castledare site engaging in territorial behavior and are suspected to be breeding within this site. These birds are also Specially Protected Fauna under Schedule 4 Conservation Status of the Wildlife Conservation Notice (Specially Protected Fauna) 1998, thus preservation and rehabilitation of their habitats is critical to their survival.

TABLE 5 : List of birds with young seen within the Canning River Regional Park between Castledare and Kent Street Weir, during a period from 1998 - 1999:
(Observed and identified by Tom Kemp, voluntary observer for Birds Australia, WA Division)

ARTAMIDAE	
Gymnorhina tibicen	Australian Magpie
Cracticus torquatus	Grey Butcher Bird
GRALLINIDAE	
Grallina cyanoleuca	Magpie Lark
CACATUIDAE	
Cacatua roseicapilla	Pink and Grey Galah
DICRURIDAE	
Rhipidura leucophrys	Willie Wagtail
COLUMBIDAE	
Streptopelia senegaliensis	Laughing Turtle Dove
Streptopelia chinensis	Spotted Turtle Dove
MELIPHAGIDAE	
Lichenostomus virescens	Singing Honeyeater
Lichmera indistincta	Brown Honeyeater
Anthochaera carunculata	Red Wattle Bird
PSITTACIDAE	
Barnardius zonarius	Australian Ring Necked Parrot (Twenty Eight)
CAMPEPHAGIDAE	
Coracina novaehollandiae	Black Faced Cuckoo Shrike
CORVIDAE	
Corvus coronoides	Australian Raven

Many of the species observed within the CRRP, and at this site in particular, are listed under the Western Australian Wildlife Conservation Act (1950), the Japan-Australia Migratory Birds Agreement (JAMBA) and the China-Australia Migratory Birds Agreement (CAMBA). Australia is a signatory to these international treaties (JAMBA and CAMBA) under which there is an obligation to preserve, enhance and manage the habitats of these migratory birds. Australia is also a signatory to the Ramsar Convention on Wetlands that demands that wetlands be protected and managed wisely (CALM *et al*,1997).

Refer to the following key for the tables below:

Key

Column 1	Scientific Name	Names follow Stanger *et al.*, 1998
Column 2	Common Name	
Column 3	Significant Bird Species	(Perth's Bushplan, 1998, Volume 2, Part A, pp54-56)

1 = species listed under the Wildlife Conservation Act, 1950.
2 = species listed on the JAMBA/CAMBA agreements.
3 = habitat specialists with a reduced distribution on the Swan Coastal Plain.
4.= wide ranging species with reduced populations on the Swan Coastal Plain.

Column 4 Conservation Status after the Wildlife Conservation (Specially Protected Fauna) Notice, 1998.

R1 = Specially Protected Fauna - Schedule 1
R4 = Specially Protected Fauna - Schedule 4

TABLE 6 : List of birds sighted within the Canning River Regional Park between Castledare and Kent Street Weir, during a period from 1998 - 1999:
(Observed and identified by Tom Kemp, voluntary observer for Birds Australia, WA Division)

Scientific Name	Common Name	Significant Bird Species	Conservation Status
ACCIPITRIDAE			
Accipiter fasciatus	Brown Goshawk	4	
ALCEDINIDAE			
Todiramphus sanctus	Sacred Kingfisher		
Dacelo novaeguineae	Laughing Kookaburra		
ANATIDAE			
Cygnus atratus	Black Swan		
Tadorna tadornoides	Australian Shelduck		
Anas superciliosa	Pacific Black Duck		
Anas platyrhynchos	Mallard Duck		
Anas gracilis	Grey Teal Duck		
Anas rhynchotis	Australasian Shoveller	3	
Malacorhynchus membranaceus	Pink Eared Duck	3	
Aythya australis	Hardhead Duck	3	
Chenonetta jubata	Maned (Wood) Duck		
Oxyura australis	Blue Billed Duck	3	
Biziura lobata	Musk Duck	3	
ANHINGIDAE			
Anhinga melanogaster	Darter		
ARDEIDAE			
Ardea novaehollandiae	White Faced Heron		
Egretta alba	Great Egret	2	
Egretta garzetta	Little Egret		
Nycticorax caldonicus	Rufous Night Heron	4	
ARTAMIDAE			
Gymnorhina tibicen	Australian Magpie		
Cracticus torqatus	Grey Butcherbird		
CACATUIDAE			
Calyptorhynchus latirostris	White Tailed Black Cockatoo (Carnaby's)	1,4	R1
Calyptorhynchus baudinii	White Tailed Black Cockatoo (Baudin's)	1,4	R1
Cacatua roseicapilla	Pink and Grey Galah		
Cacatua sanguinea	Little Corella		
CAMPEPHAGIDAE			
Coracina novaehollandiae	Black Faced Cuckoo Shrike		
CHARADRIIDAE			
Elseyornis melanops	Black Fronted Plover(Dotterel)		
COLUMBIDAE			
Columba livia	Feral Pigeon		
COLUMBIDAE			
Streptopelia senegalienśis	Laughing Turtle Dove		
Streptopelia chinensis	Spotted Turtle Dove		
CORVIDAE			
Corvus coronoides	Australian Raven		
CUCULIDAE			
Cuculus pallidus	Pallid Cuckoo		
DICAEIDAE			
Dicaeum hirundinaceum	Mistletoe Bird		
DICRURIDAE			
Rhipidura fuliginosa	Grey Fantail		
Rhipidura leucophrys	Willie Wagtail		
Grallina cyanoleuca	Magpie Lark		

FALCONIDAE			
Falco longipennis	Australian Hobby		
Falco peregrinus	Peregrine Falcon	1,4	R4
HIRUNDINIDAE			
Hirundo neoxena	Welcome Swallow		
Hirundo nigricans	Tree Martin		
LARIDAE			
Larus novaehollandiae	Silver Gull		
MELIPHAGIDAE			
Anthochaera carunculatus	Red Wattlebird		
Lichenostomus virescens	Singing Honeyeater		
Lichmera indistincta	Brown Honeyeater		
MEROPIDAE			
Merops ornatus	Rainbow Bee-Eater	2	
NEOSITTIDAE			
Daphoenositta chrysoptera	Varied Sittella	3	
PACHYCEPHALIDAE			
Pachycephala rufiventris	Rufous Whistler		
PARDALOTIDAE			
Acanthiza chrysorrhoa	Yellow Rumped Thornbill	3	
Pardalotus striatus	Striated Pardalote		
PELECANIDAE			
Pelecanus conspicillatus	Australian Pelican		
PETROICIDAE			
Petroica goodenovii	Red Capped Robin		
Microeca fascinans	Brown Flycatcher(Jacky Winter)		
PHALOCROCORACIDAE			
Phalocrocorax varius	Pied Cormorant		
Phalocrocorax melanoleucos	Little Pied Cormorant		
Phalocrocorax carbo	Great Black Cormorant		
Phalocrocorax sulcirostris	Little Black Cormorant		
PODICIPEDIDAE			
Tachybaptus novaehollandiae	Australasian Grebe		
PSITTACIDAE			
Trichoglossus haematodus	Rainbow Lorikeet		
Purpureicephalus spurius	Red Capped Parrot		
Barnardius zonarius	Australian Ring Necked Parrot (Twenty Eight)		
RALLIDAE			
Gallinula tenebrosa	Dusky Moorhen	3	
Porphyrio porphyrio	Purple Swamphen		
Fulica atra	Eurasian Coot		
RECURVIROSTRIDAE			
Cladorhynchus leucocephalus	Banded Stilt		
SYLVIIDAE			
Acrocephalus stentoreus	Clamorous Reed Warbler		
THRESKIORNITHIDAE			
Threskiornis molucca	Sacred Ibis		
Threskiornis spinicollis	Straw Necked Ibis		
Platalea flavipes	Yellow Spoonbill		
ZOSTEROPIDAE			
Zosterops lateralis	Silvereye		

TABLE 7 : List of birds other than in Table 5 & 6 observed within the Canning River Regional Park (as cited by Brock & Pen, 1984)

Scientific Name	Common Name	Significant Bird Species	Conservation Status
ACCIPITRIDAE			
Circus approximans	Marsh Harrier		
Elanus axillaris	Australian Black-shouldered Kite		
Haliastur sphenurus	Whistling Kite	4	
Accipiter cirrhocephalus	Collared Sparrow Hawk	4	
Hieraaetus morphnoides	Little Eagle	4	
Falco cenchroides	Nankeen Kestrel		
ANATIDAE			
Anas castanea	Chestnut Teal		
ARDEIDAE			
Ardea pacifica	White-necked (Pacific) Heron		
CHARADRIIDAE			
Pluvialis squatarola	Grey Plover		
Charadrius ruficapillus	Red-capped Plover		
CUCULIDAE			
Cacomantis flabelliformis	Fan-tailed Cuckoo		
Chalcites basalis	Horsfield's Bronze Cuckoo		
LARIDAE			
Sterna caspia	Caspian Tern		
MALURIDAE			
Malurus splendens	Splendid Wren	3	
MELIPHAGIDAE			
Melithreptus lunatus	White-naped Honeyeater	4	
Anthocaera chrysoptera	Little Wattlebird	4	
Acanthorynchus superciliosus	Western Spinebill		
Epthianura albifrons	White-fronted Chat		
Phylidonyris novaehollandiae	New Holland Honeyeater	4	
MOTACILLIDAE			
Anthus novaeseelandiae	Australian (Richard's) Pipit		
PACHYCEPHALIDAE			
Pachycephala pectoralis	Golden Whistler	3	
PARDALOTIDAE			
Acanthiza inornata	Western Thornbill	3	
Acanthiza apicalis	Broad-tailed (Inland) Thornbill	3	
Sericornis frontalis	Spotted (White-browed) Scrub Wren	3	
Gerygone fusca	Western (Gerygone) Warbler		
PETROICIDAE			
Petroica multicolor	Scarlet Robin	3	
PODICIPEDIDAE			
Poliocephalus poliocephalus	Hoary-headed Grebe		
PSITTACIDAE			
Glossopsitta porphyrocephala	Purple Crowned Lorikeet		
Platycercus icterotis	Western Rosella	4	
RALLIDAE			
Gallirallus philippensis	Buff-banded Rail		
Porzana fluminea	Australian Crake		
Porzana tabuensis	Spotless Crake		
RECURVIROSTRIDAE			
Himantopus himantopus	Black-winged Stilt		
Recurvirostra novaehollandiae	Red-necked Avocet		
SCOLOPACIDAE			
Actitis hypoleucos	Common Sandpiper		
Tringa nebularia	Greenshank	2	
Calidris acuminata	Sharp-tailed Sandpiper	2	
Calidris ruficollis	Red-necked Stint	2	
Calidris ferruginea	Curlew Sandpiper	2	

STRIGIDAE	
Ninox boobook	Southern Boobook Owl
SYLVIIDAE	
Megalurus gramineus	Little Grassbird
TYTONIDAE	
Tyto alba	Barn Owl

Allowing a housing development on Bushplan Site 224 Lots 4 & 62 Fern Road Wilson will result in the loss of existing breeding, roosting and feeding areas for fauna. Furthermore, an increase in cats and dogs, is likely to have detrimental effects on avian fauna. An increased cat and dog population will result in an increase in bird deaths as it is the natural instinct for these animals to hunt and chase.

With the loss of habitat resulting from extensive destruction of wetlands on the Swan Coastal Plain every effort should be made to conserve areas of remaining bushland and to rehabilitate degraded areas where development has not yet occurred. At this site in particular, an opportunity presents itself for the re-establishment of vegetation native to this region, thereby increasing the area of suitable habitat for many species and improving the connectivity between remnant bushlands. A well vegetated buffer also plays important roles in maintaining the integrity of wetland ecosystems and enables plant communities to respond naturally to changes in environmental parameters, thus ensuring the persistence of these ecosystems.

RECOMMENDATIONS :

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) thereby creating a well-vegetated buffer zone, providing additional habitat for wildlife (including roosting, nesting and nursery sites for birds) and thus enhancing this sites linkage potential. Refer to Perth's Bushplan Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

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Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

9. FISH

This paper focuses on why Lots 4 & 62, 63, 64 Fern Road Wilson should be preserved as part of the CRRP as a buffer zone ensuring the marine habitat is protected from further degradation, and ultimately be improved.

The Canning River, adjacent to the Wilson Wetlands is home to a great variety of bony fishes. In studies conducted between 1978 and 1987, in excess of 35 species of fish were found to be present (McDermot, 1981, cited in Brock & Pen 1983 p.163; Loneragen, Potter & Lenanton 1989)

Over the period of McDermot's study (1978-1981, cited in Brock & Pen 1983) a total of 141 050 individual fish from 36 separate species were sampled. It would be reasonable to extrapolate from these figures, plus the numbers of individual specimens from the Murdoch/Australian Marine Research Laboratories study, that the ecosystem supporting such a population of bony fish would contain a vast diversity of other marine and terrestrial species. For example, it can be assumed that crustaceans, marine worms, shellfish and diatoms, being basic food items for many of the species of bony fish (McDermot, 1981, cited in Brock & Pen 1983 p.163; Loneragen, Potter & Lenanton 1989), would be present in large numbers, as well as a large variety of marine and terrestrial plant life.

Any disruption to the ecosystem by pollutive contaminants can only have a detrimental effect on the existing ecosystem - a system already suffering degradation as a result of poor management practices of the past, resulting in bankside destruction, buffer zone degradation and pollutants entering the system in the form of pesticides, fertilisers, manures, petrochemicals etc.

Major nutrient contributions (ie pollutants) cited in the Swan River Trust Draft Action Plan (1998), included the Mills Street drain (phosphorous, nitrogen) which enters the Canning River from the Wilson Wetlands (Swan River Trust 1998).

The Swan/Canning River system has suffered wide-scale and severe water quality problems as a result of contaminants. The Swan River Trust Draft Action Plan (1998) indicates that sources of contaminants include urban gardens, parks, golf courses, unsewered residential areas and road runoff etc. Accumulation of nitrogen and phosphorous, in particular, leads to algal blooms of various types. In the long run the impact of these blooms are economic and social, as well as environmental. (Swan River Trust 1998).

Western Australian estuaries are different from many overseas situations and, it would seem, more fragile. Over time repeated excessive algal blooms, and their collapse, leads to reduction of the essential diversity of the food chain. In these extreme conditions, algal blooms also directly threaten the systems fish and other wildlife (Swan River Trust 1998). Riverside vegetation buffer zones act as filters for the nutrients that feed algal blooms.

FISH SAMPLES TAKEN BY *(Loneragen, Potter, Lenanton)*

Samples taken 1977-1981 : Shelley Bridge
Kent Street Weir

Methods of Catching :

Beach	10 sites
Gill Netting	4 sites
Trawling	6 sites

Fish Caught (36 families & 71 species)

Categories (marine teleosts) (marine stragglers) represented most catches (7 of 15 species)

7 of 15 completed life cycle within the estuary (marine opportunists)

1 of 15 was anadromous (completed spawning in estuary, fed at sea (*Nematalosa vlamingh*)(Perth Herring)

38 species use Swan Estuary as nursery area.

Estuarine and anadromous make up considerable % of catch in middle and upper estuary.

(A) Anadromous - Feeding at sea for a period and spawning in upper reaches.
(E) Estuarine - Life cycle completed in estuary
(FW) Fresh Water

Species found within the Canning River

(A) *Nematilosa vlaminghii* (Perth Herring) 75-77% of total catch in upper reaches. (Swan & Canning)
(E) (*Appogon rueppellii*) 10%
(E) *Amniataba caudavittatis* (Yellow Tailed Trumpeter) 1.4% (low catch rate could be preferred habitat of pylons, submerged structures)
(L) *Appogon rueppellii* (Hardy Head) 1.2%
(E) *Engralis australis* (Southern Anchovy) 2.1%
(E) *Psuedo gobius* (Blue Spot Goby) 1.8%
(E) *Craterocephalus mugilloides* 0.5%
(E) *Acanthoiagrus butcherii* (Black Bream) 0.7% (structure habitat)
(E) *Papic gobius pungtatus* (Spotted Goby) 0.4%

(E) *Arengobius bifrematus* (Bridled Goby) 0.2%
(FW) *Gambusia affinis* (Gamousia, Mosquito Fish) 0.2%
(E) *Favonigobius suppositus* (Long Headed Goby) 0.2%
(E) *Platycepnallis endracntensis* (Bar Tail Flathead) < 0.1%
(E) *Nyporhamphus regularis* (Western River Garfish)
(FW) *Galaxis occindetalis* (Western Minnow)
(E) *Ulocamplas carinirostris* (Hairy Pipefish)
(E) *Carrissius auratus* (Golden Carp)
Edelina vittata (Pygmy Perch)

Also take into account that the following complete major part of life cycle in upper estuary :

Muel cephalus (Sea Mullet)
Pomatus satatrix
Elops maennata (Giant Herring)
Rhabdogargus sarba (Tarwhine)
Argyrosomas hololepidorus (Mullaway)
Aldrichetta forteri (Yellow Eye Mullet)

Crustaceans : River Prawns; Blue Manna Crabs; Black Spider Crabs; Shrimps

RECOMMENDATIONS

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) thereby creating a well-vegetated buffer zone and improving groundwater quality (which will eventually impact upon the river ecosystem). Refer to Perth's Bushplan Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

- Continue sampling of the Canning catchment to assess water quality enabling detrimental impacts to be identified and acted upon before serious ramifications to the wetland occur.

- Education programs directed at residents, industry and commercial owners within Mill Street drain and Wilson Main drain catchment areas should be assessed as to their effectiveness in reducing pollution from non point sources.

- Remediation of the Mill Street drain and Wilson Main drain to living streams should occur so that the quality of the water they contain is such that it is a benign contributor to the river and does not impinge on the biota of the river.

- Residents, industry and commercial owners should be encouraged to participate in remediation and informed of it's progress.

- Restoration and reinstatement of wetland areas, including drains should be a priority in this area The drains entering the Canning River and associated buffer zones should be integrated into the fabric of the CRRP.

REFERENCES :

Balla, S. (1994) Wetlands of the Swan Coastal Plain: Their Nature and Management, Vol 1. Water Authority Of Western Australia and the Western Australian Department of Environmental Protection, Perth, W.A.

Brock, M.A. and Pen, L.J. (1984) Ecological Studies of the Canning River Wetlands, City of Canning, Perth, W.A.

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Loneragen, N.R., Potter, I.C. and Lenanton, R.C.J. (1989) Influence of Site, Season, and Year. Marine Biology 103, Murdoch University & Australian Marine Research Laboratories, Longman Cheshire, Melbourne.

Swan River Trust, (1997) Swan-Canning Cleanup Program: Progress Towards a Cleanup Action Plan, Water and Rivers Commission, Perth, W.A.

Swan River Trust. (1998) Swan-Canning Cleanup Program Draft Action Plan, Water and Rivers Commission, Perth, W.A.

REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

VOLUME 1

General Recommendations Recommendation 2, Recommendation 3 p. xv
5.4 p. xvii
5.13 p. xviii
p.11
2.2 Assessment of Regional Significance p. 21
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Protecting Bushland p. 31
Bushland Management pp.38-39
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REFERENCE TO PERTH'S BUSHPLAN (CONTINUED)

VOLUME 2

VOLUME 2 PART A
Vegetation Condition p.39
4.6.3 Directory of Important Wetlands in Australia Page 70
4.7.3. Specific Site recommendation - Category 1, Recommendation 1a, Page 85
- Category 5, Recommendation 5, Page 87
General criteria for protection of Wetland, Streamline and Estuarine Fringing Vegetation and Coastal Vegetation Page 78.
Swan and Canning Rivers EPP p.81

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Canning River Regional Park and Adjacent Bushland Riverton to Langford pp.395-397

VOLUME 2 PART C
Site Index No Page 14
Bushplan Site Maps 62 & 63

Bushplan Site No 224 (System 6 M68)
Canning River Regional Park and Adjacent Bushland, Riverton to Langford, Lots 4, 62,63 & 64 Fern Road , Wilson also known as Lots 4, 501 Fern Road, Wilson (WAPC).

Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA), Lots 14, 18, 42, 43 Woodloes Street.

10. MOSQUITOES & MIDGES

Mosquitoes depend on pools of water to complete their life cycle. It takes between six and 14 days for a mosquito to develop from egg to adult, depending on water temperature and the species (Brock and Pen, 1984, p.118).

Mosquito breeding within Canning occurs over summer and is influenced by tidal impacts within the flood plain areas of the Canning River Regional Park. Localised breeding also occurs in road gullies, small permanent water bodies (wetlands, compensating basins), and on private property.

Midges (*chironomids*) are non-biting flies that resemble mosquitoes but lack a long proboscis for feeding. The larvae of these flies live in wetlands, feeding on decaying organic matter. Consequently, nutrient enrichment inevitably leads to increased abundance of midges with larvae reaching densities of up to 40 000 larvae/m^2; (Pinder *et al* 1991). Once these larvae pupate, flight borne adults form large swarms becoming a nuisance and annoying pest (Balla, 1994).

Despite the annoyance caused by midges and mosquitoes it must be remembered that they too play a role within natural food chains. Many aquatic animals feed on the larvae of both midges and mosquitoes, which in a balanced ecosystem regulates pest populations. However, following disturbance to these fragile ecosystems the balance between predator and prey is altered, such that predators no longer have the same impact on prey populations, thus plagues in wetland areas occur. In these situations active management to control mosquito and midge numbers may be required.

Effective management relies on a detailed understanding of the problem. The ramifications of control techniques on the ecosystem as a whole must also be scrutinized. A control method which is insensitive to the environment and surrounding flora and fauna cannot be justified and will often result in the creation of far greater problems in the long run. For example, the use of insecticides should only be considered as a short term option because of its debilitating effects on other parts of the ecosystem. Filling is another control procedure which disrupts, degrades and potentially destroys entire systems. What is required is a holistic approach to the problem and an adaptive management plan which monitors the effectiveness of control methods and their impacts, and can be altered in accordance to findings. An integrated approach involving biological, physical, cultural and chemical controls is likely to give the best combination of methods for long term control (Balla 1994).

Rehabilitating disturbed wetlands to encourage natural aquatic invertebrate predators will reduce mosquito populations by targeting their larvae. Predators include microscopic animals such as rotifers, small crustaceans such as copepods, notonectids (sucking bugs), beetles, dragonfly and mayfly larvae (Balla 1994).

Techniques which reduce the contact between people and mosquito can often effectively reduce the problem (Balla 1994, p.116). Replanting wetland vegetation and upland buffer zones of natural vegetation around wetlands will help absorb nutrients, and provide a physical barrier to the movement of *chironomids* that are attracted by the suburban lights (Balla 1994). Pinder *et al.* (1991) recommended that a buffer zone of 800m be retained between a wetland and any development, with all activities in this zone being compatible with wetland conservation. Every effort should be made to conserve natural vegetation around wetland areas (Balla 1994, p.102).

RECOMMENDATIONS

- Perth's Bushplan Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 5 Recommendation 5, p.87 appears to be the level of protection afforded to the remaining privately owned sites within the CRRP (refer to Vol 2 Part B, p.397). This recommendation should be changed to Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85 as there is a clear intention supported by CALM for the bushplan site to be purchased and reserved as part of the formal conservation reserve system (CALM *et al.* 1997, p.5 Item 5, Strategy No. 2).

- Negotiated settlements take place enabling the West Australian Planning Commission to acquire Lots 4, 62, 63 & 64 Fern Road, Wilson (Castledare) within the CRRP boundary (Canning River Regional Park Management Plan, 1997-2007, refer to p.5 Item 5, Strategy No 2 and Tenure and Park Boundary Map 2 – Private Property). Refer to Perth's Bushplan Vol 1 General Recommendations XVIII 5.13 and Vol 2 Part A 4.7.3 Specific Site Recommendations, Category 1 Recommendation 1A p.85.

- Lot 15 Queens Park Road (officially Lot 15 Bacon Street, refer to DOLA) and Lots 14, 18, 42, 43 Woodloes Street within the CRRP (Bushplan Vol 2 Part B Descriptions p.396) be offered protection and acquired by the WAPC as these sites become available (CALM *et al* 1997, refer to Tenure and Park Boundary Map 2, Private Property).

- We recommend reinstatement of an arboretum with deep rooted native trees and shrubs, endemic to this region be established within Lots 4, 62, 63 & 64 Fern Road Wilson (Castledare) thereby creating a well-vegetated buffer zone, improving groundwater quality (reducing nutrient enrichment limits mosquito and midge populations), providing a physical barrier to adult midges and mosquitoes, providing additional habitat for wildlife (which may act as natural predators) and thus enhancing this sites linkage potential. Refer to Perth's Bushplan Vol 2, Part A 4.5.5. Linkage pp. 64-65 (iii) p. 66 Map 8.

- Remediation of the Mill Street drain and Wilson Main drain to living streams should occur, aiding in the control of mosquitoes and midges.

- Continue sampling of the Canning catchment to assess water quality enabling detrimental impacts to be identified and acted upon before serious ramifications to the wetland occur.

- Assess education programs regarding the excessive use of fertilisers and mosquito control within the Canning catchment.

- Restoration and reinstatement of wetland areas, including drains should be a priority in this area The drains entering the Canning River and associated buffer zones should be integrated into the fabric of the CRRP.

- An integrated approach involving biological, physical, cultural and chemical controls should be adopted in controlling mosquito and midge populations. At all times these should be environmentally sensitive.

REFERENCES :

Balla, S. (1994) Wetlands of the Swan Coastal Plain: Their Nature and Management, Vol 1. Water Authority Of Western Australia and the Western Australian Department of Environmental Protection, Perth, W.A.

Brock, M.A. and Pen, L.J. (1984) Ecological Studies of the Canning River Wetlands, City of Canning, Perth, W.A.

Pinder, A.M., Trayler, K.M. and Davis, J.A. (1991) Chironomid control in Perth Wetlands: Final report and recommendations. Murdoch University, W.A.

REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

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General Recommendations, Recommendation 2, Recommendation 3 p.xv
Boundary Definition pp.47-48

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pp.3-4
4.7.3. Specific Site recommendations
- Category 1, Recommendation 1a, p.85
- Category 5, Recommendation 5, p.87

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Bushplan Site Maps 62 & 63

Bushplan Site No 224 (System 6 M68) MRS Urban Zoning
Canning River Regional Park and Adjacent Bushland, Riverton to Langford

11. CATS

Any further sub-divisions of the MRS Urban Zoning abutting BS224 is likely to lead to an increase in the number of cats in the Canning River Regional Park. "It is estimated that one in three households keep domestic cats" (Potter 1991, p.4). "Surveys have suggested that 37% of Australian households keep at least one cat" (Potter 1991, p.64).

Potter (1991) reported that 50 to 60% of domestic cats collected birds, 50 to 60% caught mammals and approximately 30% collected reptiles. Frogs and insects were also recorded as prey for some cats. It is thought likely that estimates of prey collected per year represent only a small proportion of the total prey catch, given that studies in North America have found that cats only returned with about 50% of their prey. Predictions of the number of vertebrate prey taken by domestic cats have been made at 30 prey per year. Working on the premise that there are approximately two cats for every hectare in suburban environments then it is likely that 60 to 100 vertebrates fall victim to domestic cat predation each year per hectare (Potter 1991).

Evidence from recent surveys suggests that cats with an adequate diet may continue to hunt. Having an evening curfew on cats would reduce predation of nocturnal animals, but this does not resolve the situation for diurnal animals that can still fall prey. The most effective method to prevent cats from hunting is to stop them from roaming both day and night (Australian National Parks and Wildlife Service, 1993).

To address the issue of cat predation on native fauna a No Cat Policy was adopted by the City of Armadale for the Churchman Brook Estate (West Australian, 28-11-1999, p.37 - City of Armadale re Churchman Brook Estate). Where new development abuts areas of nature conservation value, for example the CRRP, it is suggested that a NO CAT Policy be considered at the planning stage of any new development (MRS Urban Zoning).

RECOMMENDATIONS :

- Relevant authorities investigate an education program regarding management of domestic cats for suburbs abutting the CRRP. Refer to Perth's Bushplan Vol 2 Part A Vegetation Condition p. 39.

- That a NO CAT Policy be considered at the planning stage of any new development (MRS Urban Zoning) abutting the Canning River Regional Park. Refer to Perth's Bushplan Vol 2 Part A Vegetation Condition p. 39.

REFERENCES :

Australian National Parks and Wildlife Service (1993) Cats in Australia. The Endangered Species Unit, Canberra.

Potter, C. (Ed) (1991) The Impact of Cats on Native Wildlife. Australian National Parks and Wildlife Service, Endangered Species Unit, Canberra.

REFERENCE TO PERTH'S BUSHPLAN (SEE APPENDIX 3)

VOLUME 2

VOLUME 2 PART A
Vegetation Condition p.39

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Canning River Regional Park and Adjacent Bushland Riverton to Langford pp.395-397
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