

REGIONAL STATUS OF PLANT COMMUNITIIES IN HAY PARK

BJK 21/7/97

Floristic Community Types (DEP 1996, Hay 1 - 05)

Supergroup 2 - Seasonal Wetlands

- 8 Herb rich shrublands in clay pans
- 17 *M. raphiophylla* - *Gahnia trifida* seasonal wetlands
- 18 Shrublands on calcareous silts
- S5 *Acacia saligna* wetlands

THREATENED COMMUNITIES (English and Blythe 1997)

Not assessed, Vulnerable (floristic community type 8, 18), Data Deficient

HAY PARK BUSHLAND

This list was compiled with records from the Department of Environmental Protection 1994 - 96.
(Hay01-05)

Anthericaceae

- Agrostocrinum scabrum*
- Caesia parviflora*
- Chamaescilla corymbosa*
- Sowerbaea laxiflora*
- Thysanotus multiflorus*
- Thysanotus thyrsoideus*

Apiaceae

- Hydrocotyle alata*
- Hydrocotyle diantha*
- Xanthosia huegelii*

Asteraceae

- Cotula coronopifolia*
- Cotula cotuloides*
- * *Cotula turbinata*
- * *Hypochaeris glabra*
- Podolepis gracilis* sp Swamp
- Pogonolepis stricta*
- Siloxerus filifolius*
- Siloxerus humifusus*
- Siloxerus* sp. scps
- * *Sonchus oleraceus*

Centrolepidaceae

Aphelia cyperoides
Centrolepis aristata
Centrolepis polygyna

Chenopodiaceae

* Atriplex prostrata
Halosarcia sp. scps

Colchicaceae

Burchardia multiflora
Burchardia umbellata

Cyperaceae

Baumea juncea
Cyathochaeta avenacea
Gahnia trifida
Isolepis marginata
Isolepis oldfieldiana
Isolepis sp. scps
Lepidosperma angustatum
Lepidosperma longitudinale
Schoenus elegans
Schoenus odontocarpus
Schoenus rigens
Schoenus sp. scps

Dasypogonaceae

Lomandra caespitosa
Lomandra sonderi

Dilleniaceae

Hibbertia amplexicaulis
Hibbertia sp. scps
Hibbertia vaginata

Droseraceae

Drosera gigantea
Drosera menziesii subsp. penicillaris

Gentianaceae

- * *Centaurium* sp. scps
- * *Cicendia* filiformis

Goodeniaceae

Dampiera linearis
Scaevola sp. scps
Velleia trinervis

Haemodoraceae

Conostylis aculeata

Iridaceae

- Patersonia* occidentalis
- * *Romulea* rosea
- * *Romulea* rosea var. australis

Juncaceae

- * *Juncus* bufonius
- * *Juncus* capitatus

Juncaginaceae

Triglochin centrocarpum
Triglochin mucronatum
Triglochin procerum
Triglochin trichophorum

Lauraceae

Cassytha glabella
Cassytha racemosa

Lobeliaceae

Monopsis simplex

Lycopodiaceae

Phylloglossum drummondii

Selaginellaceae

Selaginella gracillima

Stylidiaceae

Stylidium brunonianum

Stylidium junceum

Stylidium sp. scps

Thymelaeaceae

Pimelea imbricata var. *piligera*

Xanthorrhoeaceae

Xanthorrhoea brunonis

Xanthorrhoea preissii

Menyanthaceae

Villarsia parnassifolia

Mimosaceae

Acacia alata
Acacia pulchella
Acacia pulchella var. pulchella
Acacia saligna
Acacia stenoptera
Acacia willdenowiana

Myrtaceae

Hypocalymma angustifolium
Kunzea micrantha
Kunzea recurva
Melaleuca incana
Melaleuca lateritia
Melaleuca preissiana
Melaleuca raphiophylla
Melaleuca teretifolia
Melaleuca viminea
Pericalymma ellipticum

Orchidaceae

Caladenia georgei MS
Caladenia paludosa MS
Caladenia sp. scps
* Monadenia bracteata
Prasophyllum parvifolium
Thelymitra crinita
Thelymitra sp. scps

Papilionaceae

Daviesia physodes
Daviesia preissii
Eutaxia virgata
Nemcia capitata
* Trifolium dubium

Philydraceae

Herb

Philydrella pygmaea

Mel n / Cognac 3669

Poaceae

- * Aira caryophyllea
- * Briza maxima
- * Briza minor
- * Hordeum marinum
- * Lolium rigidum
- * Parapholis incurva
- * Polypogon monspeliensis
- Polypogon tenellus
- Stipa compressa

Mel chop 3673

Mel pue 3674

Mmin/Mals 3683

Lo cut 3684

Mel vin 3685

" close 3686

Turt 3687

Polygalaceae

Shrub

Comesperma virgatum

Hyp angost 1268

Primulaceae

Az pue 1314

- * Anagallis arvensis
- Samolus junceus

Dow plugh 1358

Kem oak 1837

Proteaceae

Per ellip 1854

- Adenanthos meisneri
- Banksia littoralis
- Hakea varia

Ad Meis 3536

Restionaceae

- Anarthria laevis
- Leptocarpus sp. scps
- Loxocarya flexuosa
- Loxocarya pubescens
- Lyginia barbata
- Sporadanthus strictus MS

Herb

Pod gnie 1847

Sil / Cant 2367

Cant Aust 2376

Thys 2399

Rutaceae

Boronia dichotoma

Gchnic 2659

Arg scab 2401

Pet oc's 2515

Scrophulariaceae

- * Parentucellia viscosa

Wang pue's 2793

Sih jun 3670

Close 3677

Vascular Plant Flora of the Hay Park Bushland, Bunbury

By Arthur S. Weston
June 1996

A large proportion of the vascular plant flora of the Hay Park bushland south-southwest of the Robertson Drive - Bussell Highway T-junction (an area circumscribed by Bussell Highway, Washington Avenue, Rotary Avenue, the Aquatic Sports Centre and adjacent sports grounds) is listed below.

The list provides names of species listed alphabetically by family (Column 1), indications of which species are rare (P4: Priority 4) or self-perpetuating weeds (W) (Column 2), sources of the names in Column 1 (Columns 3, 4, 5 and 6) and other information.

Most of the scientific names in Column 1 are those used in the **Flora of the Perth Region** (Marchant *et al.* 1987), although a few (eg. *Desmocladius flexuosa*) are more recent. Those scientific names set off by inverted commas ('*Chthonocephalus pygmaeus*', *Melaleuca* 'cuticularis', *Caladenia* 'huegelii', *Adenanthos* 'cygnorum', *Banksia* 'menziesii' and *Petrophile* 'teretifolia') are regarded as being based upon incorrect identifications. A question mark (?) before a name indicates uncertainty about the identification(s) upon which the listing is based.

The list has been compiled from the following four sources, none of which is comprehensive or covers the entire bushland or all seasons :

- Column 3 **ASW** (Arthur S. Weston)
notes and identification of collections made by Arthur Weston on 19 and 23 June 1996 from selected sites and transects judged to be representative of the range of vegetation occurring in the bushland;
- Column 4 **DEP** (Department of Environmental Protection)
* Department of Environmental Protection 1994-1996 System 6 Update unpublished site records: site-based flora list for Hay Park generated from five representative wetland sites (Hay 1 - Hay 5) visited on 14 October 1995 by B. J. Keighery, other botanists and volunteers;
- Column 5 **BNC** (Bunbury Naturalists Club)
lists of species recorded, mainly as in flower, during walks in the Hay Park bushland by Shirley Fisher and other members of the Bunbury Naturalists Club in 1994 (19 July, 17 August, 17 September, October and November) and 1995 (January and March) - flowering periods based upon these lists are given in this column; and
- Column 6 **MAG** (Mark A. Gray)
the 34 species listed in Appendix 2 of the November 1992 report on **Vegetation Associations and Rare and Endangered Flora for a Low Impact Golf Development: Bunbury Recreation Reserve** by Mark Gray - the area covered is a 10 ha site (384 m x 264 m) bordering the Aquatic Centre and Rotary Drive in the central western part of the bushland.

The number 1 appearing in Column 5 (**BNC**) and Column 6 (**MAG**) indicates skepticism about the identification, with the correct name being suggested in the last column (Column 7).

A question mark (?) in any column indicates uncertainty about the identification upon which the listing is based.

Column 7 gives suggested correct names for Number 1 listings (as referred to in the previous paragraph), synonyms used by DEP, BNC and MAG (each synonym is preceded by the symbol =), common names listed without scientific names by BNC, flower colours given on the BNC lists and other information about determinations (identifications).

In addition to the species listed below, *Melaleuca hamulosa* has been recorded in the bushland (R. Smith pers comm. March 1992). This record was, however, probably based upon a misidentification of *Melaleuca viminea* (see Holliday 1989, p. 240).

| <u>Family and Species</u> | <u>Status</u> | <u>ASW</u> | <u>DEP</u> | <u>BNC</u> | <u>MAG</u> | <u>Notes & Names</u> |
|---------------------------------------|---------------|------------|------------|------------|------------|--------------------------|
| ANTHERICACEAE | | | | | | |
| Agrostocrinum scabrum | | x | x | Sep-Nov | x | |
| Caesia micrantha | | | x | | | |
| Chamaescilla corymbosa | | x | x | | | |
| Sowerbaea laxiflora | | | x | | | |
| Thysanotus arenarius | | | | | | |
| T. multiflorus | | | | | | x |
| T. patersonii | | | x | Oct | | |
| T. thyrsoides | | | | Sep-Oct | | |
| | | | x | | | |
| APIACEAE | | | | | | |
| Hydrocotyle alata | | | x | | | |
| H. diantha | | | x | | | |
| Xanthosia huegelii | | | x | | | |
| ASCLEPIADACEAE | | | | | | |
| Gomphocarpus fruticosus | W | x | | | | |
| ? ASPHODELACEAE | | | | | | |
| ? Trachyandra divaricata | W | x | | | | |
| ASTERACEAE | | | | | | |
| Arctotheca calendula | W | | | Oct-Nov | | |
| 'Chthonocephalus pygmaeus' | | | | 1, Oct | | Siloxerus sp.? |
| Cotula coronopifolia | | | x | | | |
| C. cotuloides | | | x | Oct-Nov | | |
| C. turbinata | W | x | x | | | |
| Hypochaeris glabra | W | x | x | | | x |
| Podolepis gracilis 'swamp' (GJK13126) | | | | | | |
| Pogonolepis stricta | | | x | | | |
| Senecio sp. | ? | | | Nov | | Groundsel |
| Siloxerus filifolius | | | x | | | |
| S. humifusus | | | x | | | |
| S. sp. | | | x | | | |
| Sonchus oleraceus | W | x | x | | | |
| Milk Thistle | | | | Nov | | |
| CENTROLEPIDACEAE | | | | | | |
| Aphelia cyperoides | | | x | | | |
| Centrolepis aristata | | ? | x | | | |
| C. polygyna | | | x | | | |
| CHENOPODIACEAE | | | | | | |
| Atriplex prostrata | W | x | x | | | |
| Chenopodium album | W | | | Nov | | Fat Hen |
| Sarcocornia quinqueflora | | x | x | | | |
| COLCHICACEAE | | | | | | |
| Burchardia congesta | | | x | | | |
| B. multiflora | | | x | Sep-Oct | | |
| B. umbellata | | | | Aug-Oct | | |
| CYPERACEAE | | | | | | |
| Baumea juncea | | x | x | | | |
| Cyanthochaeta avenacea | | x | x | | | |
| Gahnia trifida | | x | x | | | |
| Isolepis marginata | | | x | | | |
| I. oldfieldiana | | | x | | | |
| I. sp. | | | x | | | |
| Lepidosperma gladiatum | | ? | | | | x |
| L. angustatum | | x | x | | | |
| L. longitudinale | | x | x | | | |
| Schoenus elegans | | | x | | | |
| S. rigens | | | x | | | |
| S. sculptus | | | x | | | |
| S. sp. | | | x | | | |

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|--------------------------------|---------------|------------|------------|------------|------------|--------------------------|
| DASYPOGONACEAE | | | | | | |
| Dasyogon bromeliifolius | | x | | Nov | | |
| Lomandra caespitosa | | | x | | | |
| L. nigricans | | x | | Jul | | |
| L. preissii | | | | Sep | | |
| L. sonderi | | | x | | | |
| DILLENIACEAE | | | | | | |
| Hibbertia amplexicaulis | | | x | Oct-Nov | | |
| H. hypericoides | | x | | Jul-Nov | | |
| H. rhadinopoda | | | x | | | |
| H. ? stellaris | | | | Oct-Nov | | fls orange |
| H. vaginata | | x | x | Aug-Nov | | |
| DROSERACEAE | | | | | | |
| Drosera ? bulbigena | | | | Sep | | |
| D. gigantea | | | x | Oct | | |
| D. glandulifera | | | | Oct | | |
| D. menziesii ssp. penicillaris | | ? | x | | | |
| D. pallida | | | | | | x |
| D. sp. | | x | | | | |
| EPACRIDACEAE | | | | | | |
| Conostephium sp. | | | | Jan | | |
| Leucopogon propinquus | | | | | | x |
| EUPHORBACEAE | | | | | | |
| Phyllanthus calycinus | | x | | Aug | | |
| FUMARIACEAE | | | | | | |
| Fumaria ? capreolata | | | | Aug-Nov | | F. ? officinale |
| GENTIANACEAE | | | | | | |
| Centaurium ? erythraea | W | | x | | | |
| Cicenda filiformis | W | | x | | | |
| GOODENIACEAE | | | | | | |
| Dampiera linearis | | | x | | | |
| D. trigona | | | | Sep-Nov | | |
| Goodenia filiformis | | | | Nov | | |
| Scaevola calliptera | | | | Oct-Nov | | not S. striata |
| S. ? lanceolata | | | | Nov | | = S. longifolia |
| S. sp. | | | x | | | |
| ? S. sp. | | | | Jan | | fls sm, pale blue |
| Velleia trinervis | | | x | | | |
| HAEMODORACEAE | | | | | | |
| Anigozanthus manglesii | | | | Sep | | |
| A. viridis | | | | Oct-Nov | x | |
| Conostylis aculeata | | x | x | Aug-Nov | | = C. preissii |
| C. candicans | | | | | x | |
| Phlebocarya ciliata | | x | | | | |
| HYDATELLACEAE | | | | | | |
| Trithuria bibracteata | | | x | | | |
| IRIDACEAE | | | | | | |
| Orthrosanthus laxus | | | | | x | |
| Paterersonia occidentalis | | x | x | Sep-Oct | | |
| P. umbrosa | | | | Oct | | fls yellow |
| Romulea rosea | W | | x | Oct-Nov | | |
| R. rosea var. australis | W | | x | | | |
| JUNCACEAE | | | | | | |
| Juncus bufonius | W | | x | | | |
| J. capitatus | W | x | x | | | |

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|---|---------------|------------|------------|------------|------------------------------|
| JUNCAGINACEAE | | | | | |
| Triglochin centrocarpum | | | x | | |
| T. mucronatum | | | x | | |
| T. procerum | | | x | | |
| T. trichophorum | | | x | | |
| LAURACEAE | | | | | |
| Cassytha glabella | | x | x | ?Jan | |
| C. racemosa | | x | x | ?Jan | |
| LENTIBULARIACEAE | | | | | |
| Polypompholyx ? tenella | | | | Oct | |
| LILIACEAE (see Anthericaceae, Asphodeliaceae, Colchicaceae, Dasypogonaceae, Phormiaceae, Xanthorrhoeaceae) | | | | | |
| LOBELIACEAE | | | | | |
| Isotoma hypocateriformis | | | | Oct-Nov | |
| Monopsis debilis | W | | x | | |
| LORANTHACEAE | | | | | |
| Nuytsia floribunda | | x | | Jan | |
| LYCOPODIACEAE | | | | | |
| Phylloglossum drummondii | | | x | | |
| MENYANTHACEAE | | | | | |
| Villarsia parnassifolia | | | x | Oct | |
| MIMOSACEAE | | | | | |
| Acacia alata | | | x | | |
| A. ? extensa | | | | Aug | |
| A. flagelliformis | P4 | x | | | |
| A. pulchella | | x | x | Aug-Oct | x |
| A. pulchella var. pulchella | | x | x | | |
| A. 'recurva' | | | | I | |
| A. saligna | | x | x | Sep-Oct | x |
| A. stenoptera | | ? | x | Mar | |
| A. willdenowiana | | W | x | Aug | = A. diptera |
| MYRTACEAE | | | | | |
| Agonis flexuosa | | x | | x | |
| Astartea sp. | | x | | x | |
| Eucalyptus calophylla | | x | | Jan | |
| E. gomphocephala | | | | | x |
| E. marginata | | | | x | |
| E. rudis | | x | | x | |
| Hypocalymma angustifolium | | x | x | x | |
| Kunzea micrantha | | ? | x | | |
| K. recurva | | ? | x | Oct-Nov | var. praestans? |
| Melaleuca acerosa | | | | | x |
| M. ? acuminata | | ? | | | |
| M. 'cuticularis' | | | | | I M. preissiana? |
| M. incana | | x | x | | |
| M. ? lateriflora | | ? | | | |
| M. lateritia | | x | x | Nov | x |
| M. preissiana | | x | x | Oct-Nov | |
| M. raphiophylla | | x | x | x | x |
| M. teretifolia | | x | x | Nov | |
| M. thymoides | | x | | Sep-Nov | x |
| M. viminea | | x | x | | |
| Pericalymma ellipticum | | x | x | Oct-Nov | |
| ORCHIDACEAE | | | | | |
| Caladenia flava | | | | Sep-Oct | |
| C. 'huegelii' | | | | | I C. paludosa? |
| C. paludosa ms | | | x | ? Oct | |

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|---------------------------------|---------------|------------|------------|--------------|------------|-------------------------------------|
| <i>C. varians</i> | | | | Sep | | |
| <i>C. sp.</i> | | | x | | | |
| <i>Cyanicula sp.</i> | | | | Sep | | |
| <i>Diuris sp.</i> | | | | Sep | | |
| <i>Elythranthera emarginata</i> | | | | Oct | | |
| <i>Monadenia bracteata</i> | W | | x | | | |
| <i>Prasophyllum parvifolium</i> | | x | x | Aug-Sep | | |
| <i>Pterostylis vittata</i> | | x | | Jul-Sep | | |
| <i>Thelymitra crinita</i> | | | x | | | |
| <i>T. sp.</i> | | | x | | | |
| <i>T. spp.</i> | | | | Oct | | |
| OROBANCHACEAE | | | | | | |
| <i>Orobanche minor</i> | W | | | x | | |
| OXALIDACEAE | | | | | | |
| <i>Oxalis pes-caprae</i> | W | x | | Jul-Aug | | fls yellow |
| <i>O. glabra</i> | W | x | | Jul-Aug | | fls pink |
| PAPILIONACEAE | | | | | | |
| <i>Bossiaca eriocarpa</i> | | x | | Sep | | |
| <i>Daviesia incrassata</i> | | | | Aug-Nov, Mar | | incl. dets. as <i>D. polyphylla</i> |
| <i>D. physodes</i> | | x | x | | | |
| <i>D. preissii</i> | | x | x | | | |
| <i>Eutaxia virgata</i> | | | x | | | |
| <i>Gompholobium tomentosum</i> | | x | | Oct-Nov | | |
| <i>Hovea sp.</i> | | | | Aug-Sep | | |
| <i>Jaksonia furcellata</i> | | x | | Nov-Jan | | |
| <i>J. sternbergiana</i> | | ? | | ? | x | |
| <i>Lupinus ? cosentinii</i> | W | | | Sep-Nov | | fls blue |
| <i>Kemedia prostrata</i> | | x | | Aug-Oct | | |
| <i>Nemcia capitata</i> | | x | x | x | | |
| <i>Trifolium dubium</i> | W | | x | | | |
| <i>Vicia ? sativa</i> | W | | | Oct | | Vetch |
| PHLEODRACEAE | | | | | | |
| <i>Philydrella pygmaea</i> | | | x | Nov | | |
| PIFORMACEAE | | | | | | |
| <i>Dianella revoluta</i> | | ? | | | | |
| POACEAE | | | | | | |
| <i>Aira caryophyllea</i> | W | | x | | | |
| <i>Avena barbata</i> | W | | | | x | |
| <i>A. fatua</i> | W | | | | x | |
| <i>Briza maxima</i> | W | | x | x | x | |
| <i>B. minor</i> | W | | x | | x | |
| <i>Bromus madritensis</i> | W | | | | x | |
| <i>Cortaderia selboana</i> | W | x | | | x | |
| <i>Cynodon dactylon</i> | W | x | | | x | |
| <i>Ehrharta calycina</i> | W | | | | x | |
| <i>Hordeum marinum</i> | W | | x | | | |
| <i>Lolium rigidum</i> | W | | x | | | |
| <i>Parapholis incurva</i> | W | | x | | | |
| <i>Pennisetum clandestinum</i> | W | x | | | | |
| <i>Polypogon monspeliensis</i> | W | | x | | | |
| <i>P. tenellus</i> | | | x | | | |
| <i>Stipa compressa</i> | | | x | | | |
| POLYGALACEAE | | | | | | |
| <i>Comesperma virgatum</i> | | x | x | | | |
| <i>C. volubile</i> | | | x | | | |
| PRIMULACEAE | | | | | | |
| <i>Anagallis arvensis</i> | W | | x | | | |
| <i>Samolus junceus</i> | | x | x | | | |

| <u>Family and Species</u> | <u>Status</u> | <u>ASW</u> | <u>DEP</u> | <u>BNC</u> | <u>MAG</u> | <u>Notes & Names</u> |
|----------------------------|---------------|------------|------------|--------------|------------|--------------------------|
| PROTEACEAE | | | | | | |
| Adenanthos 'cygnorum' | | | | | 1 | A. meisneri? |
| A. meisneri | | x | x | | | |
| Banksia attenuata | | x | | x | x | |
| B. grandis | | x | | x | | |
| B. littoralis | | x | x | x | | |
| B. 'menziesii' | | | | | 1 | B. grandis? |
| Conospermum capitatum | | x | | | | |
| Hakea lissocarpa | | | | Aug-Sep | | |
| H. varia | | x | x | Sep | | |
| Petrophile 'teretifolia' | | | | 1, Oct-Nov | | ? |
| Stirlingia latifolia | | x | | Sep-Nov | | |
| Xylomelum occidentale | | x | | Jan | | |
| RESTIONACEAE | | | | | | |
| Anarthria laevis | | | x | | | |
| Desmocladius flexuosus | | x | x | | | = Loxocarya flexuosa |
| Hypolaena exsulca | | | | x | | |
| Leptocarpus / coangustatus | | x | | | | |
| Loxocarya cinerea | | | | x | | |
| L. pubescens | | x | x | | | |
| Lyginia barbata | | x | x | | | |
| ? Restio amblyocoleus | | x | | | | |
| Sporadanthus strictus ms | | | x | | | |
| ? Sporadanthus sp. | | x | | | | |
| RUFACEAE | | | | | | |
| Boronia crenulata | | | | Oct | | = B. viminea |
| Boronia dichotoma | | | x | | | |
| Eriostemon spicatus | | | | Sep-Oct | | |
| SELAGINELLACEAE | | | | | | |
| Selaginella gracillima | | | x | | | |
| SOLANACEAE | | | | | | |
| Solanum nigrum | | x | | | x | |
| STACKHOUSIACEAE | | | | | | |
| Stackhousia sp. | | | | x | | |
| STYLIDIACEAE | | | | | | |
| Stylidium brunonianum | | | x | Nov | | |
| S. calcaratum | | | | Sep-Oct | | |
| S. ? canaliculatum | | | | Oct | | fls yellow |
| S. junceum | | | x | Sep-Oct | | |
| S. sp. | | | x | | | |
| THYMELAEACEAE | | | | | | |
| Pimelea ferruginea | | | | Sep-Jan, Mar | | |
| P. imbricata var. piligera | | x | x | Aug-Nov | | = var. gracillima? |
| P. ? lanata | | x | | | | |
| TRIEMANDRACEAE | | | | | | |
| Platytheca galioides | | x | | Jul-Nov | | = P. verticillata |
| XANTHORRHOEACEAE | | | | | | |
| Xanthorrhoea brunonis | | x | x | ? | | |
| Xanthorrhoea preissii | | x | x | Nov-Jan | x | |
| ZAMIACEAE | | | | | | |
| Macrozamia riedlei | | x | | | | |

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.Adiantaceae (7)

- . 1 Adiantum aethiopicum b
- . 2 Cheilanthes sieberi b

.Aizoaceae (110)

- . * Carpobrotus virescens kh
- . * Tetragonia decumbens h

.Amaranthaceae (106)

- . 2 Ptilotus stirlingii h
- . 3 Ptilotus manglesii b

.Anthericaceae (54F)

- . 4 Agrostocrinum scabrum kh kb a a b
- . 5 Amocrinum preissii h
- .. Arthropodium see Dichopogon
- . 6 Caesia micrantha k b b k
- . 7 Caesia occidentalis a
- . 8 Chamaescilla corymbosa b b k bk kb
- . 9 Chamaescilla spiralis b
- . 10 Corynotheca micrantha kh k b k b
- . 1 Dichopogon capillipes k b b a k a
- . 2 Dichopogon preissii k b
- . 3 Johnsonia acaulis ak
- . 4 Sowerbea laxiflora hk b k b kb ab ak b b
- . 5 Thysanotus arenarius k b k b
- . 6 Thysanotus dichotomus a

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| | | | | | | | | |
|---|------|----|---|-----|----|-----|---|----|
| *Gomphocarpus fruticosus | | | | w | | | | |
| Asparagaceae * Asparagus Asparagus Asparagus Asphodeliaceae (54G) | | | | | | | | b |
| *Trachyandra divaricata | hk b | b | | | | b | | |
| .Asteraceae (345) | | | | | | | | |
| *Arctotheca calendula | | b | b | | n | k | | b. |
| *Arctotheca populifolia | h | | | | | | | |
| *Aster subulatus | h | | | | | a | | |
| 6 Asteridea pulverulenta | k | k | | | k | ak | | |
| 7 Brachycome bellidioides | | | | | | | | b |
| 8 Brachycome iberidifolia | | k | | | a | a b | | |
| 9 Calocephalus angianthoides ? | | | | | | | | |
| *Carduus tenuiflorus | h | | | | | | | |
| *Conyza albida | | | | | | a | | |
| 40 Cotula coronopifolia | | | | k | | ka | | b |
| 1 Cotula cotuloides | | | | k n | | | | |
| *Cotula turbinata | | b | b | k w | | a | | |
| 2 Craspedia sp | | b | b | | ab | a b | | b |
| *Digitaria sanguinalis | | | | | | a | | |
| *Dittrichia graveolens | | | | | | a | | |
| 3 Helichrysum see Ozothamnus | | | | | | | | |
| 4 Hyalosperma cotula | | | | | | ak | | |
| *Hypochoeris glabra | hk | bk | b | k | bk | ak | b | b |
| *Lactuca saligna | | | | | | a | | |
| *Lactuca serriola | | | | | | a | | |
| 5 Lagenifera huegelii | | b | b | | bk | ba | | |
| 6 Millotia myosotidifolia | | k | | | | a | | |
| 7 Millotia tenuifolia b | | | | | | | | |
| 8 Olearia axillaris | hkb | | | | | | | |
| 9 Ozothamnus cordatus | hk | b | | | a | | | |

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|------------------------------|-----|---|-----|----|----|---|---|
| . *Silene gallica | | | | b | a | | |
| . *Stellaria media | k | | | | | | |
| Casuarinaceae (70) | | | | | | | |
| . 5 Allocasuarina fraseriana | | | | b | a | | |
| . 6 Allocasuarina humilis. | | | | b | a | | |
| .Centrolepidaceae (40) | | | | | | | |
| . 7 Aphelia cyperoides | | | k | | ka | | b |
| . 8 Centrolepis aristata | | | k | | ka | b | b |
| . 9 Centrolepis drummondiana | | | | k | k | | |
| . 70 Centrolepis polygyna | | | k | | k | b | |
| . 1 Centrolepis sp. | | | | | | | |
| .Chenopodiaceae (105) | | | | | | | |
| . *Atriplex prostrata | | | k w | | | | |
| . *Chenopodium album | | | b w | | | | |
| . 2 Halosarcia sp. ? | | | | | | | |
| . 3 Rhagodia baccata | kbh | | | | | | |
| . 4 Sarcocornia quinqueflora | | | k w | | | | |
| .Colchicaceae (54J) | | | | | | | |
| . 5 Burchardia congesta | b | b | k w | ab | ak | b | |
| . 6 Burchardia multiflora | | b | k w | b | a | b | |
| . 7 Wurmbia tenella | | | | b | | | |
| Commelinaceae (47) | | | | | | | |

?ex-umbellata yes

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|-----------------------|--------------------------------|------|----|----|-----|----|------|---|---|
| 9 | Lepidosperma gladiatum | kh | | | | | | | |
| 10 | Lepidosperma longitudinale | | | | k w | | ka | b | b |
| 1 | Lepidosperma squamatum | k | b | b | | b | | b | b |
| 2 | Mesomelaena graciliceps | | | | | | ka | | |
| 3 | Mesomelaena tetragona | | | | | b | a | b | |
| 4 | Schoenus benthamii | | | | | | g | b | b |
| 5 | Schoenus curvifolius | | | | | | ka b | b | |
| 6 | Schoenus discifer | | | | | | k | | |
| 7 | Schoenus elegans | | | | k | | | | |
| 8 | Schoenus grandiflorus | kh | bk | | | b | a | b | |
| 9 | Schoenus odontocarpus | | | | k | | k | | |
| 10 | Schoenus rigens | | | | k | | ka | b | |
| 1 | Schoenus rodwayanus | | | | b | | ka | b | |
| 2 | Schoenus sculptus | | | | k | | | | |
| 3 | Schoenus sp.2 (GJK 5739) scps. | | | | | | k | | |
| 4 | Schoenus sp. | | | | k | | k | | |
| 5 | Schoenus subfascicularis | | | | | | k | | |
| 6 | Schoenus tenellus | | | | | | k | | |
| 7 | Tetraria octandra | | | b | | b | ka | | |
| .Dasypogonaceae (54C) | | | | | | | | | |
| 8 | Acanthocarpus preissii | kh b | b | | | b | | | |
| 9 | Calectasia cyanea | | | b | | b | a | b | |
| 10 | Dasypogon bromeliifolius | | | b | b w | | ka b | b | |
| 1 | Lomandra ?brittaniai | | | | | | a | | |
| 2 | Lomandra caespitosa | | k | b | k | bk | k | b | |
| 3 | Lomandra hermaphrodita | | | b | | k | ka | | |
| 4 | Lomandra maritima | | k | | | | | | |
| 5 | Lomandra micrantha | b | b | b | b | b | | | |
| 6 | Lomandra nigricans | k | b. | b. | bnw | ab | ka.b | | b |
| 7 | Lomandra preissii | | | b | n | b | k | | b |
| 8 | Lomandra purpurea | | | | | b | ab | | |

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|----------------------|-----------------------------|-----|-----|----|-----|----|-----|---|---|
| 3 | Astroloma pallidum | k | kb. | b. | | | ka | | |
| 4 | Astroloma ciliatum | | b. | b | | | | | |
| 5 | Conostephium pendulum | | b | b | | b | bka | b | |
| 6 | Conostephium preissii | h | b | | | | | | |
| 7 | Leucopogon australis | | | | | | ab | | |
| 8 | Leucopogon capitellatus | | | | | b | | | |
| 9 | Leucopogon conostephioides | | | | | | ka | | |
| 160 | Leucopogon nutans | | | | | | a | | |
| 1 | Leucopogon parviflorus | bk | | | | | | | |
| 2 | Leucopogon polymorphus | | | b | | b | | | |
| 3 | Leucopogon aff. polymorphus | | | | | b | | | |
| 4 | Leucopogon propinquus | | b | b | | ba | ka | b | b |
| 5 | Leucopogon racemulosus | | | | | | g | | |
| 6 | Lysinema ciliatum | | | | | | ab | | |
| .Euphorbiaceae (185) | | | | | | | | | |
| 7 | Adriana quadripartita | b | | | | | | | |
| 8 | Amperea ericoides | | | | | | gk | | |
| 9 | Beyeria ? | | | | | | | | |
| * | Euphorbia peplus | k | | | | | | | |
| 170 | Monotaxis grandiflora | | | | | | k | | |
| 1 | Monotaxis occidentalis | | | | | | k | | |
| 2 | Phyllanthus calycinus | hbk | bk | b | w n | bk | ka | b | b |
| 3 | Poranthera microphylla | k | | | | | | | |
| Fumariaceae (136) | | | | | | | | | |
| * | Fumaria capreolata | | | b | n | | | | |
| .Gentianaceae (303) | | | | | | | | | |
| * | Centaurium sp. | | | | | k | | | |

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|----------------------|--|----|----|---|------|----|-----|---|---|
| . 190 | Anigozanthus manglesii | | b | b | n | ba | kab | b | |
| / | Anigozanthus viridis | | | | b | | ab | | b |
| . 2 | Conostylis aculeata | k | bk | b | kb | bk | ak | b | b |
| | ssp. aculeata | | | | | | k | | |
| ? 3 | Conostylis aurea | k | | | | | | | |
| . | 4 Conostylis candicans | k | | | | | | | |
| . | 5 Conostylis setigera | k | | | | | | | |
| . | 6 Conostylis setosa | | | | | | a | | |
| . | 7 Haemodorum paniculatum | b | | | | | ?b | | |
| . | 8 Haemodorum simplex | | | | | | | b | |
| . | 9 Haemodorum spicatum | b | | | | | | | |
| . 200 | Phlebocarya ciliata | | | b | b | bk | akb | b | b |
| / | Tribonanthes australis | | | | | | kb | | |
| Hydatellaceae (40 A) | | | | | | | | | |
| | 2 Trithuria bibracteata | | | | k | | | | |
| .Hypoxidaceae (56 A) | | | | | | | | | |
| | 3 Hypoxis occidentalis | | | b | | | b | b | b |
| .Iridaceae (60) | | | | | | | | | |
| . | 4 Orthrosanthus laxus | k | bk | b | | ba | ab | b | |
| . | 5 Patersonia occidentalis | | | b | k | b | ak | b | b |
| . | 6 Patersonia occidentalis (swamp form) | | | | | | kb | b | |
| . | 7 Patersonia umbrosa | | | | n | | | | |
| . | *Romulea flava | | | b | | | | | |
| . | *Romulea rosea | kh | bk | b | bk n | b | kba | b | |
| . | *Romulea rosea var.australis | k | | | k | | k | | |

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|--------------------------------|----|---|---|---|---|---|---|-----|-----|
| . 3 Polypompholyx multifida | | | | | | | k | b | |
| . 4 Utricularia violacea | | | | | | | k | b | |
| . 5 Utricularia dichotoma | | | | | | | | b | |
| Lindsaeaceae (11D) | | | | | | | | | |
| . 6 Lindsaea linearis | | | | | | | | b | |
| .Lobeliaceae (340) | | | | | | | | | |
| . 7 Isotoma hypercrateriformis | | | | | b | | | a | |
| . 8 Lobelia alata | | | | | | b | | a | |
| . 9 Lobelia gibbosa | | | b | | | | | | |
| . 230 Lobelia tenuior | kh | k | | | | | | kab | |
| . *Monopsis simplex | | | | | k | | | b | b |
| . *Monopsis debilis | | | | | k | | | k | |
| .Loganiaceae (302) | | | | | | | | | |
| . 1 Logania serpyllifolia | | b | b | | | b | | ka | b |
| . 2 Logania vaginalis | kb | | | | | | | b | |
| . 3 Mitrasacme paradoxa | | | | | | | | k | |
| .Loranthaceae (97) | | | | | | | | | |
| . 4 Nuytsia floribunda | h | b | b | b | b | b | | kb | b b |
| .Lycopodiaceae (2) | | | | | | | | | |
| . 5 Phylloglossum drummondii | | | | | k | | | | |
| Lythraceae (265) | | | | | | | | | |

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.Myrtaceae (273)

| | | | | | | | | | |
|-------|---|-----|---|---|-------|-----|-----|-----|---|
| . 8 | Agonis flexuosa | hk | b | b | w n | abk | ab | b | b |
| . 9 | Agonis linearifolia | | | | | | a b | | |
| . 260 | Astartea aff. fascicularis | | | | | | kab | b. | b |
| ? | Astartea sp. G. Keigheri | | | | | | k | k | |
| . 1 | Baekea camphorosmae | | | | | b. | kab | | |
| . 2 | Calothamnus lateralis | | | | | | k | b | |
| | ssp. lateralis | | | | | | a | | |
| . 3 | Calytrix angulata | | | | | | k | | |
| . 4 | Calytrix flavescens | | | b | | b | kba | | |
| . 5 | Calytrix leschenaultii | | | | | | b | | |
| . 6 | Eucalyptus calophylla | b | b | b | b | b | bka | b | b |
| . 7 | Eucalyptus gomphocephala | khb | b | b | b | bk | | | |
| . 8 | Eucalyptus marginata | hkb | b | b | n | b | akb | b | b |
| . 9 | Eucalyptus rudis | | | b | b nw | | ab | b | b |
| . 270 | Hypocalymma angustifolium | | | | k nw | b | kba | b | b |
| . 1 | Kunzea ericifolia (=vestita) | | | b | | b | b a | b | |
| . 2 | Kunzea limnicola ? | | | | | | a | | |
| . 3 | Kunzea micrantha | | | | k | | | | |
| . 4 | Kunzea recurva | | | | k n | | ka | b | |
| . 5 | Melaleuca incana | | | | kb w | | ak | b | |
| . 6 | Melaleuca lateritia | | | | bk nw | | | abk | b |
| . 7 | Melaleuca lateriflora ssp.acutifolia MS | | | | | | k | | |
| . 8 | Melaleuca parviflora k | | | | | | | | |
| . 9 | Melaleuca pauciflora | | | | | | k | b | |
| . 280 | Melaleuca preissiana | | | b | kb nw | b | abk | b | b |
| . 1 | Melaleuca rhapsiophylla | | | | kbnw | b | kba | b | b |
| . 2 | Melaleuca teretifolia | | | | k nw | | a | | |
| . 3 | Melaleuca thymoides | | | | nw | b | ka | | b |
| . 4 | Melaleuca viminea | | | | kw | | kb | b | |
| . 5 | Pericalymma ellipticum | | | | kb nw | | kab | b | |

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|---------------|-----------------------------------|---|----|-----|----|----|----|
| 4 | <i>Microtis media</i> | | | | | kb | |
| 5 | <i>Microtis media densiflora</i> | | | | | | b |
| 6 | <i>Microtis unifolia</i> | | | | | a | b |
| | * <i>Monadenia bracteata</i> | | | k | | ab | |
| 7 | <i>Prasophyllum cyphochilum</i> ? | | | | b? | | |
| 8 | <i>Prasophyllum fimbria</i> | | | b | b | ab | |
| 9 | <i>Prasophyllum parvifolium</i> | | | knw | | | b |
| 310 | <i>Prasophyllum rigens</i> | | | | | | b |
| 1 | <i>Prasophyllum sp.</i> | | | k | | | |
| 2 | <i>Pterostylis aff. nana</i> | k | | | | | ?b |
| 3 | <i>Pterostylis nana</i> | k | | | | | |
| 4 | <i>Pterostylis recurva</i> | | | b | | | b |
| 5 | <i>Pterostylis sanguinea</i> | | | | | k | |
| 6 | <i>Pterostylis sp.scps</i> k | | | | | | |
| 7 | <i>Pterostylis vittata</i> | | kb | b | wn | k | |
| 8 | <i>Thelymitra antennifera</i> | | | | b | | |
| 9 | <i>Thelymitra benthamiana</i> | | | | | k | |
| 320 | <i>Thelymitra crinita</i> | | | | k | b | |
| 1 | <i>Thelymitra flexuosa</i> | | | | | k | |
| 2 | <i>Thelymitra fuscolutea</i> | | | | | b | |
| 3 | <i>Thelymitra nuda</i> | | | | | k | b |
| 4 | <i>Thelymitra pauciflora</i> | | | | | k | |
| 5 | <i>Thelymitra aff. holmesii</i> | | | | | b | |
| 6 | <i>Thelymitra sp.</i> | | | | k | | ka |
| 7 | <i>Thelymitra variegata</i> | | | | | b | |
| Onagraceae | | | | | | | |
| 8 | <i>Epilobium billardierianum</i> | | | | | | a |
| Orobanchaceae | | | | | | | |
| 9 | <i>Orobranche minor</i> | | | | | | a |

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|------------------------------|----|---|--|-----|---|----|--|
| . *Lolium rigidum | h | | | k | | | |
| .. 4 Microlaena stipoides | | k | | | k | k | |
| 5 Neurachne alopecuroidea | | | | | b | | |
| . *Parapholis incurva | | | | k | | | |
| . *Paspalum dilatatum | | | | | | a | |
| . *Pennisetum clandestinum | | | | w | | | |
| . *Pennisetum purpureum | | | | | | a | |
| . 6 Poa drummondiana | h | k | | | | a | |
| . 7 Poa poiformis | h | k | | | | | |
| . 8 Poa porphyroclados | k | | | | | | |
| . *Polypogon monspeliensis b | | | | k | | | |
| . Polypogon tenellus | | | | k | | | |
| . 9 Spinifex longifolius | h | | | | | | |
| . Stipa see Austrostipa | | | | | | | |
| .. 600 Stipa compressa | | | | k | a | ka | |
| . 1 Stipa campylachne | | k | | | | a? | |
| . 2 Stipa flavescens | hk | k | | | k | | |
| . *Vulpia bromoides | | | | | | k | |
| . *Vulpia membranacea | h | | | | | | |
| . *Vulpia myuros | | | | | | g | |
| . Polygalaceae (183) | | | | | | | |
| . 3 Comesperma calymega | | | | | | a | |
| . 4 Comesperma confertum | h. | | | b w | | a | |
| . 5 Comesperma flavum | | | | | | b | |
| . 6 Comesperma virgatum | | | | kb | | b | |
| . 7 Comesperma volubile | | | | kb | | | |
| . Polygonaceae (103) | | | | | | | |
| . *Rumex crispus | | | | | | kb | |

Southern Bunbury Remnant Bushland -Consolidated vascular plant Species List including
 B. Koch, 1990 (a) ; Hart, Simpson & Assoc.(h) , Gibson & al .1994 (g) and B.J.Keighery, 13/3/96 (k)
 Also included are species collected and identified by B. Bischoff during 1996/1997 (b), A. Weston (w),
 Bunbury Naturalists' Club (n), Kathy Meney, 5/3/99 (M)

Ocean Dve W,Maidens

MAID

Ocean Dve E

ODE

Usher

USH

5-Mile Brook.- Hay Park

5MB

College Gve

COL

Manea Park, Eedle Ck.

MAN

Air Port, N and S of

AIRP

N.-Boy. Rd. -Preston R.

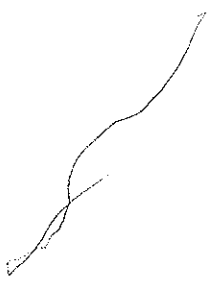
PRR

| | | | | | | | | | |
|----------------------|--|----|----|---|--|----|-----|-----|-----|
| 2 | <i>Synaphea petiolaris</i> | | | | | | | b | b |
| 3 | <i>Synaphea spinulosa</i> | hk | kb | b | | b | a | | |
| 4 | <i>Xylomelum occidentale</i> | | | b | | bk | bak | | |
| .Ranunculaceae (119) | | | | | | | | | |
| 5 | <i>Clematis microphylla</i> | hb | b | | | | | | |
| 6 | <i>Clematis pubescens</i> | | b | | | b | | | |
| 7 | <i>Ranunculus colonorum</i> | | b | | | | | | |
| | * <i>Ranunculus muricatus</i> | | | | | | kb | | |
| .Restionaceae (39) | | | | | | | | | |
| 8 | <i>Anarthria laevis</i> | | | | | k | | | |
| 9 | <i>Anarthria prolifera</i> | | | | | | b | b | |
| 400 | <i>Chaetanthus aristatus (Leptoc.)</i> | | | | | b | | b | b |
| 1 | <i>Desmoclades flexuosus</i> | | | | | wk | | | M |
| 2 | <i>Hypolaena exsulca</i> | | | b | | | b | akb | b |
| 3 | <i>Hypolaena pubescens (ex Loxocarya?)</i> | | | | | | | | M |
| 4 | <i>Leptocarpus coangustatus</i> | | | | | | | a | |
| 5 | <i>Leptocarpus tenax</i> | | | | | | | b | |
| 6 | <i>Lepyrodia glauca</i> | | | | | | | k | |
| 7 | <i>Loxocarya cinerea</i> | | | | | | | a | |
| 8 | <i>Loxocarya fasciculata</i> | | | b | | | b | kab | b |
| | <i>Loxocarya flexuosa</i> | h | | b | | k | k | kab | b |
| | <i>Loxocarya pubescens</i> | | | | | kb | | k | b |
| 9 | <i>Lyginia barbata</i> | | | b | | w | b | kb | b |
| 450 | <i>Meeboldina decipiens</i> | | | | | | | b | M b |
| 1 | <i>Meeboldina kraussii</i> | | | | | | | M b | |
| 2 | <i>Meeboldina roycei</i> | | | | | b | | b | M b |
| 3 | <i>Sporodanthus strictus MS</i> | | | | | k | | | |

Southern Bunbury Remnant Bushland -Consolidated vascular plant Species List including
 B. Koch, 1990 (a) ; Hart, Simpson & Assoc.(h) , Gibson & al .1994 (g) and B.J.Keighery, 13/3/96 (k)
 Also included are species collected and identified by B. Bischoff during 1996/1997 (b), A. Weston (w),
 Bunbury Naturalists' Club (n), Kathy Meney, 5/3/99 (M)

Ocean Dve W,Maidens MAID
 Ocean Dve E ODE
 Usher USH
 5-Mile Brook.- Hay Park 5MB
 College Gve COL
 Manea Park, Eedle Ck. MAN
 Air Port, N and S of AIRP
 N.-Boy. Rd. -Preston R. PRR

| | | | | | | | |
|-------------------------------|------|-----|----|----|----|-----|---|
| . *Dischisma sp. | k | | | | | | |
| . 7 Gratiola peruviana | | | | | a | | |
| . *Parentucellia viscosa | k | | kb | | kb | b | |
| . Selaginellaceae (3) | | | | | | | |
| . 8 Selaginella gracillima | | | k | | k | b | |
| Solanaceae (315) | | | | | | | |
| . 9 Anthocercis littorea | hb | | | | | | |
| . *Solanum nigrum | | | w | | a | | |
| . Stackhousiaceae (202) | | | | | | | |
| . 470 Stackhousia huegelii | | | b | | ?b | ka | |
| . 1 Stackhousia monogyna | | | | | | g | b |
| . 2 Tripterococcus brunonis | | | | | b | ab | |
| . Sterculiaceae (223) | | | | | | | |
| . 3 Lasiopetalum membranaceum | kh b | k b | | b | | | |
| . 4 Thomasia cognata | hk | b | | | | b | |
| . 5 Thomasia pauciflora | | k | | | | | |
| . Stylidiaceae (343) | | | | | | | |
| . 6 Levenhookia stipitata | | | | | | bg | b |
| . 7 Stylidium brunonianum | | | | kn | | kab | b |
| . 8 Stylidium calcaratum | k | | b | | | kba | b |
| . 9 Stylidium canaliculatum | | | | n | | | |
| . 480 Stylidium carnosum | | | | | | a | |



VEGETATION, FLORA AND SIGNIFICANT FLORA
IN
THE PROPOSED TARGET GOLF DEVELOPMENT SITE
THE NATURAL BUSHLAND
HAY PARK RESERVE
CITY OF BUNBURY

Prepared for

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June - July 1996

SUMMARY

This report presents the results of June 1996 vegetation survey and rare flora search of a proposed location for a target golf course about 5 km south of the Bunbury city centre. The proposed location is the southeastern half of the Hay Park natural bushland, which borders Bussell Highway and Washington Avenue. The results are presented in the context of both the Hay Park bushland and the Bunbury region.

Three distinctive vegetation types and three subtypes are described and mapped for the proposed location. These types are *Eucalyptus calophylla* (marri) open forest, *Melaleuca raphiophylla* (swamp paperbark) - *Eucalyptus rudis* (flooded gum) forest and *Banksia littoralis* (swamp banksia) woodland and open woodland. There are three subtypes of *Banksia littoralis* (swamp banksia) woodland and open woodland: *B. littoralis* - *M. preissiana* woodland and open woodland, *B. littoralis* - *E. rudis* - *M. preissiana* woodland and *B. littoralis* open woodland.

The *Eucalyptus calophylla* (marri) open forest, *Melaleuca raphiophylla* (swamp paperbark) - *Eucalyptus rudis* (flooded gum) forest constitute a belt of vegetation along Bussell Highway. The *Banksia littoralis* (swamp banksia) woodland and open woodland and its subtypes cover the rest of the proposed location for the golf course.

The Hay Park type of *Banksia littoralis* (swamp banksia) woodland and open woodland and its subtypes appear to be unusual and may not occur elsewhere in the Bunbury region.

All of the vegetation is in good condition, with perennial grasses and other weeds being prominent and a problem only near roads.

Over 200 species of vascular plants are recorded as occurring in the Hay Park bushland; they are listed in Appendix 1. One of these species is regarded as significant, the Priority 4 species *Acacia flagelliformis*. It was found in two places in the proposed location.

There may be other populations of this significant species, and of other significant taxa, in the area which were not found because they are not yet in flower, or even in leaf.

No Declared Rare Flora was found.

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APPENDIX 1

Vascular Plant Flora of the Hay Park Bushland, Bunbury

APPENDIX 2

Declared Rare Flora, Priority Taxa and other Significant Species:
Background, Definitions and Discussion

1.0 INTRODUCTION

1.1 LOCATION

Hay Park is a large, city sports, recreation and bushland park between 4 km and 5 km south-southeast of the Bunbury city centre. The Hay Park bushland referred to in this report is the area of natural vegetation in the southeast corner of the park (Figure 1). It borders a small road about 250 m south of Robertson Drive on the north, Bussell Highway on the east, Washington Avenue on the south and Rotary Avenue, Bunbury Community Recreation Centre, the aquatic centre and a car park on the west.

The proposed location for a proposed target golf course is on a 21 ha site in the southeast part of the bushland (Figure 2). This 21 ha site is referred to in this report as the Survey Area. The Survey Area appears to cover between one-third and one-half of the bushland.

1.2 OBJECTIVES AND SCOPE OF WORK

The objectives and scope of work of the project described in this report are set out in a letter faxed by Target Golf Investments on 29 May 1996. The general objectives are to describe and define the biological, in this case mainly botanical, values of the Survey Area.

The specific objectives of the botanical survey are to:

- o collect and identify the vascular plant species in the Survey Area;
- o search for any rare, endangered or otherwise significant flora species;
- o review the conservation status of the plant species recorded on the basis of the Department of Conservation and Land Management data base for rare and endangered species;
- o identify any weed species which are known or expected to occur in the Survey Area;
- o define and map the vegetation of the Survey Area;
- o review the local and regional significance of the flora and vegetation, and
- o evaluate the ecological significance of the Survey Area.

This report presents the results of the vegetation survey and rare flora search and other information about the vegetation and flora of the Survey Area, in the context of both the Hay Park bushland and the Bunbury region. It also provides brief descriptions of the climate and physical environment of the Survey Area.

1.3 CLIMATE

The climate of the Bunbury area is temperate mediterranean, with warm, dry summers and mild, wet winters. Bunbury's long-term average annual rainfall is 855 mm, with approximately 90% falling in the period between April and October. Monthly temperatures range from a mean minimum of 8^o C, in July, to a mean maximum of 28^o C, in January.

1.4 PHYSICAL ENVIRONMENT

1.4.1 Geology

The 1981 edition of the Geological Survey of Western Australia 1:50,000 scale Bunbury - Burekup Urban Geology map sheet (2031-III - 2031-II) shows the geology of the Survey Area as Holocene alluvium (Qha), with Holocene swamp deposits (Qhw) west of the Survey Area and, possibly, in its western part.

The Qha unit lies between Holocene and Pleistocene dunes and Pleistocene limestone, sand and clay formations, is broadest in Bunbury and tapers rapidly towards Gelorup and Collie River. It continues northwards as a narrow strip adjacent to the east side of Leschenault Inlet. Most of the natural vegetation of the unit has been cleared (Keighery and Bischoff pers. comms. 1996; Smith 1974: map).

The Qhw unit underlies numerous, mostly small swamps between Bunbury, Boyanup and Gynudup Brook. A large proportion of these swamps has also been cleared of native vegetation, especially in the understorey.

1.4.2 Wetlands

The wetlands of the Survey Area and the rest of the Swan Coastal Plain are being classified, mapped and evaluated for conservation significance by the Water and Rivers Commission. Wetlands of the Bunbury area have already been classified and mapped but have yet to be evaluated. The detailed 1:200,000 map of southern Swan Coastal Plains by Del Marco and Hill (1995) shows the Survey Area as seasonally waterlogged palusplain flat wetland with seasonally waterlogged dampland basin wetland west of it. Map identification numbers given to these two wetlands by the Water and Rivers Commission (in press: Maps 2031 III NE and 2031 III SE) are '7' for the palusplain and '6' for the dampland.

Depressions and parts of the north-south drain in the southeast corner of the bushland and the depression or drain below the northern edge of Washington Avenue are probably the only seasonally inundated wetlands in the Survey Area.

2.0 METHODS

The survey was undertaken in the following series of overlapping and inter-related stages:

- o preparation for field work, including the gathering and collation of available information and examination of aerial photography and maps;
- o field work to determine types and distribution of vegetation units and presence of plant species, especially any of the rare and priority species listed in Table 1 and other significant flora;
- o follow-up work, including refining the description and classification of vegetation in the Survey Area, vegetation mapping and identification of plant specimens collected during field work, and
- o comparison and integration of previously available information with the results of the field work.

Arthur Weston undertook a rare flora search and vegetation survey of the Hay Park bushland on Thursday, 20 June and Sunday, 23 June 1996, with vegetation mapping checks on 8, 18 and 20 July. He concentrated on the Survey Area during the survey.

During the rare flora search Declared Rare Flora (DRF) and Priority (P) Flora (and other significant flora) plants and likely habitats for them were searched for. The principal species searched for are those listed in Table 1, but the survey also focussed on other rare, priority and otherwise significant taxa not previously recorded in the vicinity.

Vegetation and significant flora were photographed and a comprehensive flora list was compiled during the survey, with voucher specimens collected for plants which were not readily identifiable to species, subspecies or variety in the field.

Soon after the field work, the preliminary identification and drying of collected and pressed plant specimens was completed. When subsequent freeze-fumigation of the specimens in the Western Australian Herbarium (WAH) is completed, confirmations will be made of identifications to species and, where appropriate and possible, to subspecies or variety.

Specimens are identified by comparing them with named specimens in WAH collections, by checking them against keys and descriptions in floras and taxonomic works and by consultation with specialist taxonomists studying relevant groups.

3.0 VEGETATION AND FLORA

3.1 REGIONAL VEGETATION

The native vegetation of the broader Bunbury area is shown on maps by Smith (1974), Heddle, Loneragan and Havel (1980) and Beard (1980). These three maps, being relatively small scale vegetation maps do not adequately reflect the diversity and complexity of the vegetation of the region in which the Survey Area lies, or of the Survey Area itself.

Two 1:25,000 scale Bunbury topographic maps (Department of Lands and Surveys - Royal Australian Survey Corps 1986 Bunbury 2031-III NW & NE and SE map sheets) show the distribution of native vegetation and its density and the location of swamps. They also show that a large proportion of the region has been cleared and no longer supports unaltered native vegetation.

Beard (1980) has mapped the native vegetation potential (i.e. what native vegetation would be there if it had not been cleared) of the region including the Survey Area at a scale of 1:1,000,000. Beard's very small scale map shows the native vegetation potential of the Survey Area and the region east of it as being a mosaic of *Banksia attenuata* - *B. menziesii* low woodland (b1,2Li), jarrah-marri woodland (e2,3Mi) and *Melaleuca* (teatrees and paperbarks) low woodland (mLi).

The 1:250,000 scale map of vegetation complexes by Heddle, Loneragan and Havel (1980) shows the native vegetation potential of the bushland as being in the Yoongarillup Complex (56), with Karrakatta Complex - Central and South (49) west of it. The bushland's paperbark and swamp vegetation does not, however, fit within the descriptions of either complex's vegetation type. Both complexes are described by the authors as being predominantly woodlands and open forests of tuart, marri and jarrah, with large numbers of peppermint in the understorey of Complex 56 and fewer peppermint and tuart trees and more banksias and vegetation diversity in Complex 49.

Smith (1974) has mapped the native vegetation of the region which includes the Survey Area at a scale of 1:250,000. The map is based on 1966 aerial photography and traverses driven

and walked in 1973 and 1974. It shows the native vegetation as it existed at the time of mapping, areas that had been cleared and what trees were probably dominant in the cleared areas prior to clearing. Smith's map shows the native vegetation of the property as being:

- o banksia low open forest and, on the west side of it,
- o low open woodland, probably of species of *Melaleuca* (paperbarks).

The banksia low open forest is the only one shown by Smith in the broader Bunbury area, ie. within 15 km of the city centre, and the low open woodland is one of several low open woodlands. Both the forest and the woodlands are more diverse than the map suggests.

The banksia low open forest on Smith's map appears to occur as a relatively short, narrow band from Washington Avenue to a few hundred metres north of Robertson Drive, but much of it has been cleared since the 1966 aerial photography and the 1974 mapping.

3.2 PRIOR VEGETATION AND FLORA SURVEYS OF THE HAY PARK BUSHLAND

Vegetation of parts of the Hay Park bushland were surveyed in 1992 by R. L. Smith and Hazelden (Bischoff pers. comm. 1996) and Gray (1992), in 1994 by the Bunbury Naturalists Club (Fisher pers. comm. 1996) and in 1995 by a Department of Environmental Protection (DEP) floristic communities survey team.

Smith described the vegetation of 42 ha of the bushland surveyed by him and Hazelden for Southern Brown Bandicoots and their habitat in March 1992. About two months prior to the survey a wildfire burnt about ninety percent of the area between Washington Avenue and the water pipeline track which runs between the Bussell Highway tourist information bay and Rotary Avenue. Parts of the otherwise unburnt vegetation north of the track were burnt in 1994-95 and 1995-96. Little disturbance, other than from the burn, and few weeds were noted, except for introduced grasses along boundaries.

Smith recognised two distinct types of vegetation in the burnt area:

- o a 1.5 - 2 m high closed heath of *Melaleuca hamulosa* [*M. viminea* ?], *M. thymoides*, *Kunzea recurva*, *Acacia saligna* and *Jacksonia* sp. in the western strip of the bushland, and
- o an open woodland of *Eucalyptus rudis*, *Melaleuca rhapsiophylla*, *M. preissiana*, *Banksia littoralis* and *Nuytsia floribunda* trees, with *Kunzea recurva*, *Melaleuca thymoides* and *Acacia saligna* in the understorey, which covered the eastern three-quarters of the area.

The eastern two-thirds or more of the area surveyed by Smith, the open woodland, is in the Survey Area.

Gray's 1992 report on a 10 ha site in the central western part of the bushland lists 34 species and describes three distinct types of vegetation. The list and descriptions are based upon field work undertaken after the early 1992 fire, presumably during late spring. Gray's 34 plant species are listed in Appendix 1 of this report.

The three vegetation communities Gray described are:

- o a Melaleuca Tree Community dominated by two paperbarks (*Melaleuca raphiophylla* and *M. cuticularis* [*M. preissiana* ?]) in association with *Eucalyptus gomphocephala* (tuart) and *E. rudis* and with *Banksia attenuata* [*B. littoralis* ?] and *B. menziesii* [*B. grandis* ?] being prevalent;
- o a Melaleuca Shrub Community characterised by *Melaleuca thymoides*, *M. lateritia* and *Acacia saligna*, and
- o a Melaleuca Shrub Community characterised by *Melaleuca acerosa*, low shrubs and *Lepidosperma gladiatum*.

Gray observed that parts of his two shrub communities were heavily infested with weeds.

Whether or not the eastern part of Gray's 1992 survey area overlaps the 1996 Survey Area is unclear. However, his Melaleuca Tree Community does occur in the western part of the Survey Area.

The Bunbury Naturalists Club conducted seven walks in the Hay Park bushland between July 1994 and March 1995 during which they noted plants they saw, particularly ones in flower (Fisher pers. comm. 1996). The locations and routes of the walks were not specified. The species the naturalists identified and the flowering periods they noted are listed in Appendix 1.

The Department of Environmental Protection (DEP) 1994 - 1996 System 6 Update unpublished site records: site-based flora list for Hay Park has been generated from five representative wetland sites (Hay 1 - Hay 5) visited on 14 October 1995 by B. J. Keighery, other botanists and volunteers. During the site visit, Keighery's teams marked out five permanent 100 m² quadrats, from within which they sampled all species of vascular plants. The DEP list has been compiled from identifications of these samples, and a description of wetland floristic community types will be based upon them. The species on the DEP list are listed in Appendix 1. Two of the DEP quadrats, Hay-3 and Hay-4, are in the Survey Area.

3.3 VEGETATION OF THE BUSHLAND AND SURVEY AREA

There are six distinctive types of vegetation, plus sub-types, in the Hay Park bushland, of which three types are represented in the Survey Area. The vegetation types are listed in Table 2 and illustrated in Plates 1 and 2. The distribution of these types and sub-types in the bushland is shown in Figure 3, a vegetation map of the bushland.

The vegetation types are described in Sections 3.3.1, and the map is described in Section 3.3.2.

3.3.1 Descriptions of Vegetation Types

() M *Eucalyptus calophylla* Open Forest

The central northern belt of vegetation in the bushland is *Eucalyptus calophylla* (marri) Open Forest, which is on higher, drier ground than the rest of the bushland. Most of this vegetation type in the bushland is in the Survey Area. Although a distinct vegetation type, it merges with neighbouring vegetation types, particularly the *Melaleuca raphiophylla* - *Eucalyptus rudis* Forest on the south side of it.

The dominant trees are marri (*E. calophylla*); they have a canopy cover of over 50% and many are over 10 m tall. *Banksia attenuata* and, to a lesser extent, *B. grandis* and *Xylomelum occidentale* are understorey trees to 6 m tall. Shrubs which are common in the understorey, at least locally, include *Acacia pulchella*, *Melaleuca thymoides*, *Jacksonia ? sternbergiana*, *Gompholobium tomentosum*, *Adenanthos meisneri*, *Hibbertia hypericoides*, *Bossiaea eriocarpa* and *Stirlingia latifolia*. *Platytheca galioides*, *Phlebocarya ciliata* and *Dasyogon bromeliifolius* are also common, at least locally, in the understorey.

The unusual curly-leafed smokebush *Conospermum capitatum* is uncommon in the understorey.

Eucalyptus calophylla (marri) Open Forest is widespread and common outside the Hay Park bushland.

RF *Melaleuca raphiophylla* - *Eucalyptus rudis* Forest

There is a very small stand of *Melaleuca raphiophylla* - *Eucalyptus rudis* Forest in the extreme southeast corner of the bushland, in the Survey Area, and probably nowhere else in the bushland. It merges with the *Eucalyptus calophylla* Open Forest north of it.

The dominant trees are swamp paperbarks (*Melaleuca raphiophylla*) and flooded gums (*E. rudis*), at least some of which are more than 10 m tall and have a canopy cover of over 70%. *Banksia littoralis* and the shorter, shrubbier wattle *Acacia saligna* are occasional shorter trees. *Melaleuca preissiana* and *Nuytsia floribunda* are associated trees on higher ground. The understorey is characterised by swards of the sedges *Baumea juncea* and *Lepidosperma longitudinale* and the herbaceous plant *Samolus junceus* and tussocks of the sedge *Gahnia trifida*. Couch grass (*Cynodon dactylon*) has invaded the eastern and southern margins of the forest.

There are a few shallow pools in the forest, in depressions which are probably artificial. There were no aquatic or semi-aquatic plants in the pools at the time of the survey.

Though not common or extensive, stands of *Melaleuca raphiophylla* - *Eucalyptus rudis* Forest similar to the one in the Survey Area can be found on the Swan Coastal Plain west of Bunbury and as far north as Perth.

BB *Banksia littoralis* Woodland and Open Woodland

The principal vegetation of the Hay Park bushland, and of the Survey Area, is a type of woodland of swamp banksia (*Banksia littoralis*) which varies in density, associated dominants and understorey. This vegetation type, and its subtypes, covers one-half to two-thirds of the bushland and two-thirds to three-quarters of the Survey Area. The type and subtypes appear to be unusual and may not occur elsewhere in the Bunbury region.

The dominant swamp banksia trees range in height to over 10 m and either occur as the only dominant or share dominance with *Melaleuca preissiana* or *Eucalyptus rudis*. The shrub understorey is quite variable, but typically comprises, separately and in combination, *Acacia saligna*, *Kunzea ? recurva*, *Daviesia physodes*, *Daviesia preissii*, *Pericalymma ellipticum*, *Hakea varia*, *Xanthorrhoea brunonis*, *Nemcia capitata* and *Acacia pulchella*. Sedges and herbaceous plants in the woodland include *Gahnia trifida*, *Lepidosperma longitudinale*, *Lyginia barbata*, *Loxocarya pubescens*, *Conostylis aculeata* and *Patersonia ? occidentalis*.

The Priority 4 wattle, *Acacia flagelliformis*, is occasional in the *Banksia littoralis* woodland and open woodland.

Three subtypes of the woodland have sufficiently distinct appearances on the aerial photograph to be mapped as separate units. These are:

B1 ○ *B. littoralis* - *M. preissiana* Woodland and Open Woodland

The central swamp banksia woodland runs north from Washington Avenue and has *Banksia littoralis* and *Melaleuca preissiana* as codominants, both to over 10 m tall.

Between one-half and two-thirds of the bushland's *B. littoralis* - *M. preissiana* woodland and open woodland are in the Survey Area.

B2 ○ *B. littoralis* - *E. rudis* - *M. preissiana* Woodland

A woodland of swamp banksia, *Melaleuca preissiana* and taller, more conspicuous *Eucalyptus rudis* trees lies south of the central *B. littoralis* - *M. preissiana* woodland and open woodland in the western part of the bushland. Swamp paperbark and *Kunzea ? recurva* are common in the understorey.

Most of the *Banksia littoralis* - *Eucalyptus rudis* - *M. preissiana* woodland is west of the Survey Area.

Gray's *Melaleuca* Tree Community probably corresponds in part to this association.

○ *B. littoralis* Open Woodland

The relatively small area of *B. littoralis* open woodland is east of the central *B. littoralis* - *M. preissiana* woodland and is distinguished from it by having exposed soil and a shrub understorey which is sparse and patchy. The exposed soil is probably seasonally waterlogged, maybe even inundated, and may support a number of ephemeral species.

All or almost all of the Hay Park bushland *B. littoralis* open woodland is in the Survey Area.

7/4 **Melaleuca raphiophylla - M. viminea - M. teretifolia Shrublands**

The western part of the Hay Park bushland bordering Rotary Avenue between Washington Avenue and the recreation centre is covered by scrub which is very dense in the southwestern corner, open to medium dense north of the pipeline track and relatively low and open south of the track except in the southwestern corner. This vegetation type covers between 20% and 25% of the bushland. Very little, if any, of the vegetation type is in the Survey Area.

The following two subtypes are distinguishable in the field and on the aerial photograph.

7/1 **Melaleuca raphiophylla - M. viminea Heath and Dense Heath**

The dominants of the teatree heath are generally two broomlike shrubs, *Melaleuca raphiophylla* and *M. viminea*, which stand 1.5 m to 2.5 m high, but in some places they share dominance with other species of *Melaleuca*, *Acacia saligna* and *Hakea varia*.

Gray's Melaleuca Shrub Community probably corresponds to this association.

7/2 **Melaleuca teretifolia - Gahnia trifida Low Heath**

The succulent samphire *Sarcocornia quinqueflora*, the sedges *Gahnia trifida* and *Baumea juncea*, the herbaceous plant *Samolus juncea* and the shrub *Melaleuca teretifolia* characterise the relatively low, open area. There are also patches of *Acacia saligna*.

Gray's Melaleuca Shrub Community probably corresponds to this association.

5/1 **Melaleuca raphiophylla Low Open Forest**

Most of the vegetation in the northern part of the Hay Park bushland west of a belt next to Bussell Highway is dominated by swamp paperbark (*Melaleuca raphiophylla*) trees mainly under 10 m tall. In its eastern part, it forms a low woodland and, in its western part, a low open forest. The understorey varies from dense sedges to open shrubland. The sedges are mainly *Baumea juncea* and *Lepidosperma longitudinale*, while the shrubs include *Pericalymma ellipticum*, *Hakea varia*, *Acacia pulchella*, *Acacia saligna*, species of *Daviesia* and *Astartea* sp. Part of the vegetation was burnt within the previous few months.

This vegetation type is probably relatively common and widespread outside of Hay Park.

***Melaleuca preissiana* Scrub and Low Open Forest**

In the northeast corner of the Hay Park bushland there is a low open forest or low woodland of dense groves or thickets of small *Melaleuca preissiana* trees around 3 m tall and patches of *Baumea juncea* with occasional plants of *Xanthorrhoea brunonis* and *Acacia ? stenoptera* and invasion by couch grass (?*Cynodon dactylon*) and other weedy grasses.

3.3.2 Vegetation and Site Map

Figure 3, a map of the Hay Park bushland vegetation, shows the distribution of vegetation types and the location of sites at which vegetation and rare flora were photographed. The boundaries shown as dashed lines are either broad and poorly defined, or they are provisional, pending checking in the field.

The vegetation types, their dominant and principal native species, their map symbols, their photograph site numbers and their plate numbers are listed in Table 2.

3.4 FLORA OF THE SURVEY AREA

The species of vascular plants recorded as occurring in the Hay Park bushland are listed in Appendix 1. The list provides names of species listed alphabetically by family, indications of which species are rare or are self-perpetuating weeds, sources of the names listed and other information. It makes no attempt to distinguish between species which do and do not occur in the Survey Area, but it is possible that some listed species occur only in the Survey Area.

The list amalgamates the lists of Gray (1992), the Bunbury Naturalists Club, the DEP and the records of the survey for this report.

The list contains a majority of the species in the bushland and perhaps all of the dominant and characteristic ones. Most of the major weeds, but fewer of the minor ones, are listed. Comprehensive surveys best conducted during the spring and early summer would expand the list, especially of weeds, significantly.

A few of the names listed are believed to be based upon misidentifications of plants by those who recorded them. Paramount among these suspected misidentifications are three of the principal trees in Gray's *Melaleuca* Tree Community: *Melaleuca cuticularis*, *Banksia menziesii* and *B. attenuata* (suggested alternative identifications are *M. preissiana*, *B. grandis*

and *B. littoralis*, respectively). If the original identifications are correct, the first two species would be important new records for the bushland. The *Banksia menziesii* would be a new record for the Bunbury area as it has not been recorded as occurring south of Harvey (Marchant *et al.* 1987; George 1984; Taylor and Hopper 1988), Beard (1980) notwithstanding. The third species, *Banksia attenuata*, occurs elsewhere in the bushland.

4.0 RARE FLORA

4.1 INTRODUCTION

The majority of the species of plants searched for during the rare flora search of the Project Area are on two sets of lists covering the entire state. The first set is revised and printed annually in the Government Gazette and includes currently gazetted rare flora (DRF) taxa known to be extant (Part 1) and taxa presumed to be extinct (Part 2). The second set is an approximately annual printout from the Department of Conservation and Land Management (CALM) computer data base of Declared Rare Flora and Priority taxa, which includes the taxa on the first set. The two sets of lists current at the time of the field survey are:

- o Wildlife Conservation (Rare Flora) Notice 1995 (Government Gazette, WA of 4 July 1995) Parts 1 (extant) and 2 (presumed extinct), and
- o Declared Rare and Priority Flora List (current: 14/09/95)

Appendix 2 provides more detailed information about Priority species and other significant species, including definitions of terms and categories and the background of the classification system now used.

Marchant *et al.* (1987), Hopper *et al.* (1990) and Hoffman and Brown (1995) supply descriptions and illustrations of most DRF species recorded in the broad general area. These publications also provide flowering times, habitat descriptions and distributions of the DRF species and information about Priority taxa.

Table 1, a list of twelve Priority (P1-P4) and five Declared Rare Flora (DRF) taxa of the Bunbury area to be searched for in the Survey Area, was compiled from several sources. The principal source was a June 1996 rare flora data base printout based on the place names 'Bunbury', 'Eaton' and 'Waterloo', a subset of the state-wide list obtained from the

Department of Conservation and Land Management (CALM). A. Brown, G. Keighery and other botanists supplied other names. The table lists taxa having currently known distributions and habitats which might include the Survey Area, along with information about their conservation status, flowering times, habitats and distributions. This information was compiled from CALM lists of rare flora, Marchant *et al.* (1987), Lowrie (1987), Hoffman and Brown (1995), previous field work, herbarium surveys and personal communications from other botanists.

4.2 RARE FLORA OF THE SURVEY AREA

The Priority 4 species *Acacia flagelliformis* (Plate 3) was the only significant species listed in Table 1 found during the June 1996 searches of the Survey Area. It was at the beginning of its flowering season. The locations of the two populations of this wattle found in the Survey Area are shown in Figure 3. One population is on the north side of the prominent track running southwest from the water pipeline track about 20 m from the water pipeline track. The other population is marked with red flagging tape at a point about 110 m 310° compass bearing from the centre of the tourist information bay shelter. The first population has about ten plants, the second about three.

Other populations of the species were also found in the Hay Park bushland west and north of the Survey Area, east of Bussell Highway across from the tourist information bay and in the paperbark bushland in the northeastern corner of the Robertson Drive - Bussell Highway junction. The plants in these populations were mostly in early stages of flowering.

There may be other populations of this significant species, and of other significant taxa, in the area which were not found because they are not yet in flower, or even in leaf.

The pools and drains in the southeastern part of the Survey Area and along Washington Avenue were searched for significant aquatics and semiaquatics, particularly *Aponogeton hexatepalus*, *Rhodanthe pyrethum*, *Villarsia submersa* and *Diuris drummondii*, but none were found. Although it is still too early in the season and water levels are too low to be certain, it does not appear that these are likely habitats for any of these species. There are no other even remotely likely habitats for the *Aponogeton* and the *Diuris* in the Survey Area.

Another species, *Daviesia physodes*, was a Priority 2 species in 1972, when the Gray (1992) survey was undertaken, but it is no longer considered to be a significant species and has been deleted from Priority listing. It is a principal understorey species in the Hay Park bushland.

5.0 LIMITATIONS OF THE SURVEYS

5.1 THE VEGETATION SURVEY

Most vegetation units, unlike most species of plants and animals, are not discrete units, nor are the parts of a vegetation unit necessarily interdependent, as are parts of a plant or animal. (Some ecologists, such as Whittaker (1970) regard plant communities as little more than chance meetings of species with overlapping ranges of tolerance to aspects of their habitat). Consequently, defining, classifying and mapping vegetation units is much more arbitrary and less consistent than defining species or compiling lists of species.

The accuracy of mapping the occurrence and distribution of vegetation units and dominant species from interpretation of aerial photographs depends upon the unit and species having an appearance on the photograph that is consistently distinguishable from all other units. For the most part, the appearances of the Hay Park bushland units on the aerial photograph used for the survey were not distinct enough to draw boundaries between them with a high degree of confidence.

5.2 THE FLORA SURVEY

It cannot be expected that all of the species occurring in the area could be recorded during a single visit such as the one undertaken for this survey, particularly as the survey was undertaken at a time when a very small proportion of the plants in the Survey Area were in flower. Some significant species may have been missed during the survey because they flower later, such as the *Anthotium*. However, even a survey undertaken at a time when flowering is at its peak would still be bound to miss a number of species which flower or appear at other times.

The location and intensity of flowering varies greatly from year to year, as in the case of the *Caladenia*, and some plants flower or appear only rarely. For instance, one of the DRF species listed in Table 1, *Diuris purdiei*, can be found only during the first flowering season, and possibly the second, after a hot summer fire.

Consequently, a comprehensive survey should include several field visits, and searches for particular species, such as particular significant species, should be undertaken when those species are most likely to be at their peak of flowering. Table 1 gives flowering times for 17 Priority and DRF species with habitats or distributions or both which are likely to include the Survey Area.

Accuracy and consistency of identification of plant specimens depends upon the herbarium specimens being correctly named. Two lists of exactly the same species compiled several years apart would be expected to differ not only because some specimens have been re-identified, from incorrect names to correct names, but also because some species have been renamed, divided or amalgamated. Examples of all of these cases can be found among the species listed in Appendix 1.

Appendix 2 has allusions to these and other limitations of flora surveys.

6.0 DISCUSSION

There has been no comprehensive detailed survey of vegetation and flora in the Bunbury region, but information available suggests that two of the vegetation types in the Hay Park bushland do not occur elsewhere in the Bunbury region, or possibly even elsewhere in the southwest. This information includes the Bunbury-Burekup urban geology map and the Smith (1974) vegetation map.

The two vegetation types described in Section 3.3.1 which appear to be restricted to the Hay Park bushland are *Banksia littoralis* woodland and open woodland and *Melaleuca raphiophylla* - *M. viminea* - *M. teretifolia* shrublands, especially subtype *Melaleuca teretifolia* - *Gahnia trifida* low heath. *Banksia littoralis* woodland is in the Survey Area; *Melaleuca* shrublands probably are not.

7.0 ACKNOWLEDGEMENTS

A number of people have contributed information and suggestions during the course of the survey and others have helped with the identification of specimens collected during the field work. Among these are Ken Atkins, Bernard Bischoff, John Dell, Shirley Fisher, Bronwen Keighery, Brendan Lepschi and Peter Spriggins. Andrew Brown and Greg Keighery suggested additions to Table 1.

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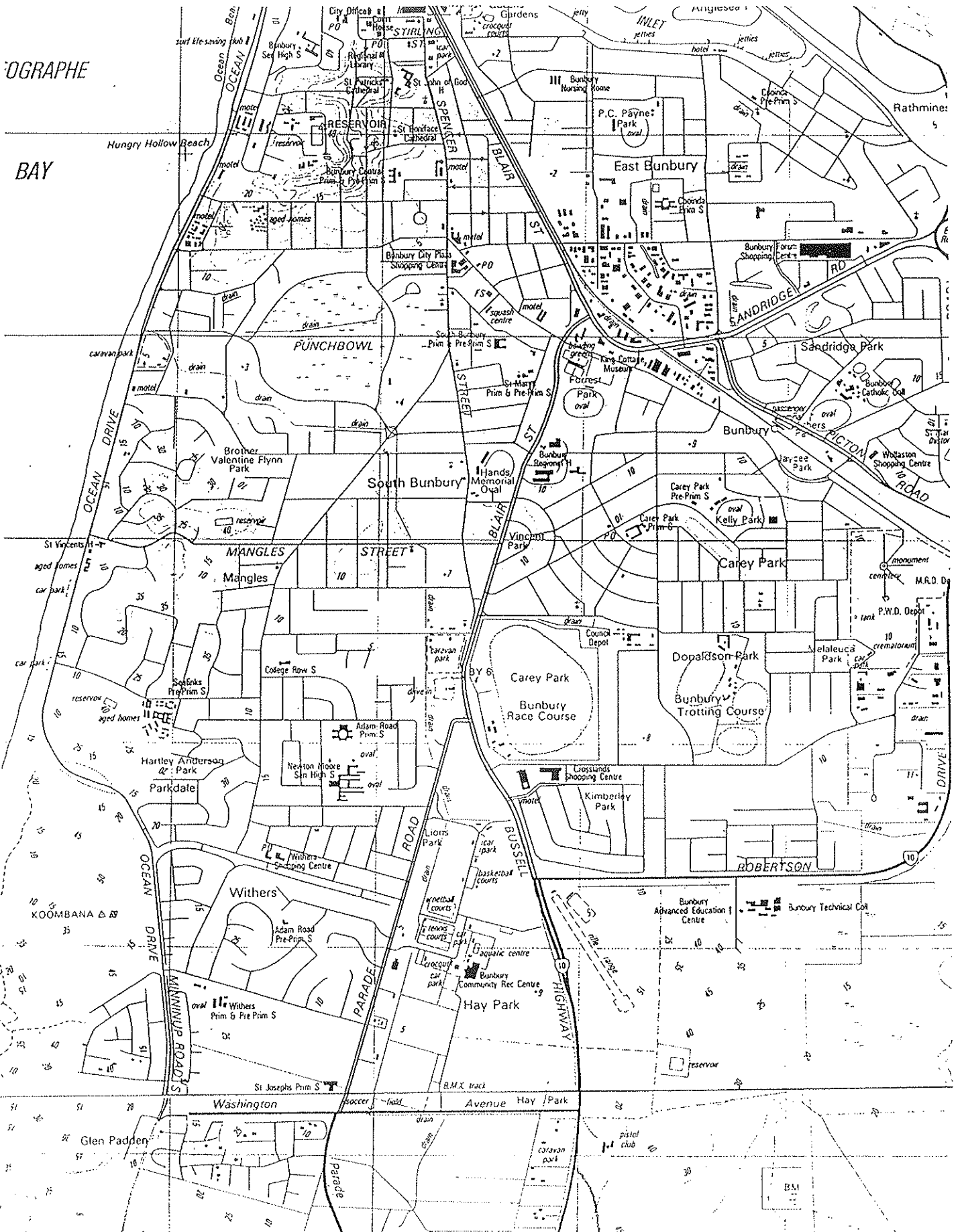
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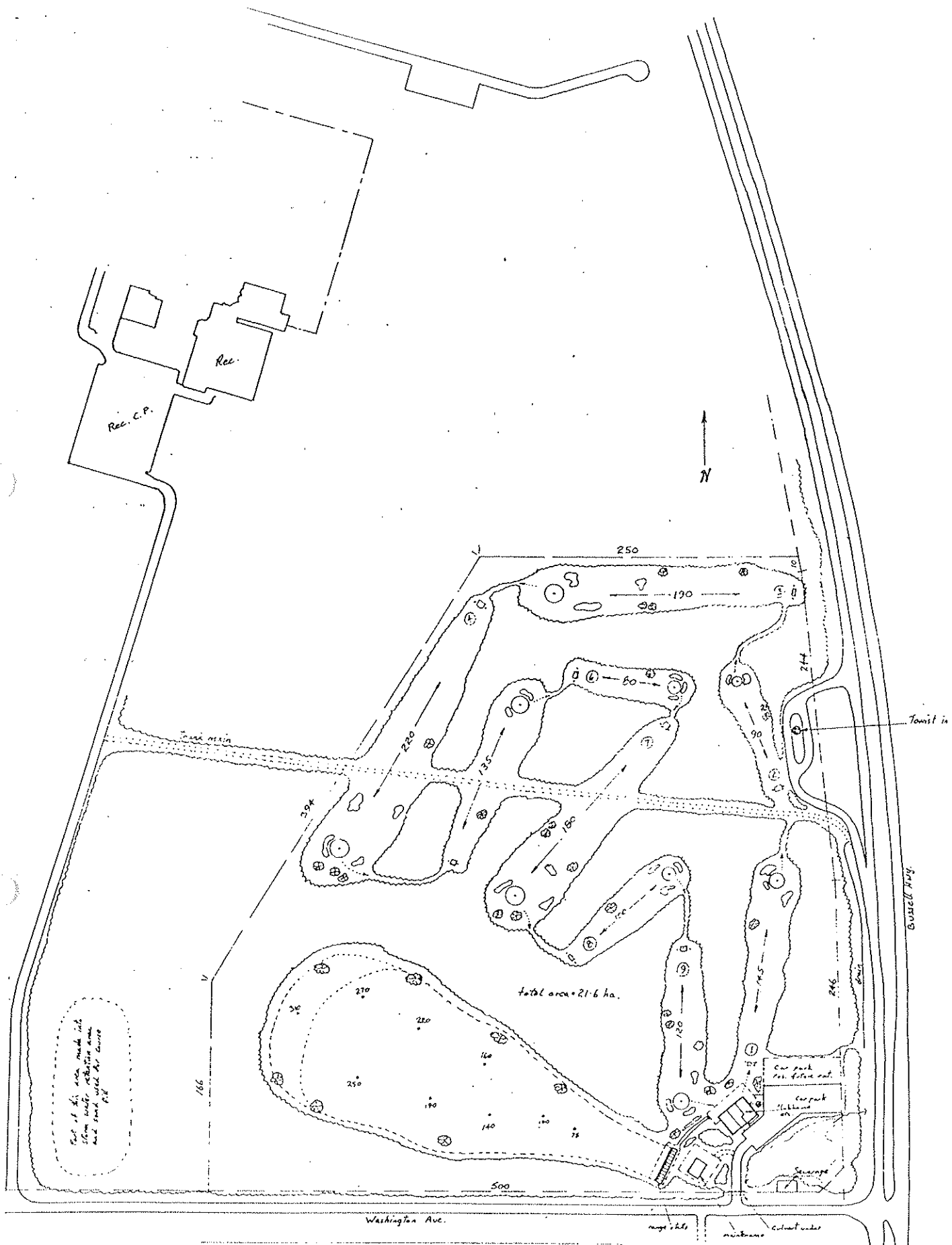
TOGRAPHE

BAY



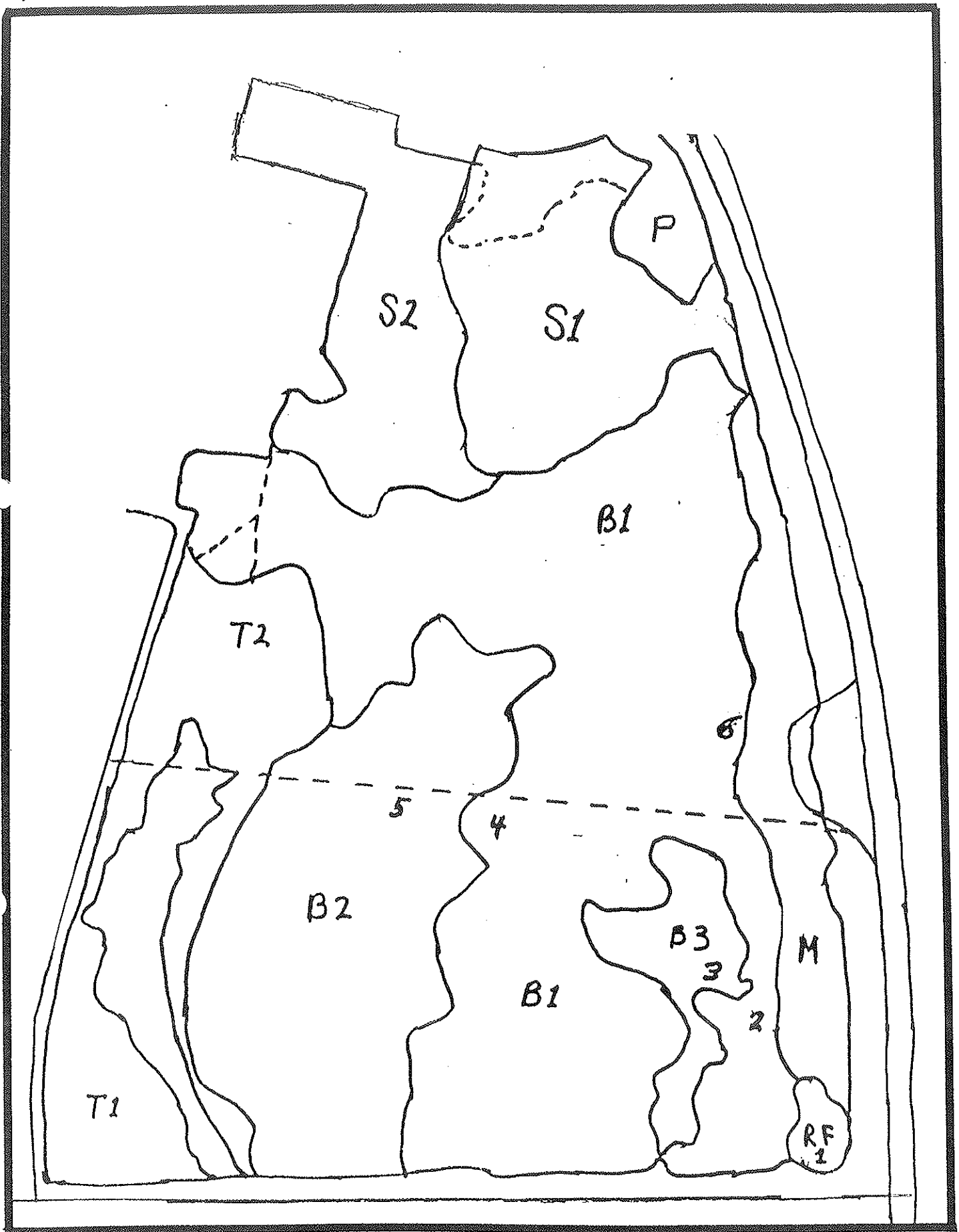
Location of Hay Park Bushland

Figure 1



Survey Area, in Hay Park Bushland

Figure 2



Vegetation and Survey Area Sites in Hay Park Bushland

Figure 3

Table 1

Declared Rare Flora and Priority Taxa (1995 lists)
with Distributions and Habitats which may include the Hay Park Bushland

| Species and Family | Status, Distribution and Localities | Habitat | Flowering Times |
|--|--|---|-----------------|
| <i>Acacia flagelliformis</i> MIMOSACEAE | P4: Harvey-Busselton, Donnybrook, Eaton | Mainly edges of seasonal shallow swamps | Jun-Sep |
| <i>Acacia semitrullata</i> MIMOSACEAE | P3: Yarloop-Yallingup, Donnybrook | Sand, usually above and near edge of swamp | May-Aug |
| <i>Anthotium junciforme</i> GOODENIACEAE | P4: Upper Swan-Yallingup, Scott River plain | Winter wet flats and depressions, often with <i>Pericalymma ellipticum</i> | Dec-Mar |
| <i>Aponogeton hexatepalus</i> APONOGETONACEAE | DRF: Kenwick-Darradup- Augusta, Bunbury | Shallow winter pools on clayey soils | Aug-Sep |
| <i>Caladenia huegelii</i> ORCHIDACEAE | DRF: Gnangara-Yallingup, Scott River | Sandy soils in banksia and eucalypt woodlands, often with <i>Allocasuarina fraseriana</i> and usually low on the landscape | Aug-Oct |
| <i>Diuris drummondii</i> ORCHIDACEAE | DRF: Pinjarra-Bridgetown, Rocky Gully | Low-lying depressions and swamps which contain surface water well into summer | Nov-Jan |
| <i>Diuris micrantha</i> ms ORCHIDACEAE | DRF: Medina-Manjimup, Bunbury | Small shallow winter-wet swamps amongst short sedgeland, predominantly of <i>Lepidosperma ? longitudinale</i> , on sandy- clay soils | Aug-Sep |
| <i>Diuris purdiei</i> ORCHIDACEAE | DRF: Perth area-Waroona? | Seasonal semi-swamp on sand-over-clay soils, usually in <i>Regelia</i> and <i>Pericalymma</i> shrublands; flowers in habitats which were burnt the previous dry season | Aug-Oct |
| <i>Drosera marchantii</i> subsp. <i>marchantii</i> DROSERACEAE | P4: Dwellingup-Donnybrook, Waterloo, Bunbury | Sand-laterite and leaf litter compost in well-shaded locations | Aug-Oct |
| <i>Franklandia triaristata</i> PROTEACEAE | P4: Capel, Tutunup, Argyle | Grey sand, usually low-lying | Aug-Oct |
| <i>Lasiopetalum</i> <i>membranaceum</i> STERCULIACEAE | P2: Yalgorup-Capel | Sand, mainly in tuart woodland | Oct-Nov |
| <i>Pultenaea skinneri</i> PAPILIONACEAE | P4: Collie-Kemerton-Boyanup, Bunbury, Manca Park area | Between forests and swamps | Jul-Jan |
| <i>Rhodanthe pyrethrum</i> ASTERACEAE | P3: Bullsbrook-Eaton, Kenwick | Wet clay and shallow spring pools | Sep-Oct |
| <i>Schoenus capillifolius</i> CYPERACEAE | P2: Upper Swan-Waterloo | Winter-wet depressions with sandy soil over clay | Sep-Nov |
| <i>Stylidium longitubum</i> STYLIDIACEAE | P3: Upper Swan-Busselton | Seasonal wetlands | Oct-Dec |
| <i>Verticordia attenuata</i> MYRTACEAE | P3: Eaton-Tutunup, Bunbury, Ruabon | Mainly near edges of seasonal wetlands | Dec-Jan |
| <i>Villarsia submersa</i> MENYANTHACEAE | P4: Kenwick-Denmark, Forrestdale, Boyanup | Shallow winter pools in clay depressions | Aug-Oct |

This table was compiled from information in Hoffman and Brown (1995), Hopper *et al.* (1990), Lowrie (1987), Marchant *et al.* (1987) and CALM's 14.9.95 list of DRF and Priority taxa and on herbarium specimen labels in the W. A. Herbarium. Additional information came from CALM botanists and field work by Arthur Weston.

Table 2

Vegetation and Sites in the Hay Park Bushland
 The vegetation types, their dominant native species, their map symbols, their plate numbers and the site numbers in the Survey Area at which the plates were photographed.

| Map Symbol | Vegetation Type | Numbers: Site | Photograph | Plate |
|------------|--|------------------|----------------|-------|
| M | <i>Eucalyptus calophylla</i> (marri) Open Forest | | | |
| RF | <i>Melaleuca rhapsiophylla</i> (swamp paperbark) - <i>Eucalyptus rudis</i> (flooded gum) Forest | 1 | ASW.96.VI.1-3 | 1A |
| B | <i>Banksia littoralis</i> (swamp banksia) Woodland and Open Woodland | | | |
| B1 | o <i>B. littoralis</i> - <i>M. preissiana</i> Woodland and Open Woodland | 2 | ASW.96.VI.1-5 | 1B |
| in B1 | Priority 4 species <i>Acacia flagelliformis</i> , and branches of former P2 species <i>Daviesia physodes</i> | 4 | ASW.96.VI.1-11 | 3 |
| in B1/M | Priority 4 species <i>Acacia flagelliformis</i> , in overlap (ecotone) between vegetation M and B1 | 6 | ---- | ---- |
| B2 | o <i>B. littoralis</i> - <i>E. rudis</i> - <i>M. preissiana</i> Woodland | 5 | ASW.96.VI.1-15 | 2B |
| B3 | o <i>B. littoralis</i> Open Woodland | 3 | ASW.96.VI.1-7 | 2A |
| T | <i>Melaleuca rhapsiophylla</i> - <i>M. viminea</i> (teatree) - <i>M. teretifolia</i> (teatree) Shrublands | | | |
| T1 | o <i>Melaleuca rhapsiophylla</i> - <i>M. viminea</i> Heath and Dense Heath | | | |
| T2 | o <i>Melaleuca teretifolia</i> - <i>Gahnia trifida</i> Low Heath | | | |
| S | <i>Melaleuca rhapsiophylla</i> (swamp paperbark) Low Open Forest | | | |
| S1 | o eastern, open form | | | |
| S2 | o western, denser form | | | |
| P | <i>Melaleuca preissiana</i> (moonah paperbark) Scrub and Low Open Forest | | | |

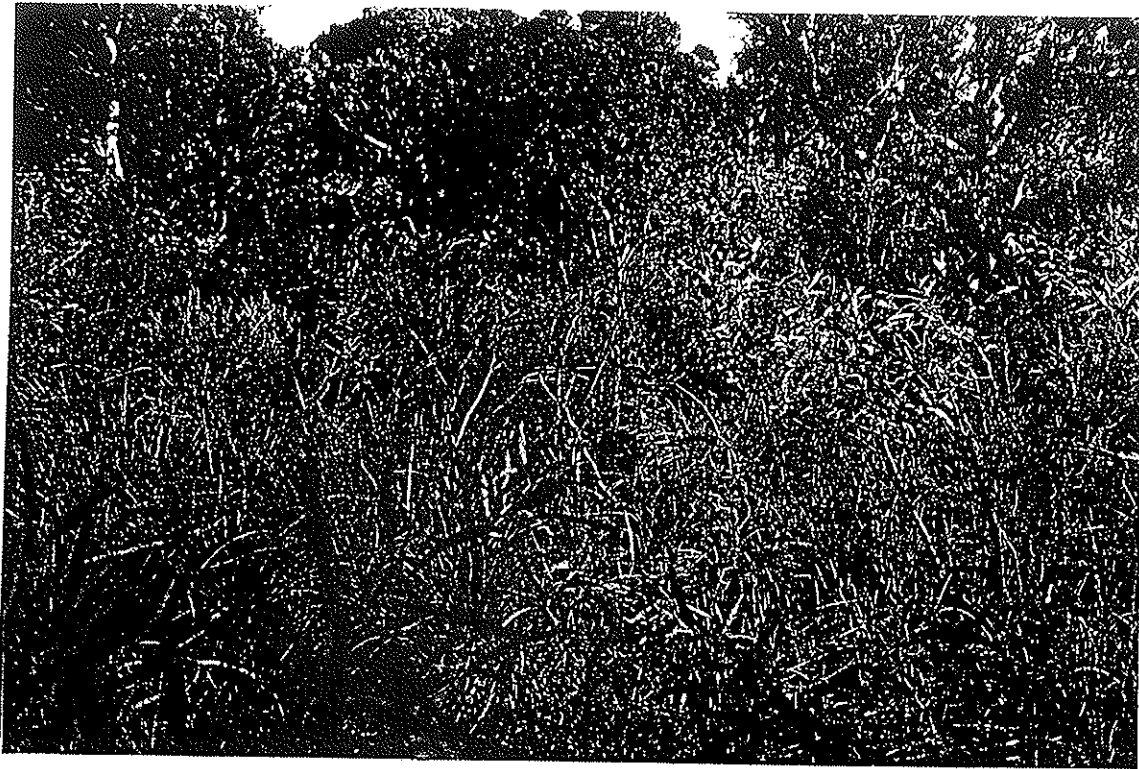


A. *Melaleuca raphiophylla* - *Eucalyptus rudis* Forest, Site 1. (ASW 96.VI.1-3)



B. *Banksia littoralis* - *Melaleuca preissiana* Woodland, Site 2. (ASW.96.VI.1-5)

Survey Area Vegetation Types, Hay Park Natural Bushland, Bunbury.

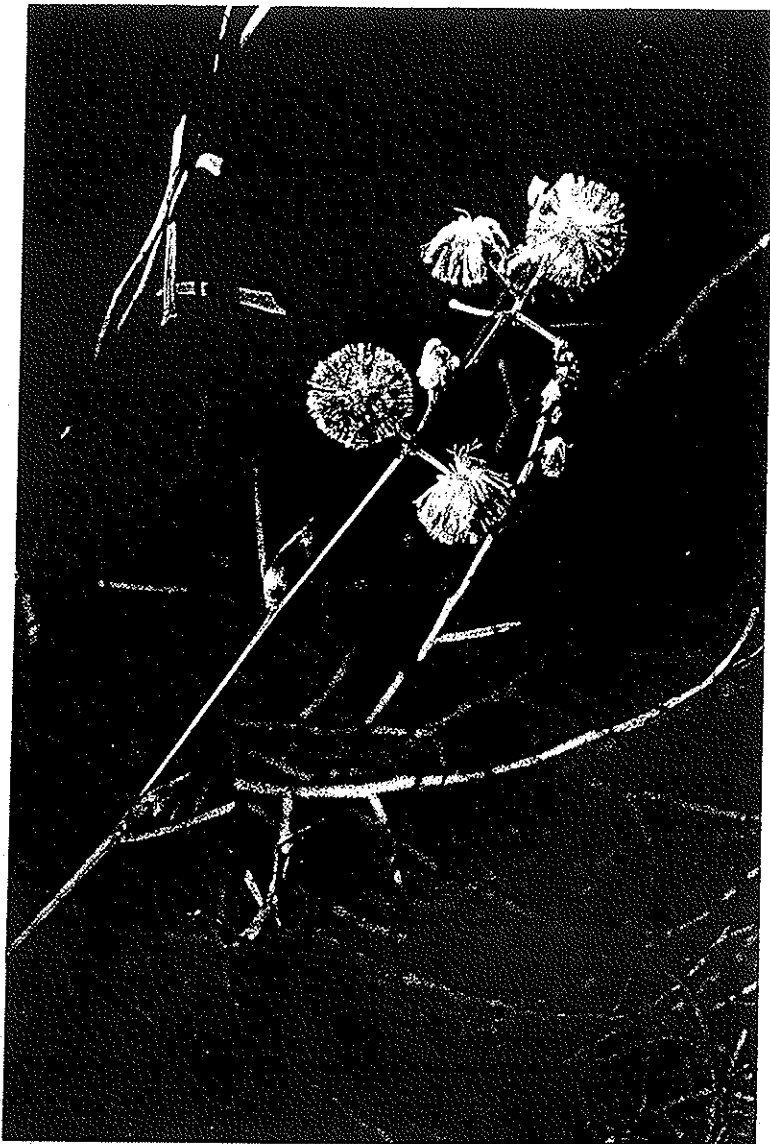


A. *Banksia littoralis* Open Woodland, Site 3. (ASW 96.VI.1-7)



B. *Banksia littoralis* - *Eucalyptus rudis* - *Melaleuca preissiana* Woodland, Site 5.
(ASW 96.VI.1-5)

Survey Area Vegetation Types, Hay Park Natural Bushland, Bunbury.



Acacia flagelliformis. A Priority 4 species with yellow flowers and few, stemlike leaves; inconspicuous when not in flower; in B1 woodland at Site 4 (and Site 6); with branches of *Daviesia physodes*, formerly a Priority 2 species. (ASW 95.VI.1-11)

APPENDIX 1

Vascular Plant Flora of the Hay Park Bushland, Bunbury

By Arthur S. Weston
June 1996

Vascular Plant Flora of the Hay Park Bushland, Bunbury

By Arthur S. Weston
June 1996

A large proportion of the vascular plant flora of the Hay Park bushland south-southwest of the Robertson Drive - Bussell Highway T-junction (an area circumscribed by Bussell Highway, Washington Avenue, Rotary Avenue, the Aquatic Sports Centre and adjacent sports grounds) is listed below.

The list provides names of species listed alphabetically by family (Column 1), indications of which species are rare (P4: Priority 4) or self-perpetuating weeds (W) (Column 2), sources of the names in Column 1 (Columns 3, 4, 5 and 6) and other information.

Most of the scientific names in Column 1 are those used in the **Flora of the Perth Region** (Marchant *et al.* 1987), although a few (eg. Desmocladius flexuosa) are more recent. Those scientific names set off by inverted commas ('Chthonocephalus pygmaeus', Melaleuca cuticularis', Caladenia huegelii', Adenanthos cygnorum', Banksia menziesii' and Petrophile teretifolia') are regarded as being based upon incorrect identifications. A question mark (?) before a name indicates uncertainty about the identification(s) upon which the listing is based.

The list has been compiled from the following four sources, none of which is comprehensive or covers the entire bushland or all seasons :

Column 3 **ASW** (Arthur S. Weston)
notes and identification of collections made by Arthur Weston on 20 and 23 June 1996 from selected sites and transects judged to be representative of the range of vegetation occurring in the bushland;

Column 4 **DEP** (Department of Environmental Protection)
'Department of Environmental Protection 1994 - 1996 System 6 Update unpublished site records: site-based flora list for Hay Park generated from five representative wetland sites (Hay 1 - Hay 5) visited on 14 October 1995' by B. J. Keighery, other botanists and volunteers;

Column 5 **BNC** (Bunbury Naturalists Club)
lists of species recorded, mainly as in flower, during walks in the Hay Park bushland by Shirley Fisher and other members of the Bunbury Naturalists Club in 1994 (19 July, 17 August, 17 September, October and November) and 1995 (January and March) - flowering periods based upon these lists are given in this column; and

Column 6 **MAG** (Mark A. Gray)
the 34 species listed in Appendix 2 of the November 1992 report on **Vegetation Associations and Rare and Endangered Flora for a Low Impact Golf Development: Bunbury Recreation Reserve** by Mark Gray - the area covered is a 10 ha site (384 m x 264 m) bordering the Aquatic Centre and Rotary Drive in the central western part of the bushland.

The number '1' appearing in Column 5 (**BNC**) and Column 6 (**MAG**) indicates skepticism about the identification, with the correct name being suggested in the last column (Column 7).

A question mark (?) in any column indicates uncertainty about the identification upon which the listing is based.

Column 7 gives suggested correct names for Number 1 listings (as referred to in the previous paragraph), synonyms used by DEP, BNC and MAG (each synonym is preceded by the symbol =), common names listed without scientific names by BNC, flower colours given on the BNC lists and other information about determinations (identifications).

In addition to the species listed below, Melaleuca hamulosa has been reported to occur in the bushland (R. Smith pers comm. March 1992). This record was, however, probably based upon a misidentification of Melaleuca viminea (see Holliday 1989, p. 240).

| <u>Family and Species</u> | <u>Status</u> | <u>ASW</u> | <u>DEP</u> | <u>BNC</u> | <u>M A G</u> | <u>Notes & Names</u> |
|---------------------------------------|---------------|------------|------------|------------|--------------|--------------------------|
| ANTHERICACEAE | | | | | | |
| Agrostocrinum scabrum | | x | x | Sep-Nov | x | |
| Cacalia micrantha | | | x | | | |
| Chamaescilla corymbosa | | x | x | | | |
| Sowerbaea laxiflora | | | x | | | |
| Thysanotus arenarius | | | | | x | |
| T. multiflorus | | | x | Oct | | |
| T. patersonii | | | | Sep-Oct | | |
| T. thyrsoideus | | | x | | | |
| APIACEAE | | | | | | |
| Hydrocotyle alata | | | x | | | |
| H. diantha | | | x | | | |
| Xanthosia huegelii | | | x | | | |
| ASCLEPIADACEAE | | | | | | |
| Gomphocarpus fruticosus | W | x | | | | |
| ? ASPHODELACEAE | | | | | | |
| ? Trachyandra divaricata | W | x | | | | |
| ASTERACEAE | | | | | | |
| Arctotheca calendula | W | | | Oct-Nov | | |
| 'Chthonocephalus pygmaeus' | | | | I, Oct | | Siloxerus sp.? |
| Cotula coronopifolia | | | x | | | |
| C. cotuloides | | | x | Oct-Nov | | |
| C. turbinata | W | x | x | | | |
| Hypochaeris glabra | W | x | x | | x | |
| Podolepis gracilis 'swamp' (GJK13126) | | | | | | |
| Pogonolepis stricta | | | x | | | |
| Senecio sp. | ? | | | Nov | | Groundsel |
| Siloxerus filifolius | | | x | | | |
| S. humifusus | | | x | | | |
| S. sp. | | | x | | | |
| Sonchus oleraceus | W | x | x | | | |
| Milk Thistle | | | | Nov | | |
| CENTROLEPIDACEAE | | | | | | |
| Aphelia cyperoides | | | x | | | |
| Centrolepis aristata | | ? | x | | | |
| C. polygyna | | | x | | | |
| CHENOPODIACEAE | | | | | | |
| Atriplex prostrata | W | x | x | | | |
| Chenopodium album | W | | | Nov | | Fat Hen |
| Sarcocornia quinqueflora | | x | x | | | |
| COLCHICACEAE | | | | | | |
| Burchardia congesta | | | x | | | |
| B. multiflora | | | x | Sep-Oct | | |
| B. umbellata | | | | Aug-Oct | | |
| CYPERACEAE | | | | | | |
| Baumea juncea | | x | x | | | |
| Cyanthochaeta avenacea | | x | x | | | |
| Gahnia trifida | | x | x | x | | |
| Isolepis marginata | | | x | | | |
| I. oldfieldiana | | | x | | | |
| I. sp. | | | x | | | |
| Lepidosperma gladiatum | | ? | | | x | |
| L. angustatum | | x | x | | | |
| L. longitudinale | | x | x | | | |
| Schoenus elegans | | | x | | | |
| S. rigens | | | x | | | |
| S. sculptus | | | x | | | |
| S. sp. | | | x | | | |

| <u>Family and Species</u> | <u>Status</u> | <u>ASW</u> | <u>DEP</u> | <u>BNC</u> | <u>MAG</u> | <u>Notes & Names</u> |
|--------------------------------|---------------|------------|------------|------------|------------|--------------------------|
| DASYPOGONACEAE | | | | | | |
| Dasypogon bromeliifolius | | x | | Nov | | |
| Lomandra caespitosa | | | x | | | |
| L. nigricans | | x | | Jul | | |
| L. preissii | | | | Sep | | |
| L. sonderi | | | x | | | |
| DILLENACEAE | | | | | | |
| Hibbertia amplexicaulis | | | x | Oct-Nov | | |
| H. hypericoides | | x | | Jul-Nov | | |
| H. rhadinopoda | | | x | | | |
| H. ? stellaris | | | | Oct-Nov | | fls orange |
| H. vaginata | | x | x | Aug-Nov | | |
| DROSERACEAE | | | | | | |
| Drosera ? bulbigena | | | | Sep | | |
| D. gigantea | | | x | Oct | | |
| D. glanduligera | | | | Oct | | |
| D. menziesii ssp. penicillaris | | ? | x | | | |
| D. pallida | | | | | x | |
| D. sp. | | x | | | | |
| EPACRIDACEAE | | | | | | |
| Conostephium sp. | | | | Jan | | |
| Leucopogon propinquus | | | | | x | |
| EUPHORBIACEAE | | | | | | |
| Phyllanthus calycinus | | x | | Aug | | |
| FUMARIACEAE | | | | | | |
| Fumaria ? capreolata | | | | Aug-Nov | | F. ? officinale |
| GENTIANACEAE | | | | | | |
| Centaureum ? erythraea | W | | x | | | |
| Cicenda filiformis | W | | x | | | |
| GOODENIACEAE | | | | | | |
| Dampiera linearis | | | x | | | |
| D. trigona | | | | Sep-Nov | | |
| Goodenia filiformis | | | | Nov | | |
| Scaevola calliptera | | | | Oct-Nov | | not S. striata |
| S. ? lanceolata | | | | Nov | | = S. longifolia |
| S. sp. | | | x | | | |
| ? S. sp. | | | | Jan | | fls sm, pale blue |
| Velleia trinervis | | | x | | | |
| HAEMODORACEAE | | | | | | |
| Anigozanthus manglesii | | | | Sep | | |
| A. viridis | | | | Oct-Nov | x | |
| Conostylis aculeata | | x | x | Aug-Nov | | = C. preissii |
| C. candicans | | | | | x | |
| Phlebocarya ciliata | | x | | | | |
| HYDATELLACEAE | | | | | | |
| Trithuria bibracteata | | | x | | | |
| IRIDACEAE | | | | | | |
| Gladiolus sp. | W | x | | | | |
| Orthrosanthus laxus | | | | | x | |
| Patersonia occidentalis | | x | x | Sep-Oct | | |
| P. umbrosa | | | | Oct | | fls yellow |
| Romulea rosea | W | | x | Oct-Nov | | |
| R. rosea var. australis | W | | x | | | |
| JUNCACEAE | | | | | | |
| Juncus bufonius | W | | x | | | |
| J. capitatus | W | x | x | | | |

| <u>Family and Species</u> | <u>Status</u> | <u>ASW</u> | <u>DEP</u> | <u>BNC</u> | <u>MAG</u> | <u>Notes & Names</u> |
|---------------------------|---------------|------------|------------|--------------|------------|------------------------------|
| C. varians | | | | Sep | | |
| C. sp. | | | x | | | |
| Cyanicula sp. | | | | Sep | | |
| Diuris sp. | | | | Sep | | |
| Elythranthera emarginata | | | | Oct | | |
| Monadenia bracteata | W | | x | | | |
| Prasophyllum parvifolium | | x | x | Aug-Sep | | |
| Pterostylis vittata | | x | | Jul-Sep | | |
| Thelymitra crinita | | | x | | | |
| T. sp. | | | x | | | |
| T. spp. | | | | Oct | | |
| OROBANCHACEAE | | | | | | |
| Orobanche minor | W | | | x | | |
| OXALIDACEAE | | | | | | |
| Oxalis pes-caprae | W | x | | Jul-Aug | | fls yellow |
| O. glabra | W | x | | Jul-Aug | | fls pink |
| PAPILIONACEAE | | | | | | |
| Bossiaea eriocarpa | | x | | Sep | | |
| Daviscia incrassata | | | | Aug-Nov, Mar | | incl. dets. as D. polyphylla |
| D. physodes | | x | x | | | |
| D. preissii | | x | x | | | |
| Eutaxia virgata | | | x | | | |
| Gompholobium tomentosum | | x | | Oct-Nov | | |
| Hovea sp. | | | | Aug-Sep | | |
| Jaksonia furcellata | | x | | Nov-Jan | | |
| J. sternbergiana | | ? | | ? | x | |
| Lupinus ? cosentinii | W | | | Sep-Nov | | fls blue |
| Kennedia prostrata | | x | | Aug-Oct | | |
| Nemcia capitata | | x | x | x | | |
| Trifolium dubium | W | | x | | | |
| Vicia ? sativa | W | | | Oct | | Vetch |
| PHILYDRACEAE | | | | | | |
| Philydrella pygmaea | | | x | Nov | | |
| PHORMIACEAE | | | | | | |
| Dianella revoluta | | ? | | | | |
| POACEAE | | | | | | |
| Aira caryophylla | W | | x | | | |
| Avena barbata | W | | | | x | |
| A. fatua | W | | | | x | |
| Briza maxima | W | | x | x | x | |
| B. minor | W | | x | | x | |
| Bromus madritensis | W | | | | x | |
| Cortaderia seloana | W | x | | | x | |
| Cynodon dactylon | W | x | | | x | |
| Ehrharta calycina | W | | | | x | |
| Hordeum marinum | W | | x | | | |
| Lolium rigidum | W | | x | | | |
| Parapholis incurva | W | | x | | | |
| Pennisetum clandestinum | W | x | | | | |
| Polypogon monspeliensis | W | | x | | | |
| P. tenellus | | | x | | | |
| Stipa compressa | | | x | | | |
| POLYGALACEAE | | | | | | |
| Comesperma virgatum | | x | x | | | |
| C. volubile | | | x | | | |
| PRIMULACEAE | | | | | | |
| Anagallis arvensis | W | | x | | | |
| Samolus junceus | | x | x | | | |

| Family and Species | STATUS | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | |
|---|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|-----------------|----------------|
| JUNCAGINACEAE | | | | | | | | | | | | | | | | |
| Triglochin centrocarpum | | | | X | | | | | | | | | | | | |
| T. mucronatum | | | | X | | | | | | | | | | | | |
| T. procerum | | | | X | | | | | | | | | | | | |
| T. trichophorum | | | | X | | | | | | | | | | | | |
| LAURACEAE | | | | | | | | | | | | | | | | |
| Cassytha glabella | | | X | X | | | | | | | | | | ?Jan | | |
| C. racemosa | | | X | X | | | | | | | | | | ?Jan | | |
| LENTIBULARIACEAE | | | | | | | | | | | | | | | | |
| Polypompholyx ? tenella | | | | | | | | | | | | | | Oct | | |
| LILIACEAE (see Anthericaceae, Asphodeliaceae, Colchicaceae, Dasypogonaceae, Phormiaceae, Xanthorrhoeaceae) | | | | | | | | | | | | | | | | |
| LOBELIACEAE | | | | | | | | | | | | | | | | |
| Isotoma hypocrateriformis | | | | | | | | | | | | | | Oct-Nov | | |
| Monopsis debilis | W | | | X | | | | | | | | | | | | |
| LORANTHACEAE | | | | | | | | | | | | | | | | |
| Nuytsia floribunda | | | X | | | | | | | | | | | Jan | | |
| LYCOPODIACEAE | | | | | | | | | | | | | | | | |
| Phylloglossum drummondii | | | | | | | | | X | | | | | | | |
| MENYANTHACEAE | | | | | | | | | | | | | | | | |
| Villarsia parnassifolia | | | | X | | | | | | | | | | Oct | | |
| MIMOSACEAE | | | | | | | | | | | | | | | | |
| Acacia alata | | | | X | | | | | | | | | | | | |
| A. ? extensa | | | | | | | | | | | | | | Aug | | |
| A. flagelliformis | P4 | X | | | | | | | | | | | | | | |
| A. longiflora subsp. sophorae | W | X | | | | | | | | | | | | | | |
| A. pulchella | | X | X | | | | | | | | | | | Aug-Oct | X | |
| A. pulchella var. pulchella | | X | X | | | | | | | | | | | | | |
| A. 'recurva' | | | | | | | | | | | | | | I | | |
| A. saligna | | X | X | | | | | | | | | | | Sep-Oct | X | |
| A. stenoptera | | ? | X | | | | | | | | | | | Mar | | |
| A. willdenowiana | | X | X | | | | | | | | | | | Aug | = A. diptera | |
| MYRTACEAE | | | | | | | | | | | | | | | | |
| Agonis flexuosa | | X | | | | | | | | | | | | X | | |
| Astartea sp. | | X | | | | | | | | | | | | X | | |
| Eucalyptus calophylla | | X | | | | | | | | | | | | Jan | | |
| E. gomphocephala | | | | | | | | | | | | | | | X | |
| E. marginata | | | | | | | | | | | | | | X | | |
| E. rudis | | X | | | | | | | | | | | | X | | |
| Hypocalymma angustifolium | | X | X | | | | | | | | | | | X | | |
| Kunzea micrantha | | ? | X | | | | | | | | | | | | | |
| K. recurva | | ? | X | | | | | | | | | | | Oct-Nov | var. praestans? | |
| Melaleuca acerosa | | | | | | | | | | | | | | | X | |
| M. ? acuminata | | ? | | | | | | | | | | | | | | |
| M. 'cuticularis' | | | | | | | | | | | | | | | I | M. preissiana? |
| M. incana | | X | X | | | | | | | | | | | | | |
| M. ? lateriflora | | ? | | | | | | | | | | | | | | |
| M. lateritia | | X | X | | | | | | | | | | | Nov | X | |
| M. preissiana | | X | X | | | | | | | | | | | Oct-Nov | | |
| M. raphiophylla | | X | X | | | | | | | | | | | X | X | |
| M. teretifolia | | X | X | | | | | | | | | | | Nov | | |
| M. thymoides | | X | | | | | | | | | | | | Sep-Nov | X | |
| M. viminea | | X | X | | | | | | | | | | | | | |
| Pericalymma ellipticum | | X | X | | | | | | | | | | | Oct-Nov | | |
| ORCHIDACEAE | | | | | | | | | | | | | | | | |
| Caladenia flava | | | | | | | | | | | | | | Sep-Oct | | |
| C. 'hugelii' | | | | | | | | | | | | | | | I | C. paludosa? |
| C. paludosa ms | | | | X | | | | | | | | | | ? Oct | | |

APPENDIX 2

DECLARED RARE FLORA, PRIORITY TAXA
AND OTHER SIGNIFICANT SPECIES:
BACKGROUND, DEFINITIONS AND DISCUSSION

By Arthur S. Weston, PhD (Botany)

| <u>Family and Species</u> | <u>Status</u> | <u>ASW</u> | <u>DEP</u> | <u>BNC</u> | <u>MAG</u> | <u>Notes & Names</u> |
|----------------------------|---------------|------------|------------|--------------|------------|--------------------------|
| PROTEACEAE | | | | | | |
| Adenanthos 'cygnorum' | | | | | 1 | A. meisneri? |
| A. meisneri | | x | x | | | |
| Banksia attenuata | | x | | x | x | |
| B. grandis | | x | | x | | |
| B. littoralis | | x | x | x | | |
| B. 'menziesii' | | | | | 1 | B. grandis? |
| Conospermum capitatum | | x | | | | |
| Hakea lissocarpha | | | | Aug-Sep | | |
| H. varia | | x | x | Sep | | |
| Petrophile 'teretifolia' | | | | 1, Oct-Nov | | ? |
| Stirlingia latifolia | | x | | Sep-Nov | | |
| Xylomelum occidentale | | x | | Jan | | |
| RESTIONACEAE | | | | | | |
| Anarthria laevis | | | x | | | |
| Dacrydium flexuosus | | x | x | | | = Loxocarya flexuosa |
| Hypolaena exsulca | | | | x | | |
| Leptocarpus ? coangustatus | | x | | | | |
| Loxocarya cinerea | | | | x | | |
| L. pubescens | | x | x | | | |
| Lyginia barbata | | x | x | | | |
| ? Restio amblyocoleus | | x | | | | |
| Sporadanthus strictus ms | | | x | | | |
| ? Sporadanthus sp. | | x | | | | |
| RUTACEAE | | | | | | |
| Boronia crenulata | | | | Oct | | = B. viminea |
| Boronia dichotoma | | | x | | | |
| Eriostemon spicatus | | | | Sep-Oct | | |
| SELAGINELLACEAE | | | | | | |
| Selaginella gracillima | | | x | | | |
| SOLANACEAE | | | | | | |
| Solanum nigrum | | x | | | x | |
| STACKHOUSIACEAE | | | | | | |
| Stackhousia sp. | | | | x | | |
| STYLIDIACEAE | | | | | | |
| Stylidium brunonianum | | | x | Nov | | |
| S. calcaratum | | | | Sep-Oct | | |
| S. ? canaliculatum | | | | Oct | | fls yellow |
| S. junceum | | | x | Sep-Oct | | |
| S. sp. | | | x | | | |
| THYMELEACEAE | | | | | | |
| Pimelea ferruginea | | | | Sep-Jan, Mar | | |
| P. imbricata var. piligera | | x | x | Aug-Nov | | = var. gracillima? |
| P. ? lanata | | x | | | | |
| TREMANDRACEAE | | | | | | |
| Platytheca galioides | | x | | Jul-Nov | | = P. verticillata |
| XANTHORRHOEACEAE | | | | | | |
| Xanthorrhoea brunonis | | x | x | ? | | |
| Xanthorrhoea preissii | | x | x | Nov-Jan | x | |
| ZAMIACEAE | | | | | | |
| Macrozamia riedlei | | x | | | | |

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**DECLARED RARE FLORA, PRIORITY TAXA
AND OTHER SIGNIFICANT SPECIES:
BACKGROUND, DEFINITIONS AND DISCUSSION**

Arthur S. Weston, PhD (Botany)

1.0 'SIGNIFICANT SPECIES' AND OTHER TAXA

The term 'significant species' as used in this report refers to species, infraspecific taxa and populations that are:

- o given Priority listings or are gazetted as Declared Rare Flora,
- o according to Department of Conservation and Land Management (CALM) botanists, likely to be given Priority listing or to be gazetted as DRF or are otherwise of special interest,
- o rare, geographically restricted or apparently rare or restricted because they are poorly collected or recorded,
- o at the limits of their ranges or in areas outside their normal ranges or habitats,
- o particularly susceptible or vulnerable to environmental changes, especially ones caused by humans, either directly or indirectly,
- o diminishing significantly in abundance or geographical range due to clearing and other environmental changes associated with agriculture, mining, recreation, urbanisation and provision of services,
- o poorly represented in secure conservation reserves, or
- o high quality or otherwise exceptional populations of the plants.

The term 'significant' is used in this report instead of 'vulnerable', 'threatened', 'depleted' or 'endangered' because these terms either are too limited in their scope or implications or, as Leigh, Boden and Briggs (1984) put it, "have become highly emotive through popular usage, making it difficult to develop objective criteria for use in ascribing species to various categories". Leigh, Boden and Briggs and Hopper *et al.* (1990) discuss appropriate terminology in more detail.

Some significant species are gazetted as rare or endangered taxa; most are not.

The following sections discuss significant taxa, particularly ones that are Conservation Coded, i.e. are gazetted as Declared Rare Flora (DRF, R) or are given the Priority numbers 1, 2, 3 and 4 by CALM.

2.0 PUBLISHED LISTS

Australia-wide treatments of rare, geographically restricted and endangered species by Specht, Roe and Boughton (1974), Hartley and Leigh (1979), Leigh, Briggs and Hartley (1981) and Briggs and Leigh (1988) also contain Western Australian lists, which are based upon publications or other information provided by botanists in the various states. They cover presumably rare or threatened plants and poorly known and poorly collected taxa. The Briggs and Leigh 1988 Australia-wide list is reproduced in Kennedy (1990).

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

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

Four reports dealing with rare, restricted and threatened species were published by the Department of Fisheries and Wildlife. One, by Rye (1982), lists geographically restricted southwestern plants, and another, by Rye, Hopper and Watson (1980), is concerned with the distribution and conservation status of commercially exploited native plants. The first two lists of gazetted rare Western Australian flora are presented, and the listed species are described and illustrated, in Rye and Hopper (1981) and Patrick and Hopper (1982). Rye (1982) lists 527 species of southern Western Australian flowering plants that are geographically restricted, and she includes most, if not all, of the species gazetted in 1982 as rare.

The Rye and Hopper (1981) and Patrick and Hopper (1982) publications were superseded by CALM's **Western Australia's Endangered Flora** (Hopper *et al.* 1990), which lists and discusses DRF and Priority species. The book also has illustrations and brief descriptions of all of the 1989 DRF species and some of the Priority species.

CALM has produced three publications in a continuing series of Western Australian Wildlife Management Programs dealing with DRF and Priority flora in need of special protection and plans for managing them. The three are for the Metro Area (Kelly *et al.* 1993), the Merredin District (Mollemans, Brown and Coates 1993) and the Northern Forest Region (Kelly *et al.* 1990). They provide information about the plants covered and their habitats, distributions and flowering times.

3.0 COMPLETENESS AND ACCURACY OF LISTS

The completeness and accuracy of most earlier lists of significant Western Australian species are limited in that the intensity, uniformity and seasonal coverage of collecting and systematic surveying have been insufficient to distinguish between genuinely rare (and restricted) taxa and taxa which only appear to be rare (or restricted) because they have been poorly collected. Systematic surveying and collecting by Western Australian Wildlife Research Centre (WAWRC) and Western Australian Herbarium (WAH) botanists, and others, are correcting this deficiency.

In some cases, significant species are found in areas where they were not previously known to occur. For instance, *Acacia benthamii*, a P2 species related to *Acacia cochlearis*, was recorded only from Kings Park and the Wanneroo area until 1994, when it was found northeast of Mandurah. *Synaphea pinnata* and *Stachystemon axillaris* are plant species originally gazetted as rare (Government Gazette, WA, of 14 November 1980) which have since been found to be more common or widespread or better conserved than previously believed and are no longer gazetted.

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

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

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

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

4.0 GAZETTED TAXA

In 1975, Western Australia's Fauna Conservation Act was retitled as the Wildlife Conservation Act, and in 1979 the Act was amended to provide protection for specified species of flora as well as of fauna. The first plant species to be declared by the Minister as protected rare flora under the Act were listed in the Government Gazette, WA, of 14 November 1980. Periodically, generally once a year, the Minister publishes notices in the Government Gazette, deleting and adding species to the list of protected flora. During the time a species, or other taxon, is gazetted as protected no-one is allowed to "gather, pluck, cut, pull up, destroy, dig up, remove or injure" a plant belonging to a wild population of that species without special written consent of the Minister (Rye and Hopper 1981; Hopper *et al.* 1990; Kelly *et al.* 1993). Fines may be imposed for breaching provisions of the Act.

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

The first list of gazetted flora comprises 100 named species, including a variety of one of the species. The current list of "Protected flora declared as rare flora", printed in the Government Gazette, WA, of 27 June 1995, has 311 taxa: 272 taxa known to be extant and 39 taxa presumed to be extinct. Although the majority of these taxa are named species, many are varieties and subspecies and many are not formally named. Some of the species first gazetted in 1980 are absent from the current list, generally because they have been found to be more abundant or wide-ranging than previously indicated by collections and records or because they appear to be well-protected in nature reserves and national parks.

In some cases a species is still on the list but under a name different to the one used previously. Two examples are the orchid *Drakaea elastica*, which was originally listed as *Drakaea jeanensis*, and the lily *Wurmbea calcicola*, which was previously listed as *Wurmbea* sp. Cape Naturaliste.

In general, species are gazetted or declared as rare flora (DRF, R) not only because they are rare or geographically restricted but also because their continued, long-term survival in the wild is believed to be threatened. Kelly *et al.* (1993) list criteria for adding taxa to the gazetted list and for deleting taxa from it.

Declared Rare Flora, also known as Gazetted rare species, Protected Flora and Endangered Flora (see Hopper *et al.* 1990; Kelly *et al.* 1993), are not the only Western Australian plants that are rare, geographically restricted, threatened or vulnerable. In fact, they probably constitute only a small proportion of such species. For example, Marchant and Keighery (1979) listed more than 2,000 species that were rare or poorly collected or were geographically restricted to a range of less than 160 kilometres, and the September 1995 state-wide list of Priority and Declared Rare Flora has more than 1700 taxa. A large proportion of the taxa on the 1995 list are not on the Marchant and Keighery list.

The current list (14 September 1995) concentrates on the southwestern part of Western Australia and particular groups of species, which have, in general, been studied in greater detail than others. For example, members of the families Proteaceae, Myrtaceae, Leguminosae and Orchidaceae account for more than half of the gazetted species on the current list. It is likely that in the southwest alone there are many more ungazetted rare and restricted species than gazetted ones.

The two lists of gazetted rare flora in Rye and Hopper (1981) and Patrick and Hopper (1982) comprise fewer than 150 species, and the 1990 list contains fewer than 250 species, probably only a small proportion of Western Australian plants that could be considered as rare. Another list, in Rye (1982), contains 527 species of southern Western Australian flowering plants that are geographically restricted and includes most, if not all, of the species gazetted at that time as rare. The Rye list is based principally upon investigations of Western Australian Herbarium (WAH) collections upon which the Marchant and Keighery (1979) list is based, taxonomic publications and rare plant records of the Western Australian Wildlife Research Centre (WAWRC).

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

5.0 PRIORITY TAXA

The WAWRC and WAH have continuing programs of research on plants of uncertain conservation status to gather sufficient information upon which to base decisions on whether or not to recommend them for gazettal as Declared Rare Flora. These plants are on lists of Priority Taxa.

CALM now has lists for the entire state, and for the regions and districts into which CALM has divided the state for management purposes, of four categories of Priority Flora and two categories of Declared Rare Flora. These are:

- o Priority One (P1) - taxa which are known from one or a few (generally <5) populations, which are under threat,
- o Priority Two (P2) - taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat,
- o Priority Three (P3) - taxa which are known from several populations, at least some of which are not believed to be under immediate threat,
- o Priority Four (P4) - taxa considered to have been adequately surveyed and, at least in Australia, to be rare but not currently threatened by any identifiable factors.
- o R - Declared Rare Flora - known Extant Taxa
- o X - Declared Rare Flora - Presumed Extinct Flora

Priority One, Two and Three species are under consideration for declaration as rare flora, pending the outcome of further survey work, which, in the case of P1 and P2 taxa, is urgently needed.

Priority Four taxa require monitoring every five to ten years.

These lists are modified and updated as relevant information and results of survey work become available. For instance, on the basis of new information about distribution and abundance some taxa are added to the lists and others are deleted from them. Many of the species deleted from the lists are, however, still significant. Other taxa may be moved from one Priority code to another.

6.0 CRITICALLY ENDANGERED TAXA

CALM is also now assigning Western Australian taxa of flora and fauna to IUCN categories, and Strategy 5.1 of CALM's Policy Statement No. 50 provides that a Ranking Panel of scientists be set up to allocate all declared threatened taxa with populations known to occur in Western Australia to the IUCN categories.

In 1995 the panel ranked 46 taxa of flora and fauna as 'Critically Endangered' and 78 taxa as 'Endangered'.

Recommendations by the panel and the panel's allocations of Western Australian taxa to IUCN categories are in the two recent unpublished and undated CALM documents **Report of the Scientific Ranking Panel for Western Australia's Threatened Flora and Fauna** and **Notes on Western Australian Plant and Animal Taxa Declared as "Critically Endangered"**.

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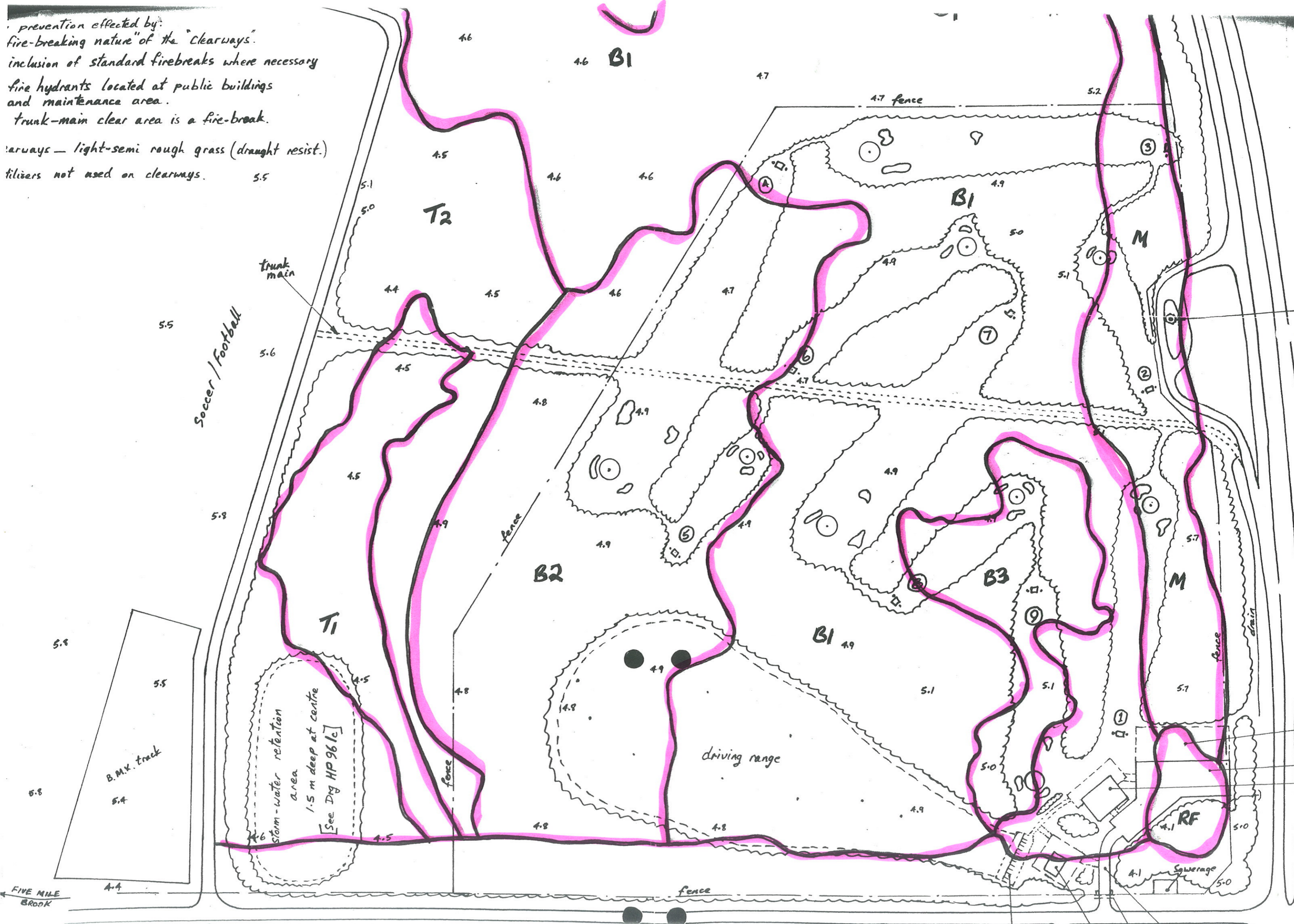
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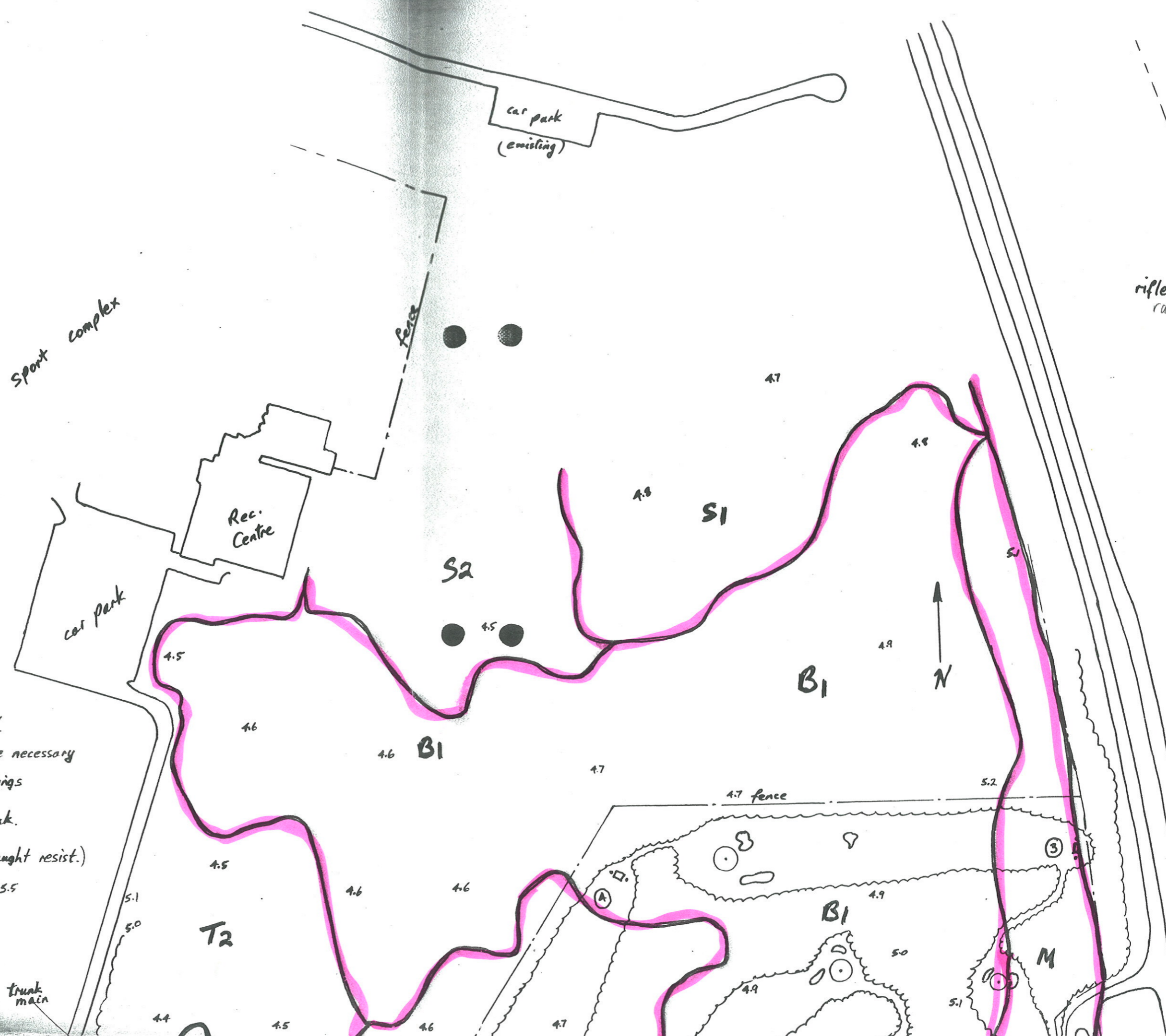
GLOSSARY

- | | |
|--------|--|
| extant | existing or living at the present time (in the original state, condition or place; i.e. not domesticated or cultivated) |
| taxa | plural of 'taxon' |
| taxon | in a broad sense: a taxonomic group of any rank. a taxonomic unit in the sense used here: species (sp.), subspecies (subsp., ssp.), variety (var.) or form (f.); the taxon may be formally named, such as <i>Dryandra mimica</i> , or unnamed, such as <i>Dryandra</i> sp. 31 or <i>Dryandra montana</i> ms |

ASW 25.6.96

prevention effected by:
 fire-breaking nature of the "clearways".
 inclusion of standard firebreaks where necessary
 fire hydrants located at public buildings
 and maintenance area.
 trunk-main clear area is a fire-break.
 clearways — light-semi rough grass (draught resist.)
 fertilisers not used on clearways.





Notes:

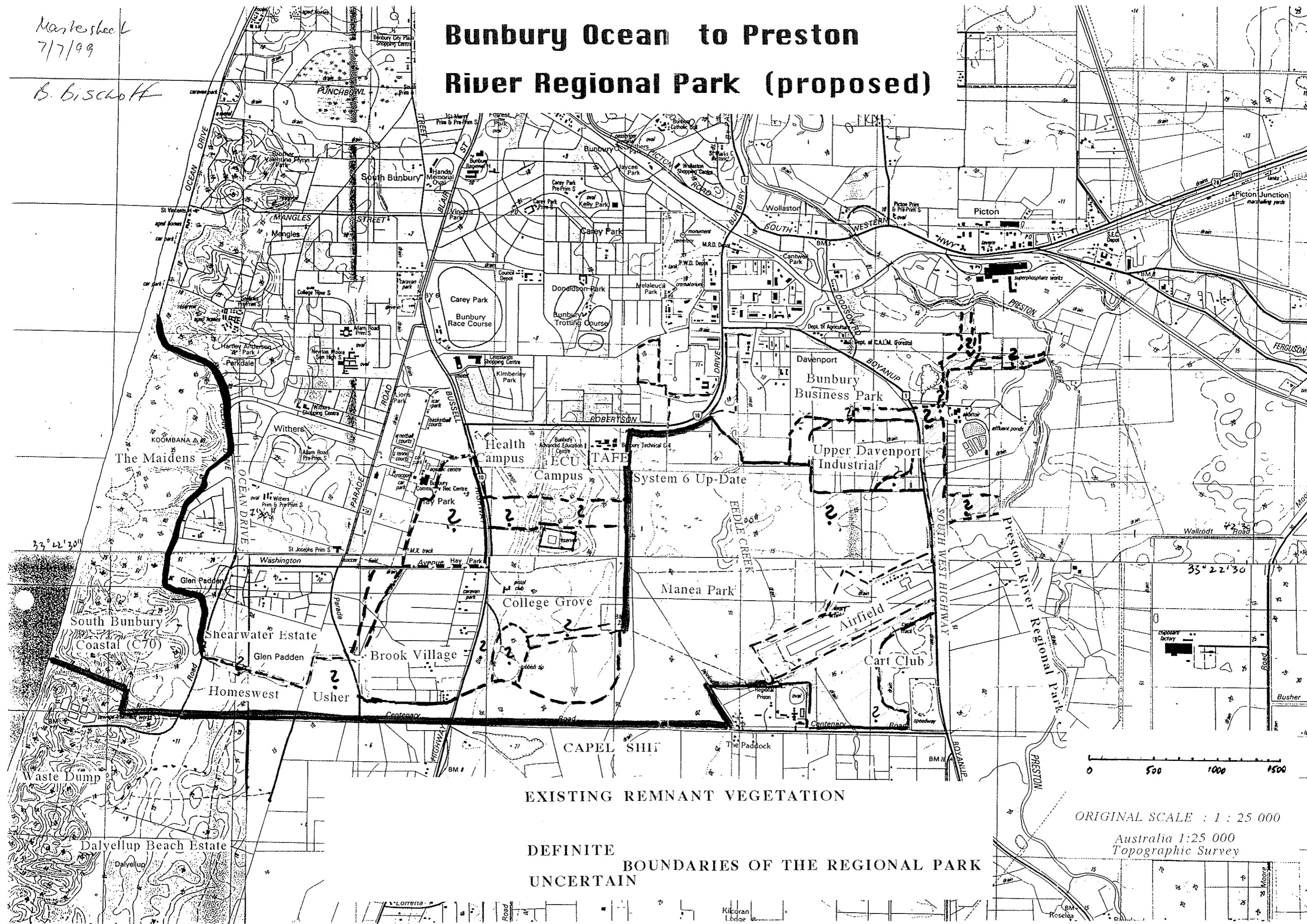
1. Fire prevention effected by:
 - 1.1 "fire-breaking nature" of the "clearways".
 - 1.2 inclusion of standard firebreaks where necessary
 - 1.3 fire hydrants located at public buildings and maintenance area.
 - 1.4. trunk-main clear area is a fire-break.
2. Clearways — light-semi rough grass (draught resist.)
3. Fertilisers not used on clearways.

5.5

Master sheet
7/7/99

B. Bischoff

Bunbury Ocean to Preston River Regional Park (proposed)



EXISTING REMNANT VEGETATION

DEFINITE
BOUNDARIES OF THE REGIONAL PARK
UNCERTAIN

ORIGINAL SCALE : 1 : 25 000

Australia 1:25 000
Topographic Survey

**ASSESSMENT OF
TWO ENDANGERED FAUNA
SPECIES:**

**SOUTHERN MULCH SKINK &
SOUTHERN BROWN BANDICOOT
WITHIN HAY PARK BUSHLAND,
BUNBURY, WA**

**Prepared for Mr Sieg Praxl
Target Golf International
PO Box 8296 Perth WA 6849**

**By Crypto Biological Surveyors & Consultants
24 Wotan Street Innaloo WA 6018**

February 1997

1.0 INTRODUCTION

A biological survey was conducted during December 1996 in the Hay Park Bushland area, located at the intersection of Bussell Hwy and Washington Ave in Bunbury . The objectives were to determine the occurrence and abundance of the Southern Brown Bandicoot (*Isoodon obesulus*) and the Southern Mulch Skink (*Glaphyromorphus australis*). The focus of this assessment on the two above mentioned species was requested due to their conservation status, and the possible effects of habitat alteration on these species, which may occur as a result of the proposed Target Golf Development.

The taxonomy of this report follows Wilson and Knowles (1988) for reptiles, Strahan (1992) for mammals and Tyler et.al (1994) for amphibians

Additional vertebrate fauna species recorded during this survey have been included in Appendix 1.

1.1 OVERVIEW OF THE BANDICOOT

The southern Brown Bandicoot (*Isoodon obesulus*) is a nocturnal and crepuscular, omnivorous, ground dwelling marsupial with an adult mass of up to 1600 grams (Strahan 1992). It is widely distributed through the southwest of Western Australia.

The effects of European settlement have been deleterious to this species which as a result of habitat alteration and introduced predators has a diminished and fragmented distribution. For this reason this mammal is Listed in Schedule 1 of the Wildlife Conservation Act 1950 as "rare or likely to become extinct". See Appendix 2 for photograph.

1.2 OVERVIEW OF THE SOUTHERN MULCH SKINK

The Southern Mulch Skink (*Glaphyromorphus australis*) is a medium sized, elongate, ground dwelling lizard growing to 107 mm snout-vent length. It is found in a variety of habitats but favouring damp swamp margins (Ehmann 1992) and other moist areas of the southwest corner of Western Australia. See Appendix 2 for photograph.

To date there are very few records of this skink from the Bunbury region with only three specimens collected. These were lodged with the Western Australian Museum (WAM) in 1966. Analysis of these three skinks has revealed two significant differences when compared with the more widespread and southern population of *G.australis*. These distinguishing characters of the Bunbury population are; more elongate body and greater length (Aplin and Dell 1997) (manuscript in press). In this paper the Bunbury skinks are formerly described as a distinct species separate from *G.australis*.

Since the above mentioned paper is not yet published, the taxonomic status of these Bunbury skinks is not yet clarified. Until this paper is published, the Bunbury skinks will continue to be "lumped" under the name *G.australis*. However, in recognition of this separate taxa and of its rare and restricted nature, it has been placed on the "Priority Fauna" list (Andrew Burbidge pers.comm) by the Department of Conservation and Land Management (CALM). This priority fauna listing is specifically designated for poorly known species occurring on threatened land.

2.0 SURVEY METHODS

Survey methods for the Southern Mulch Skink and other reptiles and frogs are listed below. Our efforts were concentrated to open Marri forest, Swamp *Banksia* woodland and Flooded Gum forest areas.

- observation
- active searching by day
- searching through natural and unnatural surface debris
- raking through leaf litter
- headtorching by night for nocturnally active species

Survey methods specifically for the Southern Brown Bandicoot and opportunistically for other mammals entailed the following:

- headtorching for nocturnal activity
- cage trapping (9 traps)
- Elliott trapping (8 traps)
- searching for signs of bandicoot activity (eg diggings, runs and scats)

This trapping effort yielded a total of 17 trap nights. Time spent manually searching was the equivalent of 6 days, ie 3 people searching for 2 days.

3.0 SURVEY RESULTS

The survey revealed Southern Brown Bandicoots (*I.obesulus*) at Hay Park, but failed to record the Southern Mulch Skink (*G.australis*). Additional mammals, reptiles and frogs recorded are listed in Appendix 1.

3.1 SOUTHERN BROWN BANDICOOT

A total of 4 bandicoots were trapped yielding the following data:

- 1 sub-adult female from *Melaleuca* woodland over sedge
- 1 adult male from open Marri Forest
- 2 adult females with pouch young from swamp paperbark woodland.

All three adult bandicoots were trapped from the south eastern corner of Hay Park Bushland. In addition to trappings, evidence of bandicoot activity was noted as widespread in woodland and swampland communities of Hay Park. This evidence was as follows:

- conical diggings identified as bandicoot foraging sites
- bandicoot tracks
- faecal pellets (scats)

3.2 SOUTHERN MULCH SKINK

As mentioned this skink was not revealed during this survey. The implications of this, and the results of other recent unsuccessful attempts at locating this species are detailed in the discussion.

4.0 DISCUSSION

The failure to find the Southern Mulch Skink at Hay Park Bushland is inconclusive given the limited time spent searching and the lack of using pitfall traps. Because of these two factors, we cannot state categorically that this lizard is absent from Hay Park. However, the information available on the three specimens collected from Bunbury in the 1960s suggests several things about its ecology which are relevant to the Proposed Hay Park Golf Course Development.

The above mentioned early data for this skink includes microhabitat and locality details. The three Bunbury skinks were found beneath wood and debris in a former railroad yard (Aplin and Dell 1997) (manuscript in press). This strongly suggests that this skink can tolerate a level of human modification to its habitat. Furthermore it can utilise the unnatural debris which often results from human activities.

These early records describe the capture site as "a low-lying area subject to occasional inundation and covered by low, partially halophytic vegetation". This habitat where the only *G.australis* are known from Bunbury is not listed as a Vegetation Type in Hay Park Bushland in the Vegetation Survey of this area (Weston 1996).

Since 1966 no specimens of *G.australis* have been formally recorded from Bunbury. A recent WA Museum initiative to locate this species in Bunbury was unsuccessful despite a widely publicised media release (Ken Aplin pers.comm). Two recent surveys specifically aimed at locating this lizard involving Museum staff and other herpetologists including Crypto personnel also failed to locate this lizard in Bunbury.

In view of the above evidence, the Proposed Golf Course does not appear to pose a major threat to the conservation of the Southern Mulch Skink.

The capture of 4 bandicoots (including 2 females with pouch young) indicates that there is a significant population within Hay Park and the evidence of bandicoot activity suggests that they range extensively within the proposed development site. The capture of 3 bandicoots in the swampy south eastern corner of the site is significant. The water retained here would provide a good source of both plant and animal food for bandicoots during drier months.

It is well known that the Southern Brown Bandicoot can survive in partially degraded areas provided there is adequate habitat remaining in tact, this is the case in many bushland and Open Space areas close to Perth where some degree of suitable native habitat remains. This situation can be the case if consideration is made for this mammal. The persistence of bandicoots after development would be an attraction and selling piece and an example of an environmental success story.

5.0 RECOMMENDATIONS

1. To further support the evidence that Hay Park Bushland appears to be the wrong habitat type for the Southern Mulch Skinks, we suggest an additional survey incorporating the use of pitfall traps with drift lines.

2. Given the previous success in translocation of Southern Brown Bandicoots (Andrew Burbidge pers.comm), one option is to translocate the animals currently inhabiting Hay Park prior to any development. This would be done in conjunction with the CALM Bandicoot Release Program.

This option would be a satisfactory if Target Golf International are required to save individual animals, rather than to conserve the bandicoot population as a whole at Hay Park Bushland. If the latter is the case, recommendations 3 or 4 should be considered.

3. Consideration should be made for bandicoots by providing bushland corridors between proposed fairways. The exposed lawn areas of a future golf course would also provide a food source (invertebrates), but would make bandicoots vulnerable to fox predation (Tony Friend pers.comm). Retained bushland corridors will ideally comprise woodland over dense understorey, thus providing bandicoots with habitat and a refuge from foxes. There is not data available on the optimum width of such refuge corridors. To protect low dense vegetation of corridors, it would be desirable to limit public access from corridors. Fox baiting is not an alternative to refuge areas due to the urban situation of Hay Park.

4. The south eastern corner of Hay Park including the small swampy area appears particularly important to the Hay Park bandicoots and the proposed development could be modified to retain this area.

ACKNOWLEDGMENTS

Crypto Biological Surveyors & Consultants would like to thank Mr Mark Cowan for assistance in the field.

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APPENDIX 1 .

The following is a list of all vertebrate fauna recorded within Hay Park Bushland during this Biological Assessment.

Frogs

| | |
|--------------------|---------------------------------|
| Squelching Froglet | (<i>Crinia insignifera</i>) |
| Lea's Frog | (<i>Geocrinia leai</i>) |
| Moaning Frog | (<i>Heleioporus eyrei</i>) |
| Slender Tree Frog | (<i>Litoria adelaidensis</i>) |

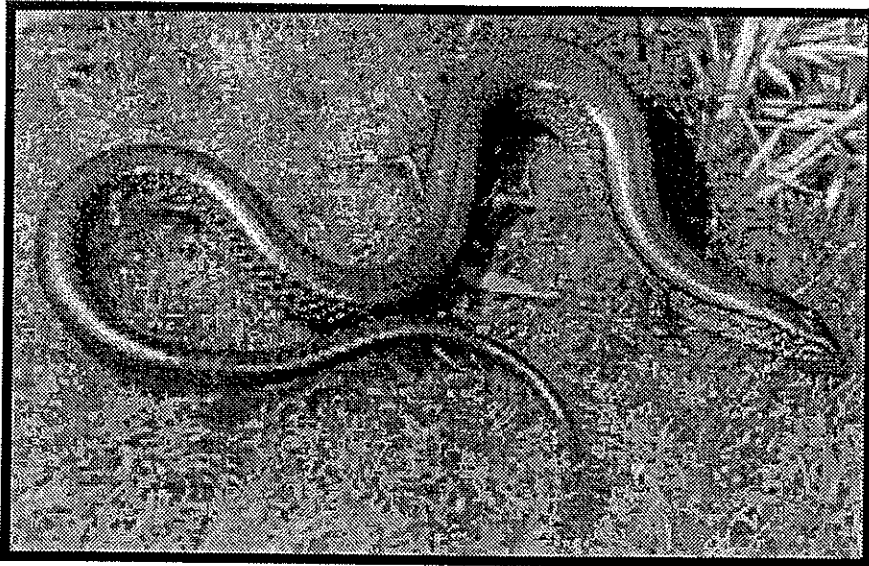
Reptiles

| | |
|--------------------|---|
| Worm Lizard | (<i>Aprasia repens</i>) |
| Bearded Dragon | (<i>Pogona minor minor</i>) |
| Sun Skink | (<i>Cryptoblepharus plagiocephalus</i>) |
| Striped Skink | (<i>Ctenotus impar</i>) |
| Two toed Skink | (<i>Hemiergus quadrilineata</i>) |
| Burrowing Skink | (<i>Lerista elegans</i>) |
| Common Dwarf Skink | (<i>Menetia greyii</i>) |
| Bobtail Skink | (<i>Tiliqua rugosa rugosa</i>) |

Mammals

| | |
|--------------------------|---------------------------------|
| Southern Brown Bandicoot | (<i>Isoodon obesulus</i>) |
| Western Grey Kangaroo | (<i>Macropus fuliginosus</i>) |

APPENDIX 2



Southern Mulch Skink (*Glaphyromorphus australis*)
Photo by: H. Ehmann from Ehmann (1992)



Southern Brown Bandicoot (*Isodon obesulus*)
Photo by: R. Miller from Strahan (1991)

City of Bunbury

**Hay Park Athletics and Cycle
Track Proposal**

Flora Survey

October 2003

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- A Site Vegetation
B Flora list and location of the species on the site
C Keighery Vegetation Condition Rating Scale

1. Introduction

The City of Bunbury proposes to extend the sports facilities at Hay Park to an area north and east of the Hay Park Aquatic Centre. Included in these proposed extensions are an eight lane athletics track and a landscaped mountain bike and walk trail.

The site is presently undeveloped and supports native remnant *Melaleuca* bushland. The Department of Environment (DoE) has advised that this remnant is a vegetation type that is unusual and may not occur elsewhere in the Bunbury region. The vegetation in the vicinity of Hay Park has also been the subject of considerable recent public concern. As a result of these matters the Environmental Protection Authority (EPA) Service Unit considers that the proposal has potentially significant environmental impacts that require it to be referred to the EPA pursuant to the *Environmental Protection Act 1986*.

In order for the EPA Service Unit to consider the proposal, the City of Bunbury is required to provide information regarding the composition and structure of the flora and vegetation of the site.

The City of Bunbury has requested that GHD pursue a study into the flora and vegetation at the Hay Park site.

1.1 Scope of Work

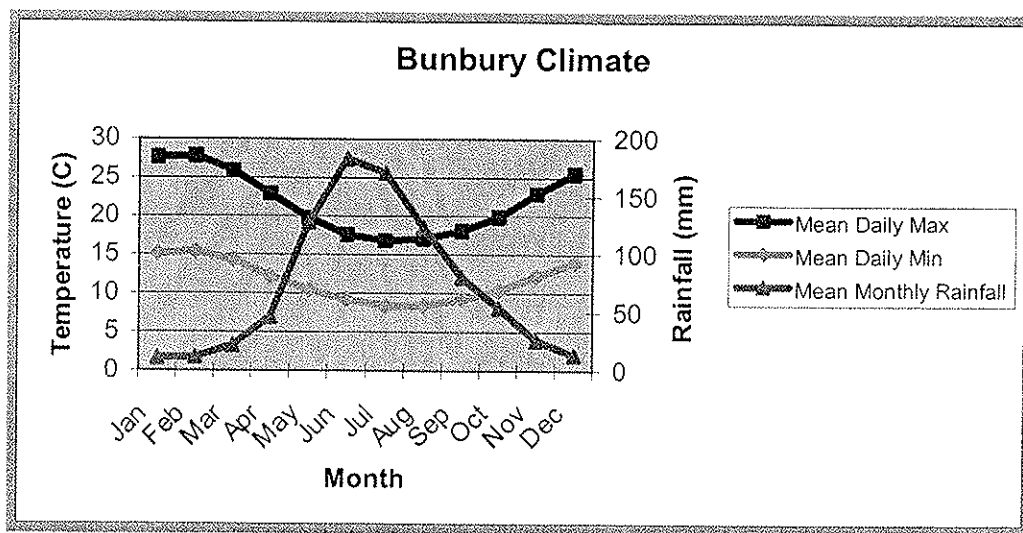
This report investigates the following scope of work:

- ▶ Background research into vegetation types previously existing in the general area;
- ▶ Field survey of the site, including an assessment of vegetation units, and search for flora of significance (Declared Rare Flora and Priority Flora species) and Threatened Ecological Communities. In addition to a thorough site overview, this assessment will include a description of reference plots in each vegetation community unit at the site;
- ▶ Allocation of a condition rating (based on the Keighery (1994) scale) for the vegetation units;
- ▶ Preparation of a GIS based map of the vegetation units over the site based on field assessment showing reference plots, vegetation structure and floristic components;
- ▶ A full flora list with discussion of any plants which are out of their normal range or of other significance;
- ▶ A full list of weed species and discussion of any Declared Weeds; and
- ▶ A regional comparison of the vegetation type with regard to its existence in the Bunbury region and the amount which is protected in reserves.

2. Physical Environment

2.1 Climate

Bunbury experiences a Mediterranean climate – with cool wet winters and hot dry summers. There is a pronounced period of rainfall between May and October when many ephemeral wetlands fill up.



Source Bureau of Meteorology (2003).

2.2 Landscape and Soils

The Hay Park site is an almost completely flat dampland with a barely perceptible rise to the east adjoining the Bussell Highway and to the west adjacent to the carpark. Soil fill has been used to the west and north of the dampland for the recreation centre and associated playing fields and this has brought the land level up by approximately 0.5 metres.

The soil of the dampland is generally grey sand with a thin humic layer on the surface.

2.3 Wetlands

The study area is categorised as palusplain, which indicates a seasonally waterlogged, poorly drained plain. A small sumpland is mapped immediately west of the recreation centre building (Hill, *et al.*, 1996). Figure 1 indicates the extent of the wetland zones.

The vegetated area of the study site has been given a wetland classification of 'Conservation' by the Water and Rivers Commission, with the surrounding, unvegetated areas recorded as 'Multiple Use'. A Conservation category wetland is one which 'supports high levels of attributes and functions'. The management priority for such a wetland is ;

"To preserve wetland attributes and functions through reservation in National Parks, crown reserves state owned land and protection under environmental protection policies." (Hill, et al., 1996).

3. Vegetation and Flora

3.1 Regional Vegetation

Vegetation complexes are predominantly reflective of the soil and moisture condition of a landscape. The historical vegetation types in the study area would have reflected the topography and soils, with vegetation present on marine deposits different from those on aeolian or fluvial deposits.

Heddle *et al.* (1980) mapped Swan Coastal Plain vegetation in the general area as being comprised of four vegetation complexes; the Quindalup, Southern River, Yoongarillup and Vasse Complexes.

The Quindalup Complex is located closest and parallel to the coast, and is composed of vegetation adapted to sandy exposed coastal dunes.

The Yoongarillup and Vasse Complexes are inland of the Quindalup Complex, and are located on marine deposits. The former is predominantly composed of woodland to tall woodland of *Eucalyptus gomphocephala* (Tuart) with *Agonis flexuosa* (Peppermint) in the second storey. The Vasse Complex is a mixture of closed *Melaleuca* scrub, fringing woodland of *E. rudis* and *Melaleuca* species, and open forest of *E. gomphocephala*, *E. marginata* and *Corymbia calophylla*.

The Southern River complex straddles the Preston River, and is located on aeolian deposits. This complex is open woodland of *Corymbia calophylla*, *Eucalyptus marginata* and *Banksia* species, with fringing woodland of *E. rudis* and *M. raphiophylla* along creek beds.

3.2 Site Vegetation

The flora and opportunistic fauna survey of the proposed Hay Park Athletics and Cycle Track was conducted by a qualified botanist on the 7th October, 2003. A total of 75 species from 31 families were recorded from the Hay Park site (See Appendix A for complete list).

The vegetation of the survey site was generally in good to excellent condition, with ratings of between 1 and 3 on the Keighery scale of vegetation condition (Keighery, 1994). This is despite the presence of weed species, which were most prevalent along external tracks. Tracks are areas of disturbance, and weeds, being opportunistic species, have quickly colonised and spread.

Vegetation maps produced by Heddle *et al.* (1980) indicate that the vegetation of the site belongs to the Yoongarillup Complex, however, the mapping scale is not sufficient to show localised variations and the results of the site survey do not indicate vegetation from this complex.

The dominant vegetation was woodland of *Melaleuca*, with communities distinguished from one another by the structure rather than species variation. The vegetation and species were recorded at six locations as shown at Figure 2 with opportunistic

recording of other plant species. Species present in each area are given in Appendix A.

The findings from the site survey indicate that the vegetation can be broadly divided into two types – a shrub dominated dampland and a tree dominated dampland.

Shrub-dominated dampland : This area is located in the centre of the study area, probably reflecting the lowest landform or perhaps shallower sands over a hardpan. It consists of a species-rich heath with a scattered tree layer.

Tree stratum : Very open woodland of *Melaleuca raphiophylla* and *Melaleuca preissiana*.

Shrub stratum : Open shrubland to 1m including *Hypocalymma angustifolium*, *Acacia saligna*, *Daviesia physodes*, *Dampiera linearis*, *Xanthorrhoea ?brunonis*, and *Pimelea imbricata*.

Herb/sedge stratum : Dense hermland/sedgeland to 0.5 m consisting primarily of *Lepidosperma* spp, *Gahnia trifida*, *Patersonia occidentalis* and *Conostylis aculeata*.

Tree-dominated dampland : This type appears to exist along the eastern and western sides of the survey area, where the ground is very slightly higher, or the overlying soil, deeper.

Tree stratum: Moderately dense woodland of *Melaleuca raphiophylla*, *Eucalyptus rudis* and *Banksia littoralis*.

Shrub stratum: Occasional thickets of *Kunzea recurva* with scattered *Daviesia inflata*, *Hakea varia* and *Hypocalymma angustifolium*.

Herb/sedge stratum: A moderately dense layer to 0.6m with a range of herb and sedge species similar to the shrub-dominated area. A range of orchid species occur in this stratum.

Details of the vegetation at representative sites within the survey area are given below. A condition rating is given based on the Keighery (1994) scale of 1 to 6, where Condition 1 indicates excellent condition and Condition 6 is essentially cleared of native vegetation. The full description of the Scale is found at Appendix B.

Area 1

Area 1 was woodland to low woodland of scattered *Melaleuca raphiophylla* and *Banksia littoralis* trees over a lower tree layer of *Acacia saligna* and *Melaleuca radula* (introduced to the area). Shrubs and sedges were also present, and included *Lepidosperma* sp, *Melaleuca preissiana* and *Hakea varia*. Weed species (flatweed, wild oats and veldt grass) were common along the tracks, where the vegetation was in poorer condition. Away from the tracks, the condition of the vegetation was very good, being 1 or 2 on the Keighery scale of vegetation condition.

Area 2

This is woodland of *Melaleuca raphiophylla* over sedges (*Lepidosperma* sp) and some larger shrubs. The woodland appears to have been burnt in the last two years, with regrowth apparent in the shrub and herb layer. This includes *Hypocalymma*

angustifolium, *Scaevola pilosa*, *Patersonia* sp. Swamp form, *Conostylis aculeata* and *Dampiera linearis*. While four weed species were recorded in the survey of this area, the woodland is in good condition (2 or 3 on Keighery's scale), and the weeds are not dominant.

Area 3

Scattered *Melaleuca preissiana* and *M. raphiophylla* woodland was present in area 3. In places, sedges dominated the understorey, with four species of *Lepidosperma* present. Shrubs and herbs dominated in other places with *X. gracilis*, *Hypocalymma angustifolium*, *Daviesia inflata*, several species of *Drosera*, and members of the Liliaceae common. The vegetation was in excellent condition, and has been assigned a condition rating of 1 or 2 on Keighery's scale. While some weeds were present, these were scattered and have not replaced any of the native species.

Area 4

This area consists of an open woodland of *Melaleuca raphiophylla* and *M. preissiana* over an understorey of sedges, grasses and *Xanthorrhoea gracilis*. Herbs, including a number of orchid species, intersperse this understorey. Densities of tree species vary, with high densities on the very slightly higher ground close to Bussell Highway, and trees becoming more scattered on lower ground. The denser woodland includes *Banksia littoralis*, and a small *Kunzea* thicket over scattered sedges and some herbs is located in the southwest of this area. The condition of this thicket is very good (1 or 2 on Keighery's scale), and that of the surrounding *Melaleuca* woodland was good (3 on Keighery's scale). Weeds were common close to tracks (areas of disturbance), but not prolific or a threat to the bushland integrity elsewhere.

Area 5

A moderately dense woodland of *Melaleuca raphiophylla*, *Eucalyptus rudis* and *Banksia littoralis* with the occasional *Kunzea* and *Acacia saligna*, covers most of this area. The understorey is composed of sedges and a range of herbaceous species. Close to the wide track at in the south-west of the area is a dense semi-open shrub and herbland, including *Philothea spicatum*. The condition of the vegetation is excellent, with a rating of 1 on the Keighery scale. Weed species were almost totally absent from this area.

3.3 Threatened ecological communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat (Blyth and English, 1997). Threatened Ecological Communities (TECs) are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered, and Vulnerable. Some TECs are protected under the Commonwealth *Environmental Protection and Biodiversity Act, 1999 (EPBC Act)*. Although TECs are not formally protected under the State *Wildlife conservation Act 1950*, the loss of, or disturbance to, some TECs trigger the EPBC Act. The Environmental Protection Authority's position on TECs

states that proposals that result in the direct loss of TECs are likely to be formally assessed.

The Department of Conservation and Land Management's (DCLM) records indicated that the two threatened ecological communities (TECs), SCP8 and SCP18, were located within the bushland of Hay Park. However, DCLM was unable to provide specific locations for these TECs, or more detail of their species composition.

The general descriptions are:

1. SCP18: Shrublands on calcareous sites of the Swan Coastal Plain - these shrublands do not have any tree storey, but are composed solely of shrubs over herbs and sedges (Gibson *et al.*, 1994).
2. SCP08: Herb rich shrublands in clay pans -- herbs dominate these communities, with the upper tree and shrub storeys almost non-existent (Gibson *et al.*, 1994).

Neither of these two communities was apparent in the area surveyed during the flora assessment on the 1st October 2003. The vegetation of the site was predominantly *Melaleuca* woodland of varying density, with the addition of *Banksia littoralis* and *Eucalyptus rudis* and *Kunzea* thicket. The species composition at the site was quite different from that of SCP18 and SCP8, as detailed in Gibson *et al.* (1994).

However, the Hay Park vegetation is poorly conserved in the Greater Bunbury Region as many such areas have been filled for urban development or grazed. The intactness of the shrub and herb layer is rare and there is a considerable diversity of species in a small area.

3.4 Declared Rare and Priority Flora

The Department of Conservation and Land Management's (DCLM) records indicate that the following Declared Rare and Priority flora are known to exist within the general Bunbury area (Table 1).

Table 1. Declared Rare and Priority Flora known from the Bunbury Area

| Taxon (species or subspecies) | Conservation Code (DCLM) | Description | Preferred Habitat | Known Localities |
|-------------------------------|--------------------------|---|---|--|
| <i>Acacia semitrullata</i> | Priority 3 | Slender, erect, pungent shrub, (0.1–)0.2–0.7(–1.5) m high. Fl. cream, white, May–Oct. | White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas. | Yallingup, Donnybrook, Harvey, Yarloop, Collie. |
| <i>Acacia flagelliformis</i> | Priority 4 | Rush-like, erect or sprawling shrub, 0.3–0.75(–1.6) m high. Fl. yellow, May–Sep. | Sandy soils. Winter-wet areas. | Harvey, Eaton, Bunbury, Capel, Busselton, Donnybrook |
| <i>Anthotium junciforme</i> | Priority 4 | Tufted perennial herb to 40cm. | Red clay loam in damp areas. | Waterloo, |

| Taxon (species or subspecies) | Conservation Code (DCLM) | Description | Preferred Habitat | Known Localities |
|--|--------------------------|--|--|---|
| | | Blue flowers. | | |
| <i>Aponogeton hexatepalus</i> | Priority 4 | Rhizomatous or cormous, aquatic perennial herb. Leaves floating. fl green white, Jul-Oct | Mud, freshwater: ponds, rivers, claypans | Perth, Pinjarra, Capel, Bunbury, Boyanup, Nannup |
| <i>Caladenia longicauda</i> spp. <i>clivicola</i> | Priority 4 | Tuberous, herb, 0.3–0.5 m high. Fl. white, green, yellow, Sep–Oct. | Clayey loam, gravel, sand. Granite outcrops. | Harvey, Dardanup, Dunsborough, Pinjarra, Lesmurdie, Cape Naturaliste |
| <i>Caladenia speciosa</i> | Priority 4 | Tuberous, perennial herb; 0.35–0.6m high; fl white, pink, Sep–Oct | White, grey or black sand | Myalup, Eaton, Yarloop, Ludlow, Gingin |
| <i>Drosera marchantii</i> subsp. <i>marchantii</i> | Priority 4 | Erect, tuberous perennial herb; 0.1–0.4m high; fl pink, Aug–Oct | Lateritic soils, damp swampy areas | Waterloo, Collie, Stratham, Donnybrook, Argyle |
| <i>Franklandia triaristata</i> | Priority 4 | Erect, lignotuberous shrub, 0.2–1 m high. Fl. white, cream, yellow, brown, purple, Aug–Oct.. | White or grey sand | Capel, Tutunup, Jarrahwood, Argyle |
| <i>Pultenaea skinneri</i> | Priority 4 | Slender shrub; 1–2m high; fl yellow, orange, red, Jul–Sep | Sandy or clayey soils, winter-wet depressions | Collie, Binningup, Boyanup |
| <i>Villarsia submersa</i> | Priority 4 | herb. Fl. white, Aug–Nov. | In freshwater 0.05–0.6 m deep. Pools, lakes, swamps, winter-wet depressions, claypans. | Gunapin, Boyanup, Lake Muir, Denmark, Forrestdale, Kenwick, Frankland River, Lane Poole |

These taxa are assigned a code of conservation significance by the DCLM, described in Table 2.

Table 2. Conservation Codes and Descriptions for DCLM Declared Rare and Priority Flora Species.

| Conservation Code | Description |
|---------------------------------------|---|
| R: Declared Rare Flora – Extant Taxa | ▶ Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. |
| 1: Priority One – Poorly Known Taxa | ▶ Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey. |
| 2: Priority Two – Poorly Known Taxa | ▶ Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey. |
| 3: Priority Three – Poorly Known Taxa | ▶ Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey. |
| 4: Priority Four – Rare Taxa | ▶ Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years. (Department of Conservation and Land Management, 2001). |

Of the ten species listed in Table 1, seven could potentially be found on the site, as their preferred habitat is similar to that at the site. These species are *Acacia semitrullata*, *Acacia flagelliformis*, *Caladenia longicauda* ssp *clivicola*, *Caladenia speciosa*, *Drosera marchantii* ssp *marchantii*, *Franklandia triaristata* and *Pultenaea skinneri*. None of these species were recorded during the flora survey in October.

3.5 Dieback

The flora survey of 1st October 2003 included a visual dieback assessment. The vegetation of the entire site was in good to excellent condition and there was no evidence of dieback.

3.6 Weeds

A total of fourteen weed species were recorded during the flora survey. The small number of weeds at the site is reflective of the good condition of the vegetation, and the apparent lack of disturbance to the site. Weeds are more prevalent close to the few disturbed areas, including tracks and firebreaks. While they are also present in other areas, they are not dominant and do not pose a threat to the integrity of the vegetation communities.

Declared weeds are those which have been listed by the Department of Agriculture under the *Agriculture and Related Resources Protection Act (1972)* as being of particular significance, usually because of their risk to agriculture. No declared weeds were found in the area surveyed.

4. Regional significance of the flora at the Hay Park site

The vegetation at Hay Park does not fit with the descriptions of the Yoongarillup Complex, within which it is mapped. The site is also within proximity of the Karrakatta (Central and South) complex but does not fit with the description of that vegetation type either. It appears to be more closely aligned with the Southern River complex, which, in the Bunbury area, is mapped further to the east. This complex occurs in low-lying areas and fringing rivers and has as its dominant overstorey plants the flooded gum, *Eucalyptus rudis*, and swamp paperbark, *Melaleuca raphiophylla*. The Hay Park vegetation is therefore unusual in its location relatively close to the coast and particularly in the diversity of shrub and herb species. Due to its uniqueness in the Bunbury area the site vegetation cannot be easily given a level of significance in relation to locally mapped vegetation complexes. This is the likely reason for its listing as a Threatened Ecological Community.

However, in the context of the mapped vegetation complex closest to it in type, it can be determined that it is likely to be poorly represented.

The Southern River Complex vegetation is represented by an estimated 21% remaining in the Greater Bunbury Region. Only 6% of this vegetation complex is conserved under secure tenure in the Greater Bunbury Region and only 8% remains on the entire Swan Coastal Plain (EPA, 2002). This is primarily because damp lands were sought after for summer pasture areas and were therefore cleared, either directly or by continued grazing.

5. Conclusion and Recommendations

The portion of bushland at Hay Park which was studied is an excellent, self-sustaining remnant which has remained in very good condition, despite being close to major areas of disturbance. It is unusual in that many of the damplands in the Bunbury Region have been lost due to urbanisation and agriculture, and because it has retained a full suite of species. The larger Hay Park area of vegetation has been listed as containing two Threatened Ecological Communities but the vegetation described during the field survey does not match the vegetation descriptions of those communities.

No Declared Rare or Priority flora species were observed during the survey although a number could potentially occur in such a habitat.

The proposal to construct an athletics track, mountain bike track and walk trail within the northern section of the survey area will create further opportunities for disturbance to the remaining bushland. Disturbance will occur through direct clearing and filling, changes in surface drainage, opening up of the site – which will allow weed species to more easily invade, and a greater risk of fire through higher use of the bushland area.

The area proposed for the tracks is in the more disturbed part of the site, as it has been impacted by the adjoining carpark and playing fields as well as some previous soil movement. However, it is still mostly in good condition and worthy of protection if possible.

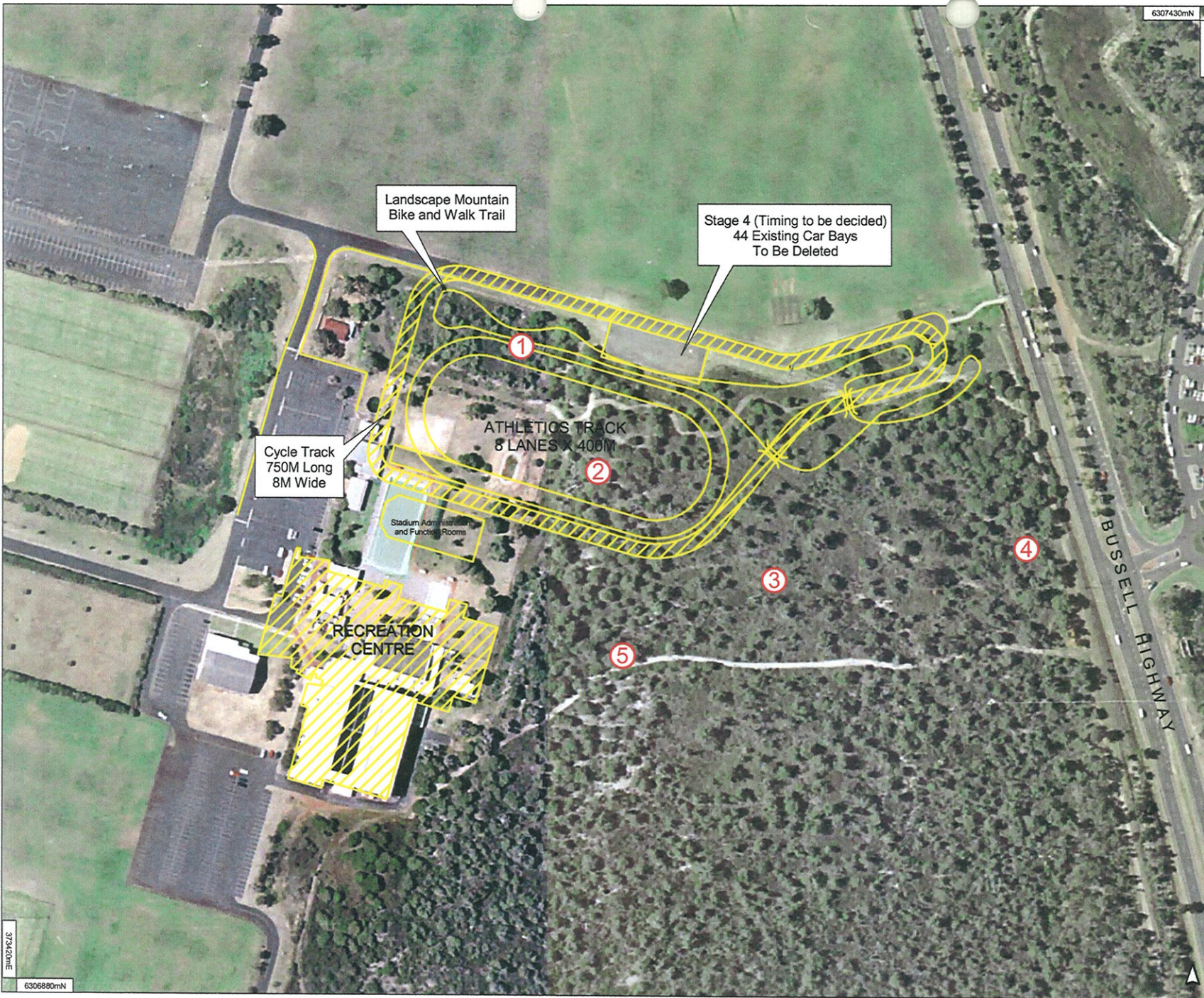
If the project proceeds the following recommendations are made to assist in minimising vegetation impacts through direct or indirect means:

- ▶ Vegetation clearing should be reduced to the absolute minimum required for construction of the tracks;
- ▶ The walk trail and mountain bike track should be constructed with physical barriers along their edges to prevent users from entering the vegetation;
- ▶ Any imported fill should be free of dieback and weed species;
- ▶ Weed control should be conducted annually along track edges;
- ▶ No potentially invasive plants should be used in landscaping the new athletics area and grandstand;
- ▶ Signage at the site should be installed and provide information on the value of the site vegetation and include interpretative material so that users can better understand and appreciate the site;
- ▶ The proposed running track site should be fenced to avoid unrestricted access to the remnant bushland; and
- ▶ The City of Bunbury should develop an 'off-set package' with the Department of Environment for the proposed clearing required for the project to proceed.

6. References

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- Gibson, N., Keighery, B.J., Keighery, G.J., Burbridge, A.H. & Lyons, M.N. (1994). *A Floristic Survey of the Southern Swan Coastal Plain*. Unpublished Report for the Australian Heritage Commission prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc).
- Hedde, E.M., Loneragan, O.W. and Havel, J.J. (1980). Vegetation Complexes of the Darling System, Western Australia. In: Atlas of Natural Resources, Darling System Western Australia. Department of Conservation and Environment. WA.
- Keighery B.J (1994). Bushland Vegetation Assessment. Wildflower Society of Western Australia. Perth..

Figure 1
Site Vegetation



6307430mN

374100mE

LEGEND

- Proposed Development Plan Outline
- Sites of Vegetation Quadrats

Landscape Mountain
Bike and Walk Trail

Stage 4 (Timing to be decided)
44 Existing Car Bays
To Be Deleted

Cycle Track
750M Long
8M Wide

ATHLETICS TRACK
8 LANES X 400M

Stadium Administration
and Function Rooms

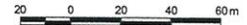
RECREATION
CENTRE

RUSSELL HIGHWAY

DATE OF PHOTOGRAPHY IS UNKNOWN
NOTE THAT POSITIONAL ERRORS CAN BE + 8M IN SOME AREAS

VIEW: hayman park

SCALE



1:2000 at A3

LOCALITY MAP



Bunbury - Western Australia

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CREATED BY: EL CHECKED: APPROVED:

HORIZONTAL DATUM: GDA94 PROJECTION: MGA Z50

HEIGHT DATUM: N/A METADATA RECORDED: N

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REVISION: DRAWING NO / LAYOUT NAME

0 61141-02-G1 / A3 L - HAY PARK



HAY PARK

**FIGURE 1
FLORA SURVEY**

374200mE

6306880mN

Appendix A

Flora list and location of the species on the site

Flora survey, 1st October 2003

| FLORA LIST | | | | | | Area | | | | |
|---------------|---------------|----------------------------|--------|-----------------------|---|------|---|---|---|--|
| Family | Genus | Species | Status | Common Name | 1 | 2 | 3 | 4 | 5 | |
| Mimosaceae | Acacia | saligna | | | X | X | X | | X | |
| Mimosaceae | Acacia | pulchella | | Prickly moses | | | X | | | |
| Mimosaceae | Acacia | alata | | | | | X | | | |
| Apiaceae | Actinotus | leucocephalus | | Flannel flower | | | | X | | |
| Myrtaceae | Agonis | flexuosa | | Peppermint | X | | | | | |
| Liliaceae | Agrostocrinum | scabrum | | | | | | X | X | |
| Asteraceae | Arctotheca | calendula | | Capeweed | | | | X | | |
| Poaceae | Avena | | * | Wild Oat | X | | | X | | |
| Proteaceae | Banksia | littoralis | | | X | | | X | | |
| Poaceae | Briza | minor | * | Shivery grass | | X | | X | | |
| Poaceae | Briza | maxima | * | Blowfly grass | | | | X | | |
| Colchicaceae | Burchardia | umbellata | | | X | X | | X | | |
| Colchicaceae | Burchardia | multiflora | | | | | X | | | |
| Anthericaceae | Caesia | micrantha | | | | | X | X | | |
| Orchidaceae | Caladenia | paludosa | | | | | | X | | |
| Anthericaceae | Chamaescilla | corymbosa | | | | | X | | | |
| Haemodoraceae | Conostylis | aculeata | | | | X | X | X | | |
| Cyperaceae | Cyathochaeta | avenacea | | | | X | X | X | | |
| Poaceae | Cynodon | dactylon | * | couch | X | X | | X | | |
| Goodeniaceae | Dampiera | linearis | | | | X | | X | | |
| Papilionaceae | Daviesia | physodes | | | | X | X | X | | |
| Papilionaceae | Daviesia | Inflata | | | | | X | X | | |
| Restionaceae | Desmocladius | flexuosa | | | | | | X | | |
| Asteraceae | Dittrichia | graveolans | * | Stinkwort | | X | | | | |
| Orchidaceae | Diuris | ?longifolia | | | | | | | X | |
| Droseraceae | Drosera | gigantea | | | | | X | | | |
| Droseraceae | Drosera | pulchella | | | | | X | | | |
| Droseraceae | Drosera | menziesii ssp menziesii | | | | | X | | | |
| Poaceae | Ehrharta | calycina | * | Veldt Grass | X | | | | | |
| Orchidaceae | Elythranthera | emarginata | | Pink Enamel Orchid | | | | | X | |
| Myrtaceae | Eucalyptus | rudis | | | | | X | X | | |
| Papilionaceae | Eutaxia | sp. | | | | | X | X | | |
| Cyperaceae | Gahnia | trifida | | | | | | | | |
| Papilionaceae | Gompholobium | tomentosum | | | | | X | | | |

| FLORA LIST | | | | | | Area | | | | |
|---------------|---------------|------------------|--------|------------------|---|------|---|---|---|--|
| Family | Genus | Species | Status | Common Name | 1 | 2 | 3 | 4 | 5 | |
| Haemodoraceae | Haemodorum | sp. | | | | | X | | | |
| Proteaceae | Hakea | varia | | | X | X | | X | X | |
| Dilleniaceae | Hibbertia | vaginata | | | | | X | | | |
| Myrtaceae | Hypocalymma | angustifolium | | myrtle | | X | X | X | | |
| Asteraceae | Hypochaeris | radicata | * | Flatweed | X | X | | | | |
| Liliaceae | Hypoxis | glabella | | | | | | | | |
| Myrtaceae | Kunzea | recurva | | | | | | X | X | |
| Asteraceae | Lattuca | serriola | * | | | X | | | | |
| Cyperaceae | Lepidosperma | sp. | | | X | | X | | | |
| Cyperaceae | Lepidosperma | ?tenue | | | X | X | X | | | |
| Cyperaceae | Lepidosperma | longitudinale | | | | | X | | | |
| Zamiaceae | Macrozamia | reidlei | | zamia | | | | X | | |
| Myrtaceae | Melaleuca | rhaplophylla | | Swamp paperbark | X | X | X | X | X | |
| Myrtaceae | Melaleuca | preissiana | | | X | X | X | | | |
| Myrtaceae | Melaleuca | radula | | | X | | | | | |
| Myrtaceae | Melaleuca | viminea | | | X | | | | | |
| Polygonaceae | Muehlenbeckia | adpressa | | | X | | | | | |
| Rubiaceae | Opercularia | hispidula | | | | X | | | X | |
| Oxalidaceae | Oxalis | pres-caprae | * | Soursob | X | | | | | |
| Oxalidaceae | Oxalis | glabra | * | | | | | X | | |
| Iridaceae | Patersonia | sp. 'swamp form' | | | | X | X | | | |
| Geraniaceae | Pelargonium | Capitatum | * | Rose Pelargonium | | | | | X | |
| Poaceae | Pennisetum | clandestinum | * | Kikuyu | X | | | | | |
| Myrtaceae | Pericalymma | ellipticum | | | | | | X | | |
| Rutaceae | Philotheca | spicatum | | Pepper and salt | | | | | X | |
| Thymeliaceae | Pimelea | imbricata | | | | | X | X | | |
| Orchidaceae | Prasophyllum | gracillimum | | Leek orchid | | | X | | | |
| | Philydrella | pygmaea | | Butterfly flower | | | X | | | |
| Iridaceae | Romulea | rosea | * | Guildford grass | X | X | | X | | |
| Goodeniaceae | Scaevola | striata | | | X | X | | | X | |
| Asteraceae | Senecio | lautus | | | X | X | | | | |

| FLORA LIST | | | | | Area | | | | |
|----------------|--------------|--------------|--------|-------------|------|---|---|---|---|
| Family | Genus | Species | Status | Common Name | 1 | 2 | 3 | 4 | 5 |
| Iridaceae | Sparaxis | bulbifera | * | | | | | | |
| Stylidiaceae | Stylidium | brunonianum | | | | | X | | |
| Orchidae | Thelymitra | Antennifera | | | | | | | X |
| | Tribonanthes | ?longipetala | | | | | | | |
| Typhaceae | Typha | sp. | | Bulrush | X | | | | |
| Asteraceae | Ursinia | anthemoides | * | Ursinia | | | | X | |
| Iridaceae | Watsonia | sp. | * | | | | | X | |
| Xanthorrhaceae | Xanthorrhoea | preisii | | | | | X | | |
| Xanthorrhaceae | Xanthorrhoea | gracilis | | | | | X | X | |
| Apiaceae | Xanthosia | | | | | | X | | |

Appendix B
Keighery Vegetation Condition Rating
Scale

Vegetation Condition Scale

1. Pristine or nearly so.
2. Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3. Vegetation structure altered, obvious signs of disturbance.
4. Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it.
5. Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6. The structure of the vegetation is no longer intact and the area is completely or almost without native species.

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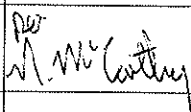
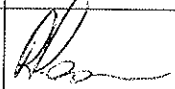
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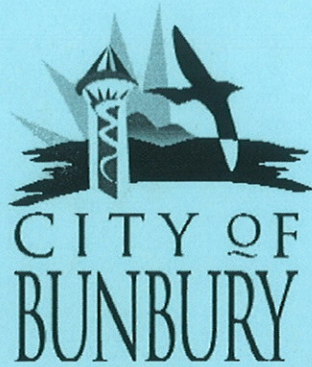
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Document Status

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|---------|---------------------------|----------|---|--------------------|---|----------|
| | | Name | Signature | Name | Signature | Date |
| 0 | K Appelhans / A Napier | A Napier |  | R Pearson |  | 15/12/03 |
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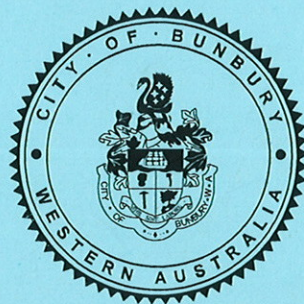
**COUNCIL COMMITTEE MEETING
2 AUGUST 2005**

**COUNCIL MEETING
9 AUGUST 2005**

**LETTER TO CHAIRMAN OF THE EPA
EPA REFERRAL FORM
GHD "CITY OF BUNBURY HAY PARK
ATHLETICS AND CYCLE TRACK
PROPOSAL ENVIRONMENTAL
IMPACT ASSESSMENT" REPORT**

Issued Under Separate Cover

*Trust
Therle*



b bischoff @ wn . com . au

Our Ref: bc1/200605:F00106-09
Your Ref:
Enquiries: ☎ (08) 9780 8217
E-Mail: billc@bunbury.wa.gov.au

29 July 2005

Chairman
Environmental Protection Authority
PO Box K822
PERTH WA 6842

Attn: Alice O'Connor

Dear Alice

Hay Park Athletics and Cycle Track Referral by Proponent

I am writing to you to submit the above project for determination of assessment by the Environmental Protection Agency.

As outlined in the information provided, the above project design began in 1999, and has continued development over the past 4 years. In this time, the proposed athletics facility has been reduced in size to minimise the potential impacts upon the surrounding environment, and no longer includes an area for archery as it had initially.

The Sportsgrounds Development Committee (SGDC) have progressed this proposal as it is felt that this is the ideal location for the athletics and cycle track. The area that has been identified for the project is centrally located within the major sporting grounds for the Greater Bunbury Region, is adjacent to the South West Sports Centre, and is also within close proximity to the South West Regional Health and Edith Cowan University Campuses. Over time, the numerous clubs that would be based from these facilities hope to conduct international level competitions in cycling, triathlons and athletics.

This entire reserve (30601) that contains this site has been identified as containing two (2) Threatened Ecological Communities, namely SCP08 and SCP18. SCP08 is located within 50m of the proposed tracks. The site is identified as a Conservation category wetland by the Department of Environment.

The City of Bunbury would like to progress this project. As a result, I am referring this proposal to the EPA for assessment. Please find attached the completed Referral document, an Environmental Impact Assessment completed by GHD Pty Ltd in 2005, and a Flora survey also completed by GHD in 2003.

Should you require any further information, please do not hesitate to contact me on (08) 9780 217.

Yours faithfully

Bill Carlsen
RECREATION PLANNER



**Referral of a Proposal to the Environmental Protection Authority under Section 38(1) of the Environmental Protection Act.
Referral by the Proponent**

PURPOSE OF THIS FORM

Section 38(1) of the *Environmental Protection Act 1986* provides that where a development proposal is likely to have a significant effect on the environment, a proponent may refer the proposal to the Environmental Protection Authority (EPA) for a decision on whether or not it requires assessment under the Act.

A referral to the EPA by a proponent under Section 38(1) must be made on this form.

Before completing this form, proponents are encouraged to familiarise themselves with the EPA's *General Guide for Referral of Proposals to the EPA under section 38(1) of the EP Act 1986* (accessed at the EPA's website at www.epa.wa.gov.au or by contacting the EPA on 9222 7186).

Proponents need to complete Parts A and B of the form by marking the appropriate boxes and providing explanatory or additional information where requested. Part B should be completed based on information known to the proponent. Only those sections of Part B that are pertinent to the proposal need to be completed. If space is insufficient, attach additional pages. Where information is contained in a report that is to be submitted with the referral form, the proponent may complete sections of the form by referring to the pertinent section of the report.

Proponents are encouraged to attach any other environmental information they consider may be relevant to the EPA for making a decision on whether or not to assess the proposal, and, if it is to be assessed, the level of assessment. In general, referrals should contain information on the potential environmental impacts of the proposal, the proposed management mechanisms to be implemented to minimise and mitigate for these impacts, and how the principles of the EP Act have been addressed by the proposal.

In addition to providing a hard copy of referral documentation, proponents are also requested to provide an electronic copy of the referral document, noting that section 39(2) of the EP Act provides for a proponent to request that matters of a confidential nature not be kept on the public record. If confidential matters are included in the referral, proponents are requested to submit this information in a separate hard copy attachment to the referral document. The electronic copy of the referral should be identical to the hard copy of the referral document, excluding any confidential attachment.

You may need to contact government agencies or local authorities to obtain information required by this form. A list of key agencies and their contact details is provided in Attachment 1.

Where the EPA decides that a proposal will be assessed at the level of Public Environmental Review or Environmental Review and Management Programme, it will also require the proponent to prepare an Environmental Scoping Document (refer *Environmental Impact Assessment (Part IV Division 1) Administrative Procedures 2002*).

Proponents should also be aware of the need to determine their obligations under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act is separate legislation to the Environmental Protection Act and it identifies a number of matters of national environmental significance which are subject to assessment and approval by the Commonwealth. The matters identified as triggers for the Commonwealth assessment and approval regime are World Heritage properties, Ramsar wetlands, nationally threatened species and ecological communities, migratory species, Commonwealth marine areas, and nuclear actions (refer to the Department of Environment and Heritage's website at www.deh.gov.au). Questions in this referral form that may be relevant to matters of national environmental significance are marked with a #.

PART A - PROPONENT AND PROPOSAL INFORMATION

1. PROPONENT DETAILS, PROPOSAL DESCRIPTION AND LOCATION

1.1 Proponent information

- Proposal title
Athletics Facility Hay Park
- Name of proponent (Person or entity proposing to implement the proposal)
City of Bunbury
- Address of proponent
PO Box 500, Bunbury WA 6231
- Key contact for the proposal
(Name address and phone/facsimile number and email address. The contact may be a consultant, if one is being used)
Bill Carlsen
City of Bunbury
PO Box 500
Bunbury WA 6231
Phone (08) 97 808 222
BillC@bunbury.wa.gov.au
- Does the proponent own the land on which the proposal is to be established? If not, what other arrangements have been established to access the land?
Yes.
- Is rezoning of any land required before the proposal can be implemented?
(please tick) Yes **If yes, please provide details.**
 No
- Is approval required from any Commonwealth or State Government agency or Local Authority for any part of the proposal?
 Yes X No **If yes, name all Agencies and Local Authorities from which any approval is required.**
Not at this point, may require approvals at a later date.
- If yes above, have you lodged any of the necessary applications or have you discussed the proposal with any person(s) at the Agency or Local Authority?
 Yes No **If yes, name all Agencies and Local Authorities for which applications have been submitted or with whom the proposal has been discussed.**
- What is the current land use on the property, and the extent (area in hectares) of the property?
Bushland / Open Space. Total area of bushland is 50ha.

1.2 Proposal Description *(Please attach extra pages where necessary)*

- Provide a description of the proposal.

The proposal is for development of an athletics track and cycling track within the bushland adjacent to the existing Bunbury Recreation Centre including clubrooms, to house a number of sporting groups. An aerial and map indicating the proposed location of all infrastructures is attached.

- What is the proposed ultimate extent (area in hectares) of the activity?
4 ha.
- Provide the timeframe in which the activity or development is proposed to occur. (Include start and finish dates where applicable)
2006 - 2010
- Provide details of any staging of the proposal.
- Indicate whether, and in what way, the proposal is related to other proposals in the region.

The proposal is related to development of sporting facilities within the City of Bunbury to allow many sporting groups and activities to be located within the one place. This will enable triathlons, running meets, athletics, cycling, mountain bike competitions and a number of other activities to be run from the same venue.

1.3 Location information

- Please provide proposal location details in one of the following two ways:
EITHER
 - a) Electronic spatial data (preferred)
 - GIS or CAD on CD, depicting the proposal extent, geo-referenced and conforming to the following parameters:
 - datum: GDA94
 - projection: Geographic (latitude/longitude) or Map Grid of Australia (MGA)
 - format: Arcview shapefile, Arcinfo coverages, Microstation or AutoCAD.
 - OR
 - b) Maps and/or directions (if no electronic spatial data is available)
Any maps or diagrams of the proposal, together with the following directions:
 - for urban areas: street address, lot number, the suburb and nearest road intersection;
 - for remote localities: the nearest town, together with distance and direction from that town to the proposal site.

Please also attach the following map/plans, clearly showing the location of the development in its regional and local context.

❖ **Locality plan – Broad Scale**

Provide a locality plan (preferably superimposed on an aerial photograph) to identify:

- proposed development site and any associated infrastructure
- main roads
- urban centres
- wetlands and watercourses
- remnant native vegetation

- adjoining land uses (including recreation)
- sensitive marine areas

❖ **Site Plan – Proposal Details**

Provide a site plan to scale and indicate the location of:

- lot boundaries
- road frontages
- extent of the proposed development area
- extent of the proposed buffer area (if applicable)

❖ **Site Plan – Existing Environment**

Provide a site plan to scale (the same scale as above) and indicate the location of:

- lot boundaries
- road frontages
- any information required to be shown from Section 2.2 of this form
- extent of native vegetation of the site (the extent of overlap between the proposed development area and the area of native vegetation must be highlighted)
- extent of hydrological features on the site (this includes wetlands, watercourses, creek lines, seasonal creeks and artificial drainage lines)
- sensitive marine areas

PART B - ENVIRONMENTAL IMPACTS AND MANAGEMENT COMMITMENTS

2. ENVIRONMENTAL IMPACTS

Describe the impacts of the proposal on the following elements of the environment, through the questions below:

- (i) flora and vegetation #;
- (ii) fauna #;
- (iii) rivers, creeks, wetlands and estuaries;
- (iv) significant areas and/or land features;
- (v) coastal zone areas;
- (vi) marine areas and biota #;
- (vii) water supply and drainage catchments;
- (viii) pollution;
- (ix) greenhouse gas emissions;
- (x) contamination;
- (xi) social surroundings; and
- (xii) risk.

These features should be shown on the site plan, where appropriate)

For all information, please provide:

- (a) the source of the information; and
- (b) how recent the information is.

2.1 Flora and Vegetation

- Do you propose to clear any native flora and vegetation as a part of this proposal?

(A proposal to clear native vegetation may require a clearing permit under Part V of the EP Act (*Environmental Protection (Clearing of Native Vegetation) Regulations 2004*). Please contact the Department of Environment for more information.

(please tick) Yes ***If yes, complete the rest of this section***
 No ***If no, go to the next section***

- How much vegetation are you proposing to clear (in hectares)?

2.29 ha

- Have you submitted an application to clear native vegetation to the Department of Environment (unless you are exempt from such a requirement)?

Yes No **If yes, on what date and to which office was the application submitted of the Department of Environment?**

- Are you aware of any recent flora surveys carried out over the area to be disturbed by this proposal?

Yes No **If yes, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey/s. (If no, please do not arrange to have any biological surveys conducted prior to consulting with the DoE.)**

GHD Pty Ltd, October 2003, Anna Napier, Senior Ecologist, Copy attached.

- Has a search of CALM records for known occurrences of rare or priority flora or threatened ecological communities been conducted for the site? #

Yes No **If you are proposing to clear native vegetation for any part of your proposal, a search of Department of Conservation and Land Management (CALM) records of known occurrences of rare or priority flora and threatened ecological communities will be required. Please contact the Como office of CALM for more information.**

- Are there any known occurrences of rare or priority flora or threatened ecological communities on the site? #

Yes No **If yes, please indicate which species or communities are involved and provide copies of any correspondence with CALM regarding these matters.**

SCP08 and SCP18 are located within close proximity to the proposal area. See attached EIA and Flora survey for details.

- If located within the Perth Metropolitan Region, is the proposed development within or adjacent to a listed Bush Forever Site? (You will need to contact the Bush Forever Office, at the Department for Planning and Infrastructure)

Yes No **If yes, please indicate which Bush Forever site is affected (site number and name of site where appropriate).**

- What is the condition of the vegetation at the site?

Considered in good condition by Anna Napier, Senior Ecologist at GHD.

2.2 Fauna

- Do you expect that any fauna or fauna habitat will be impacted by the proposal?
(please tick) Yes ***If yes, complete the rest of this section***
 No ***If no, go to the next section***

- Describe the nature and extent of the expected impact.

2.29 ha of cleared vegetation.

- Are you aware of any recent fauna surveys carried out over the area to be disturbed by this proposal?

Yes No ***If yes, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey/s. (If no, please do not arrange to have any biological surveys conducted prior to consulting with the DoE.)***

CALM Threatened Species and Communities Unit conducted a site inspection in 2002 and indicated that there was evidence of Southern Brown Bandicoot.

- Has a search of CALM records for known occurrences of Specially Protected (Threatened) fauna been conducted for the site?

Yes No (please tick)

Results are within the attached EIA.

- Are there any known occurrences of Specially Protected (Threatened) fauna on the site? #

Yes No ***If yes, please indicate which species or communities are involved and provide copies of any correspondence with CALM regarding these matters.***

Most likely evidence of Southern Bron Bandicoot as indicated by CALM.

2.3 Rivers, Creeks, Wetlands and Estuaries

- Will the development occur within 200m of a river, creek, wetland or estuary?
(please tick) Yes ***If yes, complete the rest of this section***
 No ***If no, go to the next section***

- Will the development result in the clearing of vegetation within the 200 m zone?
 Yes No ***If yes, please describe the extent of the expected impact.***

Site has been identified as a Conservation Category Wetland. The clearing will be on the fringe of the wetland area.

- Will the development result in the filling or excavation of a river, creek, wetland or estuary?
 Yes No ***If yes, please describe the extent of the expected impact.***

A small amount of clean fill will be required for the development of the tracks. Buildings are to be established in areas already cleared.

- Will the development result in the impoundment of a river, creek, wetland or estuary?
 Yes No ***If yes, please describe the extent of the expected impact.***

- Will the development result in draining to a river, creek, wetland or estuary?
 Yes No **If yes,** please describe the extent of the expected impact.
- Are you aware if the proposal will impact on a river, creek, wetland or estuary (or its buffer) within one of the following categories? (please tick)

| | | | |
|--|---|--|--|
| Conservation Category Wetland | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unsure |
| Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy 2004 | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> Unsure |
| Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998 | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> Unsure |
| Perth's Bush Forever site | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | <input type="checkbox"/> Unsure |
| Environmental Protection (Swan & Canning Rivers) EPP 1998 | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | <input type="checkbox"/> Unsure |
| The management area as defined in s4(1) of the Swan River Trust Act 1988 | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | <input type="checkbox"/> Unsure |
| Which is subject to an international agreement, because of the importance of the wetland for waterbirds and waterbird habitats (e.g. Ramsar, JAMBA, CAMBA) # | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | <input type="checkbox"/> Unsure |

2.4 Significant Areas and/ or Land Features

- Is the proposed development located within or adjacent to an existing or proposed National Park or Nature Reserve?
 Yes No **If yes,** please provide details.

Identified as Regional Open Space in the Draft Greater Bunbury Regional Plan and also nominated for inclusion in the proposed Ocean to Preston River Regional Park.

- Are you aware of any Environmentally Sensitive Areas (as declared by the Minister under section 51B of the EP Act) that will be impacted by the proposed development?
 Yes No **If yes,** please provide details.

- Are you aware of any significant natural land features (e.g. caves, ranges etc) that will be impacted by the proposed development?
 Yes No **If yes,** please provide details.

2.5 Coastal Zone Areas (Coastal Dunes and Beaches)

- Will the development occur within 300m of a coastal area?
 (please tick) Yes **If yes, complete the rest of this section**
 No **If no, go to the next section**

- What is the expected setback of the development from the high tide level and from the primary dune?

- Will the development impact on coastal areas with significant landforms including beach ridge plain, cusped headland, coastal dunes or karst?
 Yes No **If yes**, please describe the extent of the expected impact.

- Is the development likely to impact on mangroves?
 Yes No **If yes**, please describe the extent of the expected impact.

2.6 Marine Areas and Biota

- Is the development likely to impact on an area of sensitive benthic communities, such as seagrasses, coral reefs or mangroves?
 Yes No **If yes**, please describe the extent of the expected impact.

- Is the development likely to impact on marine conservation reserves or areas recommended for reservation (as described in *A Representative Marine Reserve System for Western Australia*, CALM, 1994)?
 Yes No **If yes**, please describe the extent of the expected impact.

- Is the development likely to impact on marine areas used extensively for recreation or for commercial fishing activities?
 Yes No **If yes**, please describe the extent of the expected impact, and provide any written advice from relevant agencies (e.g. Fisheries WA).

2.7 Water Supply and Drainage Catchments

- Are you in a proclaimed or proposed groundwater or surface water protection area?
 (You may need to contact the Water and Rivers Commission (WRC) for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the WRC website)
 Yes No **If yes**, please describe what category of area.

 Site within the Bunbury Groundwater Management Area.

- Are you in an existing or proposed Underground Water Supply and Pollution Control area?
 (You may need to contact the WRC for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the WRC website)
 Yes No **If yes**, please describe what category of area.

- Are you in a Public Drinking Water Supply Area (PDWSA)?
 (You may need to contact the WRC for more information or refer to the WRC website. A proposal to clear vegetation within a PDWSA requires approval from WRC.)

Yes No **If yes**, please describe what category of area.

Bunbury Water Reserve Bunbury – Busselton Water Source Protection Plan (draft)
WRP 43. Area is within a P3 protection zone.

- Is there sufficient water available for the proposal?

(Please consult with the WRC as to whether approvals are required to source water as you propose. Where necessary, please provide a letter of intent from the WRC)

Yes No (please tick)

- Will the proposal require drainage of the land?

Yes No **If yes**, how is the site to be drained and will the drainage be connected to an existing Local Authority or Water Corporation drainage system? Please provide details.

- Is there a water requirement for the construction and/ or operation of this proposal?

(please tick) Yes **If yes, complete the rest of this section**
 No **If no, go to the next section**

- What is the water requirement for the construction and operation of this proposal, in kl/year?

- What is the proposed source of water for the proposal? (eg dam, bore, surface water etc.)

2.8 Pollution

- Is there likely to be any discharge of pollutants from this development, such as noise, vibration, gaseous emissions, dust, liquid effluent, solid waste or other pollutants?

(please tick) Yes **If yes, complete the rest of this section**
 No **If no, go to the next section**

- Is the proposal a prescribed premise, under the Environmental Protection Regulations?
(Refer to the EPA *General Guide for Referral of Proposals to the EPA under section 38(1) of the EP Act 1986* for more information)

Yes No **If yes**, please describe what category of prescribed premise.

- Will the proposal result in gaseous emissions to air?

Yes No **If yes**, please briefly describe.

- Have you done any modelling or analysis to demonstrate that air quality standards will be met, including consideration of cumulative impacts from other emission sources?

Yes No **If yes**, please briefly describe.

- Will the proposal result in liquid effluent discharge?
 Yes No **If yes**, please briefly describe the nature, concentrations and receiving environment.
- If there is likely to be discharges to a watercourse or marine environment, has any analysis been done to demonstrate that the State Water Quality Management Strategy or other appropriate standards will be able to be met?
 Yes No **If yes**, please describe.
- Will the proposal produce or result in solid wastes?
 Yes No **If yes**, please briefly describe the nature, concentrations and disposal location/ method.
- Will the proposal result in significant off-site noise emissions?
 Yes No **If yes**, please briefly describe.
- Will the development be subject to the Environmental Protection (Noise) Regulations?
 Yes No **If yes**, has any analysis been carried out to demonstrate that the proposal will comply with the Regulations?
Please attach the analysis.
- Does the proposal have the potential to generate off-site, air quality impacts, dust, odour or another pollutant that may affect the amenity of residents and other "sensitive premises" such as schools and hospitals (proposals in this category may include intensive agriculture, aquaculture, marinas, mines and quarries etc.)?
 Yes No **If yes**, please describe and provide the distance to residences and other "sensitive premises".
- If the proposal has a residential component or involves "sensitive premises", is it located near a land use that may discharge a pollutant?
 Yes No Not Applicable **If yes**, please describe and provide the distance to the potential pollution source

2.9 Greenhouse Gas Emissions

- Is this proposal likely to result in substantial greenhouse gas emissions (greater than 100 000 tonnes per annum of carbon dioxide equivalent emissions)?
 Yes No **If yes**, please provide an estimate of the annual gross emissions in absolute and in carbon dioxide equivalent figures.
- Further, if yes, please describe proposed measures to minimise emissions, and any sink enhancement actions proposed to offset emissions.

2.10 Contamination

- Has the property on which the proposal is to be located been used in the past for activities which may have caused soil or groundwater contamination?
 Yes X No Unsure **If yes, please describe.**
- Has any assessment been done for soil or groundwater contamination on the site?
 Yes X No **If yes, please describe.**
- Has the site been registered as a contaminated site under the Contaminated Sites Act 2003? (on finalisation of the CS Regulations and proclamation of the CS Act)
 Yes X No **If yes, please describe.**

2.11 Social Surroundings

- Is the proposal on a property which contains or is near a site of Aboriginal ethnographic or archaeological significance that may be disturbed?
 Yes X No Unsure **If yes, please describe.**
- Is the proposal on a property which contains or is near a site of high public interest (for example, a major recreation area or natural scenic feature)?
X Yes No **If yes, please describe.**
- Adjacent to the Bunbury Recreation Centre and Hay Park Sports Grounds.
- Will the proposal result in or require substantial transport of goods, which may affect the amenity of the local area?
 Yes X No **If yes, please describe.**

2.12 Risk

- Is the proposal located near a hazardous industrial plant or high-pressure gas pipeline?
 Yes X No **If yes, please describe.**
- Does the proposal have the potential to generate off-site risk?
 Yes X No **If yes, will the proposal be a major hazardous facility regulated under the *Explosives and Dangerous Goods Act*?**

3. MANAGEMENT

3.1 Principles of Environmental Protection

- Have you considered how your project gives attention to the following Principles, as set out in section 4A of the EP Act? (For information on the Principles of Environmental Protection, please see EPA Position Statement No. 7, available on the EPA web.)

- | | | |
|--|------------------------------|-----------------------------|
| 1. The precautionary principle. | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. The principle of intergenerational equity. | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. The principle of the conservation of biological diversity and ecological integrity. | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Principles relating to improved valuation, pricing and incentive mechanisms. | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. The principle of waste minimisation. | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

- Is the proposal consistent with the EPA's Position Statements (available on the EPA web)?
 Yes No

Not consistent with EPA's Position Statement 2 "Environmental Protection of Native Vegetation in Western Australia", see further notes in EIA attached.

3.2 Management Commitments

- How has the proposal been developed to avoid, minimise and manage potential impacts? Please describe any specific commitments you make as the proponent to minimising the potential environmental impacts of this development.

Redesigned the project to minimise impacts on vegetation. New design ensures that all buildings required are within already cleared areas. The athletics track has been orientated to minimise the amount of vegetation to be cleared, and all vegetation within the tracks is to be retained.

3.3 Consultation

- Has public consultation taken place (such as with other government agencies, community groups or neighbours), or is it intended that consultation shall take place?

Yes No **If yes**, please list those consulted and attach comments or summarise response on a separate sheet.

Please see section in the Environmental Impact Assessment regarding public consultation to date. This includes a summary of consultation to date including those contacted and comments.

CHECKLIST AND DECLARATION

| Before you submit this form, have you: | YES | NO |
|--|--------------------------|--------------------------|
| Completed all the questions on this form? | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you attached any extra information, such as: | | |
| Site plans? | <input type="checkbox"/> | <input type="checkbox"/> |
| Detailed explanations? | <input type="checkbox"/> | <input type="checkbox"/> |
| Comments obtained during consultation? | <input type="checkbox"/> | <input type="checkbox"/> |
| Have you included any electronic information, such as: | | |
| A CD of the referral and documentation, in PDF format, excluding any confidential information? | <input type="checkbox"/> | <input type="checkbox"/> |
| A CD of the spatial data? | <input type="checkbox"/> | <input type="checkbox"/> |
| Any other relevant information? | <input type="checkbox"/> | <input type="checkbox"/> |

Following a review of the information presented in this form, please consider the following question. (Your response is Optional)

DO YOU CONSIDER THE PROPOSAL REQUIRES FORMAL ENVIRONMENTAL IMPACT ASSESSMENT?
(Information on the levels of environmental impact assessment is available on the EPA website at www.epa.wa.gov.au)

YES NO NOT SURE

IF YES, WHAT LEVEL OF ASSESSMENT?

ASSESSMENT ON REFERRAL INFORMATION

ENVIRONMENTAL PROTECTION STATEMENT

PUBLIC ENVIRONMENTAL REVIEW

ENVIRONMENTAL REVIEW AND MANAGEMENT PROGRAMME

STRATEGIC ENVIRONMENTAL ASSESSMENT

I, (full name) declare that I have completed all of the questions in this form and attached the requested information and declare that the information contained in this form is, to my knowledge, true and not misleading.

| | |
|-----------|----------------------|
| Signature | <input type="text"/> |
| Name | <input type="text"/> |
| Position | <input type="text"/> |
| Date | <input type="text"/> |

Environmental Protection Authority
Westralia Square
Level 8 141 St Georges Tce
PERTH WA 6000

Please mail completed referrals to:
Postal address:
PO Box K822
PERTH WA 6842
Website: www.epa.wa.gov.au

EPA Service Unit
Westralia Square
Levels 8 & 9 141 St Georges Tce
PERTH WA 6000

Telephone: (08) 9222 7000
Facsimile :(08) 9322 1598
Website: www.environment.wa.gov.au

Contact details for the head offices of the primary agencies involved in development proposals follow. You may need to contact your relevant district or regional office (details of all State Government agencies are available on the website of the Department of the Premier and Cabinet, www.dpc.wa.gov.au). You will also need to contact your Local Government Authority in the first instance. For some proposals, consultation with or referral to Commonwealth agencies may be required.

Department of Environment
Westralia Square
Level 8 141 St Georges Tce
Perth WA 6000

For Licensing under Part V -
Telephone: (08) 9222 7000
Website: www.environment.wa.gov.au

Hyatt Centre
3 Plain St
East Perth WA 6004

For Clearing Permit under Part V -
Telephone: (08) 9278 0300
Website: www.environment.wa.gov.au

Water and Rivers Commission
Hyatt Centre
3 Plain St
East Perth WA 6004

Telephone: (08) 9278 0300
Website: www.environment.wa.gov.au

Department of Industry & Resources
The Atrium
168 St George's Terrace
Perth WA 6000

Telephone: (08) 9327 5555
Website: www.doir.wa.gov.au

Mineral House
100 Plain St
East Perth WA 6004

Telephone: (08) 9327 5555
Website: www.doir.wa.gov.au

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City of Bunbury

**Hay Park Athletics and Cycle
Track Proposal**

Environmental Impact Assessment

June 2005



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Executive Summary

GHD Pty Ltd (GHD) was commissioned by the City of Bunbury, in June 2005, to prepare an Environmental Impact Assessment for the proposed Hay Park Athletics and Cycle track development. The proposed development includes an eight-lane athletics track and a landscaped road and mountain bike and walk trail.

This EIA has been prepared congruent with the City of Bunbury brief and:

- Describes the significant aspects of the existing project environment and
- Details the primary environmental and social impacts of the proposed works.

Owing to the nature of the proposed development it is considered unlikely that Acid Sulphate Soils will present a significant constraint. Acid Sulphate Soils have been identified as a moderate likelihood of occurring at greater than 3m depth, according to the Department of Planning and Infrastructure Guidelines (WAPC, 2005).

Palusplain and dampland are located within the project area. The vegetated area of the study site has been given a wetland classification of 'Conservation' by the Waters and Rivers Commission and the palusplain and dampland are listed under the *Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy 2004* and are likely to be impacted upon by the project.

It is estimated that the proposed developed would require up to 2.29 ha of vegetation clearing to occur.

The vegetation of Hay Park does not fit the description of the Yoongarillup Complex, within which it is mapped (Heddle *et al.*, 1980). It appears to be more closely aligned with the Southern River complex, which is mapped further to the east. Due to its uniqueness, in the Bunbury area the site vegetation cannot be easily given a level of significance in relation to regional vegetation complexes. However, in the context of mapped vegetation complex closest to it in type, it can be determined that it is likely to be poorly represented (GHD, 2003).

A Flora Study of the project site was conducted in 2003 and indicated that the vegetation can be broadly divided into two types – a shrub dominated dampland and a tree dominated dampland. The vegetation of the survey site was generally in good to excellent condition, with ratings of between 1 (Pristine) and 3 (Very Good) on the Bush Forever Vegetation Rating Scale (Government of Western Australia, 2000).

None of the Declared Rare and Priority Flora species listed as potentially occurring within the project area were identified during the 2003 vegetation survey.

A search of CALM's threatened ecological communities (TEC) database identified the occurrence of two TEC types, SCP08 and SCP18, in close proximity to the project area. According to CALM's TEC database two occurrences of the threatened community SCP08 are known to exist approximately 45 to 50 m east of the proposed cycle track.



Neither of the two TEC's was apparent in the area surveyed during the flora assessment on the 1st October 2003. However, as a result of the 2003 vegetation survey it was noted that the Hay Park vegetation is poorly conserved in the Greater Bunbury Region. Furthermore, the intactness of the shrub and herb layer is rare and there is considerable diversity of species in a small area (GHD, 2003).

There may be potential habitat for the Western Ringtail Possum (*Pseudocheirus occidentalis*) although no survey for this species has been conducted to date. A survey for this species may need to be to confirm the impact of the proposal on this schedule 1 species. The Western Ringtail Possum is also listed as a species of National Environmental Significance and as such will trigger the *Environmental Protection and Biodiversity of Conservation Act 2002* if found to be present.

Evidence of the Priority five (conservation dependent) species Quenda or Southern Brown Bandicoot (*Isodon obesulus fusciventer*) was also observed within the project area, during a 2002 CALM site inspection.

No declared weeds were observed within the survey area, during the 2003 flora survey.

The flora survey conducted in 2003 included a visual dieback assessment. The vegetation of the entire site was in good to excellent condition at this time and there was no evidence of dieback.

No Aboriginal heritage sites were identified within the project area from a search of the Department of Indigenous Affairs register.

No places listed on the National, Commonwealth, World Heritage Lists or the Register of National Estate is situated in the vicinity of the project area.

One site, listed by the Heritage Council of Western Australia, was identified as being within the near vicinity of the project area.

The project area is within a 'C' Class Reserve (R30601) currently zoned for recreation and vested within the City of Bunbury. The project area has been identified as Regional Open Space in the Draft Greater Bunbury Regional Scheme (1999) and has also been considered by the Proposed Ocean to Preston River Regional Park Technical Advisory Committee as a significant site worthy of possible inclusion into the regional park network.

As the surrounding landuse is currently zoned and used for recreation, an increase in noise as a result of this proposal is unlikely to cause a significant issue.

No contaminated sites were identified within the project during the preparation of this EIA.

Following the results of a field survey to determine the presence of the Western Ringtail Possum within the project area, the project may require referral to the Commonwealth Minister for the Environment and Heritage under the provisions of the *Environmental Protection and Conservation Biodiversity Act 1999*.



The project area appears to be environmentally significant and would warrant formal referral to the Environmental Protection Authority under the provisions of the *Environmental Protection Act (1986)*.

The recently enacted *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* stipulate that a 'clearing permit' is required in order to lawfully undertake any clearing of native vegetation. However, the significance of remnant native vegetation in the project area may prompt the EPA to formally assess the project, which in turn would negate the need to acquire a clearing permit.



1. Introduction

GHD Pty Ltd (GHD) was commissioned by the City of Bunbury, in June 2005, to prepare an Environmental Impact Assessment for the proposed Hay Park Athletics and Cycle Track development.

For many years there has been an interest in the possible development of an international standard athletics track in which to provide first class facilities for local, regional and State athletics events. The Hay Park Development Committee have endeavoured to identify a suitable location for this facility without disrupting present sports clubs utilising Hay Park. The Hay Park Development Committee's preferred location for the athletics facility is adjacent (north) of the South West Sports Centre (SWSC) in Hay Park (Figure 1).

This EIA has been prepared congruent with the City of Bunbury brief and:

- ▶ Describes the significant aspects of the existing project environment and
- ▶ Details the primary environmental and social impacts of the proposed works.

Based on the information provided by the City of Bunbury, a previous Flora Study of the project site and a database/literature review, the environmental and social aspects considered and discussed in this EIA are:

- ▶ Acid Sulphate Soils
- ▶ Wetlands and Drainage
- ▶ Native Flora – Declared Rare and Priority Flora, Threatened Ecological Communities, vegetation clearing
- ▶ Native Fauna
- ▶ Weed Management
- ▶ *Phytophthora cinnamomi*
- ▶ Topsoil Management
- ▶ Aboriginal Heritage
- ▶ European Heritage
- ▶ Land Use
- ▶ Noise
- ▶ Contaminated Sites
- ▶ Construction Phase Impacts.

Environmental and social issues considered in this report are summarised at the Environmental Aspects Table included at Appendix A.



2. Project Description

The proposed development includes an eight-lane athletics track and a landscaped cycle track, mountain bike and walk trail. Clearing for this development is estimated to be 2.29 ha. Figure 2 shows the development plans over an aerial photograph of the site. The site is currently undeveloped and supports native remnant Melaleuca bushland.

2.1 Project Background

The proposed development of the athletics facility has been the subject of a number of discussions in the past four years.

In March 2000, the City of Bunbury sought advice from the Department of Environmental Protection (DEP) on a proposal to extend the sports facilities at Hay Park to an area east of the Hay Park Recreation Centre for the development of an athletics track and archery range. The City of Bunbury was subsequently advised of the environmental significance of this area. After consultation with user groups the proposed extensions were downsized to the athletics track and cycle track only, to be located north of the Recreation Park, in its current proposed location. The modified proposal was designed to significantly reduce the impact on natural bushland.

Advice was sought from the DEP, by the City of Bunbury, regarding this modified proposal in February 2003. The DEP advised

“that the remnant vegetation in the area of the proposed extensions is a vegetation type that is unusual and may not occur anywhere else in the Bunbury Region. Furthermore, the bushland in the vicinity of Hay Park has been the subject of considerable public concern recently. In making any decision on the proposed extensions to the sports facilities of Hay Park, the EPA will be mindful of these matters”.

At that stage, the Environmental Protection Service Unit (EPASU) considered that the proposal has potentially significant environmental impacts, which require that it be referred to the EPA pursuant to the *Environmental Protection Act 1986*.

The City of Bunbury engaged GHD in October 2003 to conduct a flora survey of the proposal site in order to provide the EPASU with information regarding the composition and structure of the vegetation.

On the 17th February 2005, the City of Bunbury hosted a workshop attended by Mr Gary Williams (EPASU) and Mrs Bronwyn Keighery (EPASU) that provided opportunity for community representatives and Councillors to ask questions of the EPASU in relation to the process, opportunities or obstacles associated with the proposed athletics facility. The Sportsground Development Committee subsequently decided not to seek formal assessment but to engage a consultant to prepare a case utilising all relevant information to date and submit this to the Chairman of the EPA for consideration and response.



City of Bunbury has engaged GHD to prepare the following Environmental Impact Assessment of the development of the proposed athletics facility, for submission and consideration by the EPA.



3. Environmental Aspects and Impacts

The following section identifies and discusses those environmental and social issues considered relevant to the project area. This section also includes those issues considered necessary to adequately describe the project site. The issues discussed are summarised in the Environmental Aspects Table at Appendix A.

3.1 Natural Environment

3.1.1 Climate

The climate of the project area is best described as Mediterranean with warm dry summers and cool wet winters. The closest Bureau of Meteorology weather-recording station to the project site is located at the Bunbury Post Office. Relevant historical climatic data for the Bunbury Post Office Station are summarised below:

Bunbury Post Office Weather Station

| | |
|---------------------------------------|--|
| Mean Annual Maximum Temperature Range | 27.8°C (February) to 16.8°C (July) |
| Mean Annual Minimum Temperature Range | 15.4°C (February) to 8.4°C (July - August) |
| Mean Annual Rainfall | 870.9 mm |
| Mean Annual Rain days per year | 119.4 |

(Source: Bureau of Meteorology – Climate Averages for Australian Sites, 2005)

3.1.2 Geomorphology, Geology and Pedology

The project area is situated on the major landform unit of the Swan Coastal Plain. Swan Coastal Plain is considered unique amongst coastal plains of the world in that it comprises two wide belts of sediment of differing origin; the eastern section of the Plain comprises sediments that are primarily alluvial in nature whilst sediments to the west were formed by aeolian processes (Seddon, 1972).

More specifically, the project area is situated upon the 'Spearwood Dune System', one of five geomorphic elements that comprise the Swan Coastal Plain. The Spearwood Dune System was formed during the Pleistocene Period, approximately 2.5 million years ago. This dune system is characterised by highly leached yellow – brown soils and has a variable topography ranging from deep sands to areas of exposed limestone or 'aeolianite core' (Seddon, 1972).

The Spearwood Dune System itself is comprised of a number of discrete 'soil units'. The project area is situated upon the 'Yoongarillup Unit', which consists of a plain of low ridges and swales of shallow yellow and brown sands over fossiliferous marine limestone (Churchward and McArthur, 1980).



3.1.3 Acid Sulphate Soils

The Western Australian Planning Commission Planning Bulletin No. 64 (WAPC, 2005) identified the likelihood of acid sulphate soil occurrence over the Swan Coastal Plain. According to the bulletin, the likelihood of encountering acid sulphate soils in the project area is for the most part of 'moderate to low risk of AASS and PASS occurring at depths generally greater than 3m'.

However, approximately 300m south of the project an area of 'High risk of actual acid sulphate soil (AASS) & potential acid sulphate soil (PASS) <3m from surface' is located. Owing to the nature of the proposed development it is considered unlikely that Acid Sulphate Soils will present a significant constraint. The majority of the works will involve fill into the site, with limited excavation works indicating that any PASS material will most likely not be disturbed.

3.1.4 Wetlands and Drainage

Wetland Considerations

The majority of the study area was classified by Hill *et al.* (1996) as palusplain, a seasonally waterlogged, poorly drained plain. A small section of the vegetated study area is dampland, which indicates a seasonally waterlogged basin (Figure 3). A small sumpland is mapped immediately west of the recreation centre building (Hill *et al.*, 1996). The vegetated area of the study site has been given a wetland classification of 'Conservation' by the Waters and Rivers Commission, with the surrounding unvegetated areas recorded as 'Multiple Use'.

No impacts are likely to result upon any wetlands listed under the current *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* as a result of the project. However, sections of the palusplain and dampland discussed above are listed under the *Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy 2004* and are likely to be impacted upon by the project (Figure 3). Although the 2004 EPP is yet to be enacted and thus carries no force of law at the present time, it is likely that the Environmental Protection Authority would consider this impact significant during any future assessment of the project.

Drainage Considerations

No drainage lines are situated within the project area.

3.1.5 Native Flora Considerations

Site Vegetation

The flora and opportunistic fauna survey of the proposed Hay Park Athletics and Cycle Track was conducted by a qualified botanist on the 7th October, 2003. A total of 75 species from 31 families were recorded from the Hay Park site (See Appendix B for complete list).

The vegetation of the survey site was generally in good to excellent condition, with ratings of between 1 (Pristine) and 3 (Very Good) on the Bush Forever Vegetation



Rating Scale (Government of Western Australia, 2000). This is despite the presence of weed species, which were most prevalent along external tracks. Tracks are areas of disturbance, and weeds, being opportunistic species, have quickly colonised and spread.

Vegetation maps produced by Heddle *et al.* (1980) indicate that the vegetation of the site belongs to the Yoongarillup Complex. However, the mapping scale is not sufficient to show localised variations and the results of the site survey were not indicative of this vegetation complex.

The dominant vegetation was woodland of *Melaleuca*, with communities distinguished from one another by the structure rather than species variation. The vegetation and species were recorded at five locations as shown at Figure 4 with opportunistic recording of other plant species. Species present in each area are given in Appendix B.

The findings from the site survey indicate that the vegetation can be broadly divided into two types – a shrub dominated dampland and a tree dominated dampland.

Shrub-dominated dampland: This area is located in the centre of the study area, probably reflecting the lowest landform or perhaps shallower sands over a hardpan. It consists of a species-rich heath with a scattered tree layer.

Tree stratum: Very open woodland of *Melaleuca raphiophylla* and *Melaleuca preissiana*.

Shrub stratum: Open shrubland to 1m including *Hypocalymma angustifolium*, *Acacia saligna*, *Daviesia physodes*, *Dampiera linearis*, *Xanthorrhoea ?brunonis*, and *Pimelea imbricata*.

Herb/sedge stratum: Dense herbland / sedgeland to 0.5 m consisting primarily of *Lepidosperma spp*, *Gahnia trifida*, *Patersonia occidentalis* and *Conostylis aculeata*.

Tree-dominated dampland: This type appears to exist along the eastern and western sides of the survey area, where the ground is very slightly higher, or the overlying soil, deeper.

Tree stratum: Moderately dense woodland of *Melaleuca raphiophylla*, *Eucalyptus rudis* and *Banksia littoralis*.

Shrub stratum: Occasional thickets of *Kunzea recurva* with scattered *Daviesia inflata*, *Hakea varia* and *Hypocalymma angustifolium*.

Herb/sedge stratum: A moderately dense layer to 0.6m with a range of herb and sedge species similar to the shrub-dominated area. A range of orchid species occur in this stratum.

Details of the vegetation at representative sites within the survey area are given below. A condition rating is given based on the Bush Forever Vegetation Condition Scale (Government of Western Australia, 2000) of 1 to 6, where Condition 1 indicates pristine condition and Condition 6 is essentially devoid of native vegetation. A full description of the Scale is found at Appendix C.



Area 1

Area 1 comprised of woodland to low woodland of scattered *Melaleuca raphiophylla* and *Banksia littoralis* trees over a lower tree layer of *Acacia saligna* and *Melaleuca radula* (introduced to the area). Shrubs and sedges were also present, and included *Lepidosperma sp*, *Melaleuca preissiana* and *Hakea varia*. Weed species (flatweed, wild oats and veldt grass) were common along the tracks, where the vegetation was in poorer condition. Away from the tracks, the condition of the vegetation was very good, being 1 or 2 on the Bush Forever Vegetation Condition Scale.

Area 2

This section comprised of *Melaleuca raphiophylla* woodland over sedges (*Lepidosperma sp*) and some larger shrubs. The woodland appears to have been burnt in the last two years, with regrowth apparent in the shrub and herb layer. This includes *Hypocalymma angustifolium*, *Scaevola pilosa*, *Patersonia sp*. Swamp form, *Conostylis aculeata* and *Dampiera linearis*. While four weed species were recorded in the survey of this area, the woodland is in good condition (2 or 3 on the Bush Forever Vegetation Condition Scale), and the weeds are not dominant.

Area 3

Scattered *Melaleuca preissiana* and *M. raphiophylla* woodland was present in Area 3. In places, sedges dominated the understorey, with four species of *Lepidosperma* present. Shrubs and herbs dominated in other places with *X. gracilis*, *Hypocalymma angustifolium*, *Daviesia inflata*, several species of *Drosera*, and members of the *Liliaceae* common. The vegetation was in excellent condition, and has been assigned a condition rating of 1 to 2 on the Bush Forever Vegetation Condition Scale. While some weeds were present, these were scattered and have not replaced any of the native species.

Area 4

This area consists of open woodland of *Melaleuca raphiophylla* and *M. preissiana* over an understorey of sedges, grasses and *Xanthorrhoea gracilis*. Herbs, including a number of orchid species, intersperse this understorey. Densities of tree species vary, with high densities on the very slightly higher ground close to Bussell Highway, and trees becoming more scattered on lower ground. The denser woodland includes *Banksia littoralis*, and a small *Kunzea* thicket over scattered sedges and some herbs is located in the southwest of this area. The condition of this thicket is very good (1 or 2 on the Bush Forever Vegetation Condition Scale), and that of the surrounding *Melaleuca* woodland was good (3 on the Bush Forever Vegetation Condition Scale). Weeds were common close to tracks (areas of disturbance), but not prolific or a threat to the bushland integrity elsewhere.

Area 5

A moderately dense woodland of *Melaleuca raphiophylla*, *Eucalyptus rudis* and *Banksia littoralis* with the occasional *Kunzea* and *Acacia saligna*, covers most of this area. The understorey is composed of sedges and a range of herbaceous species. Close to the wide track at in the south-west of the area is a dense semi-open shrub



and herbland, including *Philothea spicatum*. The condition of the vegetation is excellent, with a rating of 1 on the Bush Forever Vegetation Condition Scale. Weed species were almost totally absent from this area.

Threatened Flora

The Department of Conservation and Land Management's Wildlife branch was engaged on the 6th of April 2005 to perform a search of the Department's own threatened flora database and that of the Western Australian Herbarium. This investigation determined that within a ten-kilometre radius of the project, 12 threatened flora species have been previously recorded (Appendix D).

It should be noted that three recorded occurrences of the Priority four species *Caladenia speciosa* occur within one kilometre of the project.

None of the species listed, including *Caladenia speciosa*, were identified within the project area during the 2003 vegetation survey. Several of the listed species could potentially be found at the site, as their preferred habitat is similar to that at the site.

Threatened Ecological Communities

The Department of Conservation and Land Management's WA Threatened Species and Communities Unit was engaged on the 6th of April 2005 to perform a search of the Department's threatened ecological community database. This investigation revealed that the following threatened ecological communities are situated in close proximity to the project area:

- ▶ SCP08: Herb rich shrublands in clay pans – herbs dominate these communities, with the upper tree and shrub storeys almost non-existent (Gibson *et al.*, 1994), and
- ▶ SCP18: Shrublands on calcareous sites of the Swan Coastal Plain – these shrublands do not have any tree storey, but are composed solely of shrubs over herbs and sedges (Gibson *et al.*, 1994).

According to CALM's Threatened Ecological Communities database two occurrences of the threatened community SCP08 are known to exist approximately 45 to 50 m east of the proposed cycle track. A third occurrence of this community type is known to exist south of an existing track, linking Bussell Highway and the South West Sports Centre, approximately 190 m from the project site. Two occurrences of the threatened community, SCP18, are known approximately 450 m and 680 m south of the project area.

Neither of these two communities was apparent in the area surveyed during the flora assessment on the 1st October 2003. The vegetation of the site was predominantly Melaleuca woodland of varying density, with the addition of *Banksia littoralis* and *Eucalyptus rudis* and Kunzea thicket. The species composition at the site was quite different from that of SCP18 and SCP08, as detailed in Gibson *et al.* (1994).

However, as a result of the 2003 vegetation survey it was noted that the Hay Park vegetation is poorly conserved in the Greater Bunbury Region. Furthermore, the intactness of the shrub and herb layer is rare and there is considerable diversity of species in a small area (GHD, 2003).



Remnant Vegetation Significance and Clearing Impact

It is estimated that the proposed developed would require up to 2.29 ha of vegetation clearing to occur.

As discussed in the 2003 flora survey report, the vegetation of Hay Park does not fit the description of the Yoongarillup Complex, within which it is mapped. It appears to be more closely aligned with the Southern River complex, which is mapped further to the east. The Hay Park vegetation is therefore unusual in its location, being relatively close to the coast, and particularly unusual in the diversity of shrub and herb species present. Due to its uniqueness, in the Bunbury area the site vegetation cannot easily be compared to regional vegetation complexes.

However, in the context of the mapped vegetation complex closest to it in type, it can be determined that it is likely to be poorly represented (GHD, 2003).

The Southern River Complex vegetation is represented by an estimated 21% remaining in the Greater Bunbury Region. Only 6% of this vegetation complex is conserved under secure tenure in the Greater Bunbury Region and only 8% remains on the entire Swan Coastal Plain (EPA, 2002). This is primarily because damp lands were sought after for summer pasture areas and were therefore cleared, either directly or by continued grazing (GHD, 2003).

The WA EPA has established through Position Statement No. 2. (Environmental Protection of Native Vegetation in Western Australia), that the 'threshold level' below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type.

As can be seen, less than 30% of the pre-European extent of the Southern River Complex remains i.e. historical clearing of this vegetation complex has exceeded the EPA's recommendations. Hence, any future clearing of this vegetation complex is likely to be opposed by the EPA and may thus warrant referral of the project.

The recently enacted *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* stipulate that a 'clearing permit' is required in order to lawfully undertake any clearing of native vegetation. However, the significance of remnant native vegetation in the project area may prompt the EPA to formally assess the project, which in turn would negate the need to acquire a clearing permit.

3.1.6 Native Fauna Considerations

The Department of Conservation and Land Management's Wildlife branch was engaged on the 20th of April 2005 to perform an investigation of the Department's threatened fauna database. This investigation determined that within the Greater Bunbury Region 15 threatened fauna species have been previously recorded (Appendix E). Of these species, seven are listed as 'Schedule 1 – Fauna that is rare or is likely to become extinct' under the *Wildlife Conservation (Specially Protected Fauna) Notice 2004* and each of these has been discussed further in Appendix E.

The vegetation of the project area does not readily fit the habitat requirements of the six of the seven listed 'Schedule 1' species. Within the vegetation of the north west



section of the project site (Area 1 in the 2003 Flora Survey) Peppermint (*Agonis flexuosa*) was recorded. This may be potential habitat for the Western Ringtail Possum (*Pseudocheirus occidentalis*) although no survey for this species has been conducted to date. A survey for this species may need to be conducted to confirm the impact of the proposal on this schedule 1 species. The Western Ringtail Possum is also listed as a species of National Environmental Significance and as such may trigger the Commonwealth *Environmental Protection and Biodiversity of Conservation Act 2002* if found to be present.

CALM's Threatened Species and Communities Unit conducted a site inspection in 2002 and indicated that there was evidence of the Priority five (conservation dependent) species Quenda or Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) within the project area.

3.1.7 Weed Management

A total of sixteen weed species were recorded within the project area, during the 2003 flora survey. These included:

- ▶ *Avena sp.* (Wild Oat)
- ▶ *Briza minor* (Shivery grass)
- ▶ *Briza maxima* (Blowfly grass)
- ▶ *Cynodon dactylon* (couch)
- ▶ *Dittrichia graveolens* (Stinkwort)
- ▶ *Ehrharta calycina* (Veldt Grass)
- ▶ *Hypochaeris radicata* (Flatweed)
- ▶ *Lattuca serriola*
- ▶ *Oxalis prescaprae* (Soursob)
- ▶ *Oxalis glabra*
- ▶ *Pelargonium capitatum* (Rose Pelargonium)
- ▶ *Pennisetum clandestinum* (Kikuyu)
- ▶ *Romulea rosea* (Guildford Grass)
- ▶ *Sparaxis bulbifera*
- ▶ *Ursinia anthemoides* (Ursinia) and
- ▶ *Watsonia sp.*

The small number of weeds at the site is reflective of the good condition of the vegetation, and the apparent lack of disturbance to the site. Weeds are more prevalent close to the few disturbed areas, including tracks and firebreaks. While weeds are also present in other areas, they are not dominant and do not appear to pose a threat to the integrity of the vegetation communities.



No declared weeds were observed within the survey area, during the 2003 flora survey.

3.1.8 *Phytophthora cinnamomi* (Dieback) Disease

Dieback caused by the exotic root-rot fungus *Phytophthora cinnamomi* has been gazetted as one of the key threatening processes affecting Australia's biodiversity under the *Environment Protection and Biodiversity Conservation Act 1999*, due to its demonstrated potential to threaten the survival, abundance and evolutionary development of native species and communities. This pathogen is currently widespread throughout a variety of Australian ecosystems and may result in an epidemic level of disease in areas of susceptible native vegetation (Environment Australia, 2002).

The flora survey conducted in 2003 included a visual dieback assessment. The vegetation of the entire site was in good to excellent condition at this time and there was no evidence of dieback.

3.1.9 Topsoil Management

The project site contains sections where the in-situ topsoil is in a relatively natural state with little weed invasion. A few small disturbed sections exist, where weeds are more prevalent.

In order to ensure that the topsoil resource is used to the most optimum, it is recommended that a project specific Topsoil Management Plan be prepared and implemented for the construction works.

3.2 Social Environment

3.2.1 Aboriginal Heritage

A search of the Department of Indigenous Affairs online database of Aboriginal heritage sites was conducted in order to determine the likelihood of the project impacting upon a listed Aboriginal site. No Aboriginal heritage sites were identified within the project area.

3.2.2 European Heritage

World and National Heritage Sites

An analysis of European heritage sites situated in the project area was conducted utilising the following datasets acquired from the federal Department of the Environment and Heritage:

- ▶ National Heritage List
- ▶ Commonwealth Heritage List
- ▶ World Heritage List; and
- ▶ Register of the National Estate.



No places listed on the National, Commonwealth, World Heritage Lists or the Register of National Estate are situated in the vicinity of the project area.

State Heritage Sites

A search of the Heritage Council of Western Australia's online database was conducted also. Only one site was identified as being within the near vicinity of the project area. The Original Airstrip Site (Site Id 04149) was constructed in 1939 and is now the site of the Hay Park Playing fields. This site is unlikely to be impacted on by the proposed development.

3.2.3 Land Use

The project area is within a 'C' Class Reserve (R30601) currently zoned for recreation and vested within the City of Bunbury. The project area has been identified as Regional Open Space in the Draft Greater Bunbury Regional Scheme (1999). The site has also been considered by the Proposed Ocean to Preston River Regional Park Technical Advisory Committee as a significant site worthy of possible inclusion into the regional park network.

3.2.4 Noise

As the surrounding landuse is currently zoned and used for recreation, an increase in noise as a result of this proposal is unlikely to cause a significant social impact.

3.2.5 Contaminated Sites

No contaminated sites were identified within the project during the preparation of this EIA.

3.3 Construction Phase Impacts

Additional environmental and social impacts identified as requiring consideration and management during the construction phase of the project include:

- ▶ Damage to Public Property
- ▶ Noise
- ▶ Vibration
- ▶ Dust
- ▶ Traffic safety and access
- ▶ Fire Management and
- ▶ Rubbish Disposal

These issues will be managed through construction phase environmental management measures. The development of a construction phase Environmental Management Plan, which also addresses pre-construction issues, will ensure the implementation of all project specific environmental and social impact measures.



4. Consultation

This project has been extensively discussed between the City of Bunbury (CoB), Department of Environment (DoE), Environmental Protection Authority (EPA) and the Hay Park Development Committee (HPDC).

The project inception began as early as 1999, and design has continued over the past years. Some changes have been made in this time, including the removal of archery and a reduction in size of the project. Community groups that have had some input into the development of the project to date include:

- ▶ Bunbury Little Athletics
- ▶ Bunbury Amateur Athletics
- ▶ Bunbury Cycling Club Inc.
- ▶ Bunbury Cross Country Running Club
- ▶ Bunbury Runners Club Inc., Bunbury Triathlon Club Inc
- ▶ South West Mountain Bike Club; and
- ▶ Volunteer Fire Brigade.

The following section outlines events, meetings and correspondence supplied by CoB outlining the development of this project.

4.1 2000

February 24 – Meeting with sports clubs and associations to discuss reorganisation of Hay Park.

March 7 – Letter from Eric Budgen of City of Bunbury to DEP regarding proposal. Noted “the area may have some environmental significance in relation to the high water table, vegetation communities and wildlife, eg Southern Brown Bandicoot, and I am seeking comment from DEP before I progress the redevelopment proposal any further. From Eric Budgen.

October 2 – reply from DEP to City of Bunbury for above letter. DEP noted:

“that the bushland area to the east of the existing sports facilities has environmental significance.

- ▶ The vegetation is in good condition and the vegetation type appears to be unusual and may not occur anywhere else in the Bunbury Region.
- ▶ The wetlands in the Hay Park bushland area contain plant communities not found elsewhere on the Swan Coastal Plain and have regional affinities with a rare regional floristic plant community; and
- ▶ A significant population of priority 4 fauna Southern Brown Bandicoot occur within Hay Park with evidence that they range extensively throughout the site.



4.2 2002

December 21 – City of Bunbury Council Meeting.

Appendix 42 from Jason Foster (Environmental Planner) for Council meeting held December 21, 2004.

October 2002 – EPA formally advised the City that this area was considered environmentally significant and given that the area supports regionally significant vegetation, any proposals to expand development in the immediate vicinity would require referral to the EPA.

October 2002 – Field survey undertaken with City's Environmental Planner and ecologists from the Department of Conservation and Land Management Threatened Species and Communities Unit. Both Vegetation communities identified, flora assessment and site mapping was undertaken.

December 2002 – City received formal advice from the CALM confirming the presence of TECs and that these are included in the Departments database. In addition it was advised that these vegetation communities are recognised by planning and regulatory agencies in WA and federal legislation.

December 2002 – HPDC agreed to refer to EPA.

4.3 2003

February 7 – Letter from City of Bunbury to DEP outlining reduced size of venue and therefore reduced impact on vegetation "the site will require placement of clean fill in degraded areas". Also stated that the new site is north of the recreation centre and on the fringes of the sensitive area that it felt would impact significantly less on the natural environment.

February 27 – Letter in response to above CoB letter. Noted "As previously advised by the DEP the remnant vegetation in the area of the proposed extensions is a vegetation type that is unusual and may not occur anywhere else in the Bunbury region. Furthermore, the bushland in the vicinity of Hay Park has been the subject of considerable public concern recently. In making any decision on the proposed extensions to the sports facilities at Hay Park the EPA will be mindful of these matters."

4.4 2004

July – EPA services invited to brief HPDC. EPASU advised that the proposal would be subject to tough hurdles and community consultation and that if council could look at an alternative then it should do so.

July 6 – Email from Mike McKenna of DoE not supporting the track for the following reasons:

- The entire area is identified as a 'Conservation' category wetland. The highest priority wetlands are the highest tier of classification and should be afforded all manner of protection, and thus development is not supported.



- ▶ The department of CALM has identified 2 TECs known as 'type 8 – herb rich shrublands in clay pans' and 'type 18 – shrublands on calcareous silts', both of which are listed as vulnerable. The presence of these communities was confirmed by CALM's Threatened Species and Communities Network in 2002.
- ▶ Furthermore, the identification of both Conservation category wetland and TECs is an automatic trigger for any proposals to be referred to the EPA to determine an appropriate level of assessment.
- ▶ The area is classified as Regional Open Space under the Draft Greater Bunbury Regional Scheme, and as such, any clearing of this area would be subject to scrutiny under the new land clearing legislation.
- ▶ The City of Bunbury has nominated the subject area for inclusion within the proposed Ocean to Preston River Regional Park.

The DoE supports the inclusion of the area into the regional park.

July 20 – Meeting at City of Bunbury. Attendees included Maree Ward (EPA), Mike McKenna (DoE), Councillor Major, Councillor Hart, Greg Trevaskis (CoB), Bill Carlsen (CoB), Jason Foster (CoB), Eric Budgen (CoB). Notes included:

- ▶ Greg asked if an area within the wetland could be used, or if the demarcation was clear and included the entire area.
- ▶ Mike replied that he believed that the whole area was the wetland and has a high classification and the athletics field should not be allowed within this area.
- ▶ Maree indicated that she was hearing from the characteristics of the site, that a number of studies would be required by the EPA (ie: fauna studies, threatened species, drainage, on-going management etc.).
- ▶ Maree believed that Council was able to seek use of the site but formal assessment would probably deny the project due to the classification and environmental characteristics of the site.
- ▶ Maree suggested a compensation package. Concluded that it could be possible but would be subject to tough hurdles and if could look at an alternative then should possibly do so.

December 14 – Council endorses the Draft Integrated Open Space Strategy which includes the Regional Open Space at Hay Park.

4.5 2005

January – emails to organise workshops stating that "the workshop will provide an opportunity for community representatives and councillors to ask questions of the EPA in relation to the process, opportunities or obstacles associated with the proposed athletic / cycling facility. Discussions will provide the opportunity to appreciate the EPA's views on the proposal in greater detail and without third party interpretation"



5. Environmental Approvals

5.1 Commonwealth Government

A review of the Environment Australia on-line database was conducted as part of preparing this EIA.

As discussed within Section 3.1.6, there may be the potential for the presence of the Western Ringtail Possum (*Pseudocheirus occidentalis*) within the project area although no survey for this species has been conducted to date. The Western Ringtail Possum is listed as a species of National Environmental Significance and as such may trigger the *Environmental Protection and Biodiversity of Conservation Act 2002* if found to be present and would require the project to be referred to the Commonwealth Minister for the Environment and Heritage.

5.2 Western Australian Government

5.2.1 Environmental Protection Authority

A definitive decision to formally assess the proposed Hay Park Athletics and Cycle track can only be made by the Environmental Protection Authority on formal referral of the project under the provisions of the *Environmental Protection Act (1986)*.

The recently enacted *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* stipulate that a 'clearing permit' is required in order to lawfully undertake any clearing of native vegetation. However, the significance of remnant native vegetation in the project area may prompt the EPA to formally assess the project, which in turn would negate the need to acquire a clearing permit.



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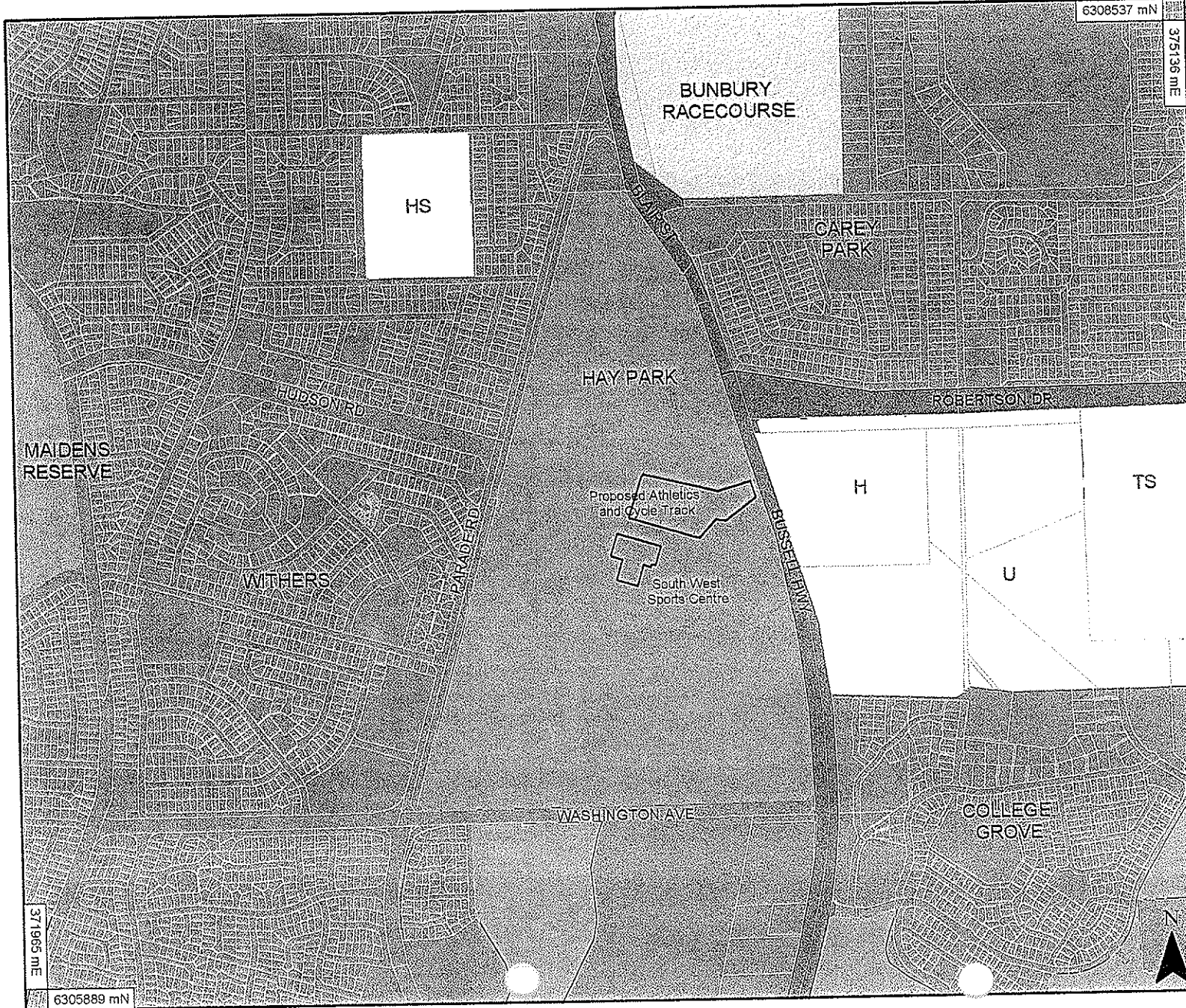
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Figure 1
Locality Plan



LEGEND

Legend

- Project Area
- Cadastre

Greater Bunbury Region Scheme

- Urban
- Private Recreation
- Primary Regional Roads
- Other Regional Roads
- Regional Open Space
- Special Purposes (Hospital)
- Special Purposes (Highschool)
- Special Purposes (Technical School)
- Special Purposes (University)

Data Sources:
GBRS - DPI - April 2005
CAD - DPI - December 2002

SCALE

0 100 200 300 400 m

1:15000 at A4

LOCALITY MAP

Western Australia

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| HEIGHT DATUM: N/A | METADATA RECORDED: N |

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Hay Park Athletics and Cycle Track Proposal Environmental Impact Assessment

Figure 1
Locality Plan

6305889 mN
371965 mE

6308537 mN
375136 mE

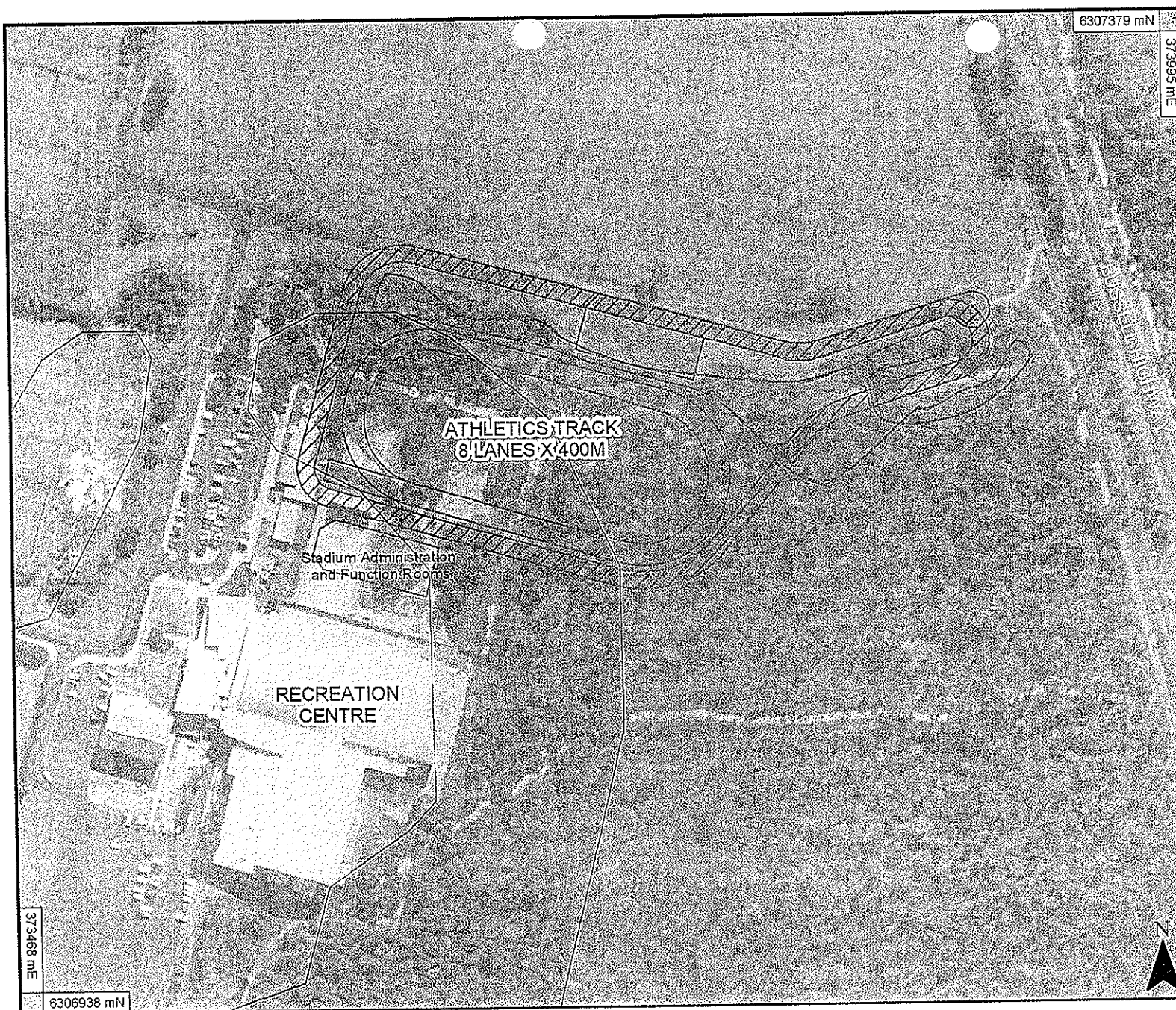


Figure 2
Proposed Hay Park Athletics and Cycle
Track



Figure 3
Wetlands within the Project Area





LEGEND

— Proposed Athletic and Cycle Track

Wetlands (WRC, 2002)

- Dampland
- Palusplain
- Sumpland

SCALE

0 25 50 75 100 m

1:2500 at A4

LOCALITY MAP

Western Australia

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Hay Park Athletics and Cycle Track Proposal Environmental Impact Assessment

Figure 3
Wetlands within the Project Area





Figure 4
2003 Flora Survey – Site Vegetation



Appendix A
Project Environmental Aspects Table



Hay Park Project Environmental Aspects Table

| Environmental Aspect | Impact | Management Measure | Timing |
|----------------------------------|---|---|-------------------------|
| Acid Sulphate Soils | 'Moderate to low risk of AASS and PASS occurring at depths generally greater than 3m'. | N/A | N/A |
| Wetlands and Drainage | Project area predominantly palusplain with small section of vegetated area, dampland. Vegetated area of the study site has been given a wetland classification of 'Conservation' by the WRC with the surrounding unvegetated areas recorded as 'Multiple Use'. Both the palusplain and dampland are listed under the <i>Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy 2004</i> and are likely to be impacted upon by the project. | Minimise vegetation clearing and drainage impacts. | Design |
| Vegetation | Clearing of up to 2.29 ha of vegetation required for proposed works. Vegetation is regionally poorly conserved and is unique in its intactness of shrub and herb layer and its diversity of species. Vegetation was considered to be generally in good to excellent condition in 2003 flora survey. | Minimise and manage clearing Requires Clearing Permit under the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> . | Design and Construction |
| Declared Rare and Priority Flora | None of the species listed were identified within the project area during the 2003 vegetation survey, although a number could potentially occur in such a habitat. | N/A | N/A |



| Environmental Aspect | Impact | Management Measure | Timing |
|-----------------------------------|--|---|------------------|
| Threatened Ecological Communities | <p>Neither of the two TEC's (SCP08 & SCP18) was apparent in the project area during the 2003 flora survey. Two occurrences of the community SCP08 known within close proximity to the project area (45 – 50m)</p> <p>It was noted within the 2003 Flora Survey that the Hay Park vegetation is poorly conserved in the Greater Bunbury Region. Furthermore, the intactness of the shrub and herb layer is rare and there is considerable diversity of species in a small area.</p> | Minimise vegetation clearing. | Design |
| Dieback Disease | No evidence of dieback. | Hygiene measures employed for weed management will ensure that dieback (if present) is not imported to or exported from the project area. | Construction |
| Topsoil Management | Project site contains sections where the in-situ topsoil is in a relatively natural state with little weed invasion. A few small disturbed sections exist, where weeds are more prevalent. | In order to ensure that the topsoil resource is used to the most optimum, it is recommended that a project specific Topsoil Management Plan be prepared and implemented for the construction works. | Pre-Construction |
| Weeds | A small number of weeds are present at the site being more prevalent close to the few disturbed areas, including tracks and firebreaks. No declared weeds were observed within the survey area, during the 2003 flora survey. | Hygiene measures should be implemented during construction to ensure weeds are not imported or exported from the project site. | Construction |



| Environmental Aspect | Impact | Management Measure | Timing |
|---------------------------|---|---|--------|
| Fauna | <p>Seven 'Schedule 1' species were identified as potentially occurring within or near to the project area. Potential habitat of the Western Ringtail Possum (a Schedule 1 species and a trigger species for the EPBC Act 1999) exists within the project area.</p> <p>Evidence of Priority 5 species, Quenda or Southern Brown Bandicoot, observed in 2002 by CALM.</p> | Survey for the presence of the Western Ringtail Possum required. | Design |
| Aboriginal Heritage Sites | None identified. | N/A | N/A |
| European Heritage Sites | One site was identified as being within the near vicinity of the project area. The Original Airstrip Site (Site Id 04149) was constructed in 1939 and is now the site of the Hay Park Playing fields. Unlikely to be impacted on by the proposed development. | N/A | N/A |
| Land Use | <p>Project area is within a 'C' Class Reserve (R30601) currently zoned for recreation and vested within the City of Bunbury.</p> <p>Identified as Regional Open Space within the Draft Greater Bunbury Region Scheme (1999) and as a site worthy of possible inclusion into the Proposed Ocean to Preston River Regional Park.</p> | Requires Clearing Permit under the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> . | Design |



| Environmental Aspect | Impact | Management Measure | Timing |
|-----------------------------|--|--|------------------|
| Noise | An increase in noise as a result of this proposal is unlikely to cause a significant issue. | N/A | N/A |
| Contaminated Sites | No contaminated sites were identified within the project during the preparation of this EIA. | N/A | N/A |
| Construction Phase Impacts | Additional environmental and social impacts have been identified as requiring consideration and management during the construction phase of the project. | These issues will be managed through the development of a construction phase Environmental Management Plan, which also addresses pre-construction issues, and will ensure the implementation of all project specific environmental and social impact measures. | Pre-Construction |



Appendix B

Flora Survey October 2003 – Flora Species List and Location of the Species on the Site



| FLORA LIST | | | | | | Area | | | | |
|---------------|---------------|----------------------------|--------|-----------------------|---|------|---|---|---|--|
| Family | Genus | Species | Status | Common Name | 1 | 2 | 3 | 4 | 5 | |
| Mimosaceae | Acacia | saligna | | | X | X | X | | X | |
| Mimosaceae | Acacia | pulchella | | Prickly moses | | | X | | | |
| Mimosaceae | Acacia | alata | | | | | X | | | |
| Apiaceae | Actinotus | leucocephalus | | Flannel flower | | | | X | | |
| Myrtaceae | Agonis | flexuosa | | Peppermint | X | | | | | |
| Liliaceae | Agrostocrinum | scabrum | | | | | | X | X | |
| Asteraceae | Arctotheca | calendula | | Capeweed | | | | X | | |
| Poaceae | Avena | | * | Wild Oat | X | | | X | | |
| Proteaceae | Banksia | littoralis | | | X | | | X | | |
| Poaceae | Briza | minor | * | Shivery grass | | X | | X | | |
| Poaceae | Briza | maxima | * | Blowfly grass | | | | X | | |
| Colchicaceae | Burchardia | umbellata | | | X | X | | X | | |
| Colchicaceae | Burchardia | multiflora | | | | | X | | | |
| Anthericaceae | Caesia | micrantha | | | | | X | X | | |
| Orchidaceae | Caladenia | paludosa | | | | | | X | | |
| Anthericaceae | Chamaescilla | corymbosa | | | | | X | | | |
| Haemodoraceae | Conostylis | aculeata | | | | X | X | X | | |
| Cyperaceae | Cyathochaeta | avenacea | | | | X | X | X | | |
| Poaceae | Cynodon | dactylon | * | couch | X | X | | X | | |
| Goodeniaceae | Dampiera | linearis | | | | X | | X | | |
| Papilionaceae | Daviesia | physodes | | | | X | X | X | | |
| Papilionaceae | Daviesia | Inflata | | | | | X | X | | |
| Restionaceae | Desmocladius | flexuosa | | | | | | X | | |
| Asteraceae | Dittrichia | graveolans | * | Stinkwort | | X | | | | |
| Orchidaceae | Diuris | ?longifolia | | | | | | | X | |
| Droseraceae | Drosera | gigantea | | | | | X | | | |
| Droseraceae | Drosera | pulchella | | | | | X | | | |
| Droseraceae | Drosera | menziesii ssp menziesii | | | | | X | | | |
| Poaceae | Ehrharta | calycina | * | Veldt Grass | X | | | | | |
| Orchidaceae | Elythranthera | emarginata | | Pink Enamel Orchid | | | | | X | |
| Myrtaceae | Eucalyptus | rudis | | | | | X | X | | |
| Papilionaceae | Eutaxia | sp. | | | | | X | X | | |
| Cyperaceae | Gahnia | trifida | | | | | | | | |
| Papilionaceae | Gompholobium | tomentosum | | | | | X | | | |



| FLORA LIST | | | | | Area | | | | |
|---------------|---------------|------------------|--------|------------------|------|---|---|---|---|
| Family | Genus | Species | Status | Common Name | 1 | 2 | 3 | 4 | 5 |
| Haemodoraceae | Haemodorum | sp. | | | | | X | | |
| Proteaceae | Hakea | varia | | | X | X | | X | X |
| Dilleniaceae | Hibbertia | vaginata | | | | | X | | |
| Myrtaceae | Hypocalymma | angustifolium | | myrtle | | X | X | X | |
| Asteraceae | Hypochaeris | radicata | * | Flatweed | X | X | | | |
| Liliaceae | Hypoxis | glabella | | | | | | | |
| Myrtaceae | Kunzea | recurva | | | | | | X | X |
| Asteraceae | Lactuca | serriola | * | Lactuca | | X | | | |
| Cyperaceae | Lepidosperma | sp. | | | X | | X | | |
| Cyperaceae | Lepidosperma | ?tenua | | | X | X | X | | |
| Cyperaceae | Lepidosperma | longitudinale | | | | | X | | |
| Zamiaceae | Macrozamia | reidleyi | | reidleyi zamia | | | | X | |
| Myrtaceae | Melaleuca | rhopiophylla | | Swamp paperbark | X | X | X | X | X |
| Myrtaceae | Melaleuca | preissiana | | | X | X | X | | |
| Myrtaceae | Melaleuca | radula | | | X | | | | |
| Myrtaceae | Melaleuca | viminea | | | X | | | | |
| Polygonaceae | Muehlenbeckia | adpressa | | | X | | | | |
| Rubiaceae | Opercularia | hispidula | | | | X | | | X |
| Oxalidaceae | Oxalis | pres-caprae | * | Soursob | X | | | | |
| Oxalidaceae | Oxalis | glabra | * | | | | | X | |
| Iridaceae | Patersonia | sp. 'swamp form' | | | | X | X | | |
| Geraniaceae | Pelargonium | capitatum | * | Rose Pelargonium | | | | | X |
| Poaceae | Pennisetum | clandestinum | * | Kikuyu | X | | | | |
| Myrtaceae | Pericalymma | ellipticum | | | | | | X | |
| Rutaceae | Philothea | spicatum | | Pepper and salt | | | | | X |
| Thymeliaceae | Pimelea | imbricata | | | | | X | X | |
| Orchidaceae | Prasophyllum | gracillimum | | Leek orchid | | | X | | |
| | Philydrella | pygmaea | | Butterfly flower | | | X | | |
| Iridaceae | Romulea | rosea | * | Guildford grass | X | X | | X | |
| Goodeniaceae | Scaevola | striata | | | X | X | | | X |
| Asteraceae | Senecio | lautus | | | X | X | | | |



| FLORA LIST | | | | | | Area | | | | |
|----------------|--------------|--------------|--------|------------------|---|------|---|---|---|--|
| Family | Genus | Species | Status | Common Name | 1 | 2 | 3 | 4 | 5 | |
| Iridaceae | Sparaxis | bulbifera | * | | | | | | | |
| Stylidiaceae | Stylidium | brunonianum | | | | | X | | | |
| Orchidaceae | Thelymitra | Antennifera | | | | | | | X | |
| | Tribonanthes | ?longipetala | | | | | | | | |
| Typhaceae | Typha | sp. | | Bulrush | X | | | | | |
| Asteraceae | Ursinia | anthemoides | * | Ursinia | | | | X | | |
| Iridaceae | Watsonia | sp. | * | | | | | X | | |
| Xanthorrhaceae | Xanthorrhoea | preisii | | Preisii | | | X | | | |
| Xanthorrhaceae | Xanthorrhoea | gracilis | | Xanthorrhoeaceae | | | X | X | | |
| Apiaceae | Xanthosia | | | | | | X | | | |



Appendix C
Bush Forever Condition Rating Scale



Vegetation Condition Scale

1. Pristine or nearly so.
2. Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3. Vegetation structure altered, obvious signs of disturbance.
4. Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it.
5. Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
6. The structure of the vegetation is no longer intact and the area is completely or almost without native species.



Appendix D
Threatened Flora in the vicinity of the
Project



Previously recorded threatened Flora within a ten kilometre radius of the project area:

- Acacia flagelliformis* (Priority 4)
- Aponogeton hexatepalus* (Priority 4)
- Caladenia speciosa* (Priority 4)
- Carex tereticaulis* (Priority 1)
- Jacksonia sparsa* (Priority 4)
- Pultenaea skinneri* (Priority 4)
- Verticordia attenuata* (Priority 3)
- Acacia semitrullata** (Priority 3)
- Caladenia longicauda subsp. clivicola** (Priority 4)
- Platysace ramosissima** (Priority 3)
- Schoenus benthamii** (Priority 3)
- Stylidium longitubum** (Priority 3)

Note: * Denotes WA State Herbarium Record (questionable accuracy).



Appendix E

Threatened Fauna previously recorded in the Greater Bunbury Region



Schedule One – Fauna that is rare or is likely to become extinct

Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*)

The Baudin's Black-Cockatoo is distributed between the Serpentine River and the deep southwest of Western Australia (R. Johnstone, pers. comm., 27th April). The Cockatoo is a seasonal visitor to the northern forest and the adjacent eastern edge of the coastal plain. The species breeds during the spring / summer in the southern forest and requires tree hollows from primarily Marri trees although it will sometimes utilise Karri tress (CALM, 2005). The species is selective in its choice of Marri hollows used for breeding and such hollows can take over 200 years to form (R. Johnstone, pers. comm., 27th April). In forested areas, the Cockatoo mainly feeds upon the seeds and flowers of Marri (Garnett & Crowley, 2000) and in the south Karri provide an important food source (R. Johnstone, pers. comm., 27th April). In coastal areas it feeds on much the same species as the Carnaby's Black-Cockatoo (R. Johnstone, pers. comm., 27th April). Baudin's Black-Cockatoo is also known to feed on the seeds from apples and pears in orchards (Garnett & Crowley, 2000). Key threats to this species are thought to be loss of habitat, shooting by orchardists and competition for remaining nesting hollows from feral bees (R. Johnstone, pers. comm., 27th April).

The vegetation of the project area does not appear to be critical feeding or breeding habitat for this species. As such, the proposed development is unlikely to threaten the long-term survival of this species.

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*)

The species breeds primarily in the southern and eastern parts of the southwest and tends to move to the coastal belt when not breeding. A small number of Carnaby's Cockatoos have been found breeding in Jarrah-Marri forests in Chittering, Mundaring Weir Catchment, Lesley area and Serpentine Dam Catchment and in tuarts on the Swan Coastal Plain (Water Corporation and WA Museum, 2003). The species is threatened primarily through the loss of tree hollows for breeding sites, particularly in the wheat belt. These birds frequent proteaceous shrubs and heaths, adjacent Eucalypt woodlands and pine plantations. Based on known habitat preferences, the species is likely to be an occasional transitory visitor to the project area and may utilise the remnant vegetation in passing. However, the species is beginning to demonstrate the ability to colonise the Swan Coastal Plain (R. Johnstone, 2005, pers. comm., 27th April) and therefore may utilise habitat in the project area more than first anticipated.

The vegetation of the project area does not appear to be critical feeding or breeding habitat for this species. As such, the proposed development is unlikely to threaten the long-term survival of this species.

Chuditch (*Dasyurus geoffroii*)

This carnivorous marsupial occupies a wide variety of habitats such as Jarrah-Marri and Wandoo forests, provided that sufficient den sites, usually log hollows, are located within the area (CALM, 2002a). It is a highly mobile animal with large home ranges, primarily due to its carnivorous diet and thus requirement for prey species that are typically widely dispersed throughout its habitat (CALM, 2002a). It has become



threatened through a wide variety of factors associated with European colonisation, including loss of habitat and predation by / competition with introduced species.

This species is an opportunistic species and may pass through the project area. However, no evidence of this was found by CALM in the 2002 site investigation. With the retention of the remaining remnant bushland it is unlikely that the proposed development would threaten the long-term survival of any populations that may be within the area.

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)

This subspecies of the Red-Tailed Black-Cockatoo is restricted to the forests of the southwest. It requires suitable tree hollows to nest and breed and is totally dependent on Jarrah-Marri forest. This species has become threatened primarily through loss habitat (Morcombe, 2003).

The vegetation of the project area does not appear to be critical feeding or breeding habitat for this species. As such, the proposed development is unlikely to threaten the long-term survival of this species.

Indian Yellow-nosed Albatross (*Thalassarche carteri*)

The Indian Yellow-nosed Albatross is an occasional visitor to south and southwest coastal Western Australia and breeds on offshore subantarctic and antarctic islands (CALM, 2005). The first only recorded sighting of this bird in the Bunbury region occurred in 1939.

It is unlikely that this species would visit the project area and thus the proposed development is unlikely to threaten the long-term survival of this species.

Wandering Albatross (*Diomedea exulans*)

The Wandering Albatross is an occasional visitor to south and southwest coastal Western Australia and breeds on offshore subantarctic and antarctic islands (CALM, 2005). The first only recorded sighting of this bird in the Bunbury region occurred in 1939.

It is unlikely that this species would visit the project area and thus the proposed development is unlikely to threaten the long-term survival of this species.

Western Ringtail Possum (*Pseudocheirus occidentalis*)

Once widely distributed throughout the south western forests of Western Australia, most populations of Western Ringtail Possum are now restricted to near coastal areas of peppermint (*Agonis flexuosa*) woodlands and peppermint / tuart associations (CALM, 2002b). Recorded evidence suggests that the species would once have created nest sites on or near the ground, but now mostly utilises tree hollows and dreys in forest canopies in order to avoid predation (CALM, 2002b). Factors thought to have contributed to the decline in Western Ringtail Possum numbers include predation, habitat loss and/or modification and changing fire regimes.

The vegetation of the project area may potentially provide habitat for this species, with Peppermint (*Agonis flexuosa*) being recorded in Area 1 of the 2003 Flora Survey. A



survey for this species has not been conducted to date and may need to be to confirm the impact of the proposal on this species.

Priority Two – Taxa with few, poorly known populations on conservation lands

Black Bittern (*Ixobrychus flavicollis australis*)

Priority Three – Taxa with several, poorly known populations, some on conservation lands

Southern Brush-tailed Phascogale (*Phascogale tapoatafa tapoatafa*)

Black-browed Albatross (*Thalassarche melanophrys*)

Western Brush Wallaby (*Macropus irma*)

Bush Stonecurlew (*Burhinus grallarius*)

Eastern Curlew (*Numenius madagascariensis*)

Crested Shrike-tit (south-western) (*Falcunculus frontatus leaucogaster*)

Priority Five – taxa in need of monitoring (conservation dependent)

Quenda (*Isodon obesulus fusciventer*)



GHD Pty Ltd ABN 39 008 488 373

1st Floor 10 Victoria Street

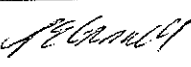

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*Reviewed by Local Member
- MP for next corridor 17/03/02*



Usher Dalyellup Region Park Management Plan



Invitation for Public Input

Usher Dalyellup Region Park consists of ^{the western half of} more than 400 hectares of land with important ^{aesthetic} conservation, recreation, social, economic and ^{scientific} tourism values. The area forms part of a ^{educational} larger Regional Open Space Network under the proposed Greater Bunbury Region Scheme. The park is bordered by the Indian Ocean, Bussell Highway, and the suburbs of Usher, Withers and Dalyellup.

Environmental consultants Ecoscape have prepared a draft Management Plan for the park. The aim of the management plan was to identify environmentally sustainable means to make the park accessible to the public, whilst enhancing the conservation values of the area. A Concept Plan was also prepared, showing a vision for management of the park.



The draft Management Plan for Usher Dalyellup Region Park is available for viewing by the public as a separate document, and has been summarised in this leaflet. Comments from members of the public on the draft management plan are welcomed. Comments should be addressed to the contacts listed on the final page of this leaflet.

The proposed Vision Statement for Usher Dalyellup Region Park is:

"To develop a significant Regional Park in the Bunbury-Capel area for community enjoyment, which incorporates and protects the rich diversity of the natural environment and Aboriginal and European cultures."

• ECOSCAPE •



Natural Environment

Usher Dalyellup Region Park is an area of high regional conservation significance. The park forms a large area of remnant vegetation within the increasingly urbanised South Bunbury region. The park also forms part of a significant east-west "green corridor" from the coast to the Preston River, through Hay Park and Manea Park. The sequence of landforms and vegetation types represented along this green corridor are rarely found intact along the Swan Coastal Plain.

College Grove

The park contains a diverse array of vegetation communities, including coastal dune heath in the west, interdunal woodland, Tuart forest, Banksia-Eucalypt woodland and paperbark woodland. Most of the vegetation within the park is in relatively good condition.



Usher Dalyellup Region Park Management Plan



Tuart woodlands in good condition are of significance due to their scarcity. Tuart woodland communities were once widespread along the coastal strip of the southern Swan Coastal Plain, but many of these communities have been destroyed or degraded

by loss of the understorey, although the Tuart trees may remain. The Maidens area, in the northern section of the park, contains one of the last remnants of coastal Tuart woodland in good condition. Other common tree species within the park include Peppermint, Jarrah, Marri, Flooded Gum, Candle Banksia, Bull Banksia and Swamp Paperbark.

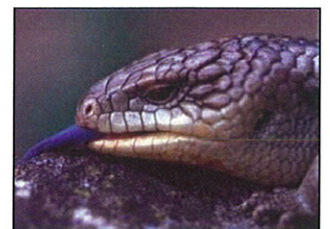
The park forms important habitat for an array of native vertebrate species, including some threatened marsupials such as the Quenda (or Southern Brown Bandicoot), Western Ringtail Possum and Brush-tailed Phascogale. A large number of bird species use the park for feeding, nesting and breeding. Threatened birds that could potentially visit the park include Short-billed and Long-billed Black Cockatoos, the Peregrine Falcon, the Masked Owl and the Square-tailed Kite.



The Maidens and the Sand Bowl are significant landforms within the park. The twin dune peaks of The Maidens are the highest dunes of their type in the region, and were once used as significant landmarks and navigation references by European explorers. The Sand Bowl is a dune blow out thought to have been created by natural processes, which is still moving inland.

Environmental Management

Environmental degradation has occurred in some parts of Usher Dalyellup Region Park. The most important factors contributing to degradation are weed invasion, pests and diseases of the vegetation, illegal



access by people and vehicles, erosion and frequent fire. These issues must be addressed to ensure appropriate management of the park. Other management issues covered in the Management Plan include ecological restoration, feral animal control, recreation, education, interpretation and ecotourism.

Weed species are concentrated in degraded areas, but are also found in high numbers along the coastal dunes, and within some areas of the Tuart forest that have been disturbed. Over 20 of the weed species within the park are currently an



environmental problem, or have the potential to become a problem if they are r.

quickly controlled. A targeted weed control program, weed action plan and bushland restoration strategy

were developed to minimise the environmental impact of these weeds.

Pests and disease that could affect plants within the park include dieback, the fungus *Armillaria*, which could affect a wide range of species, and insect borers, which have been known to cause decline in Tuart trees elsewhere in the south-west. Under the management plan, surveys would undertaken for all of these pests and diseases within the park, and strict hygiene measures implemented to avoid disease introductions.

Illegal and inappropriate human access is a major cause of degradation within the park. Although illegal except on the designated beach access track, trailbikes and four-wheel drives are able to

Invitation for Public Comment

gain access to some parts of the park, causing erosion of coastal dunes and tracks, spreading weeds and disturbing vegetation, fauna and local residents. Rubbish dumping and arson within bushland areas are associated with illegal vehicle access. To deter illegal vehicle access, secure perimeter fencing and prominent signage would be installed around the boundaries of the park, and tracks that are not required for pedestrian access would be blocked and rehabilitated.



Frequent fire within the park has led to vegetation damage, erosion and weed invasion, particularly in coastal heathland areas. Management strategies to

reduce the frequency of bushfire ignition and minimise damage from bushfires include secure fencing to deter arsonists, weed control, fuel reduction, public education and rehabilitation following fire. Park managers will work closely with CALM to determine whether strictly controlled burns should be used in selected areas for Tuart regeneration and fuel reduction.

Some recreational pursuits that currently occur within the park are causing or have the potential to cause serious environmental harm. Sand boarding causes dune erosion and damage to vegetation, and will no longer be permitted within the park. Four-wheel driving will be banned on the beach and the existing beach access track will be sealed to prevent further erosion and vegetation damage. Horses will be excluded from the park, due to the potential to spread weeds, pests and diseases throughout the park along trails used for horse riding. Erosion control works, dune restoration and revegetation will occur in degraded areas.



The Concept Plan

A draft Concept Plan for the park has been developed, which provides a basis for the future development of the park. The plan incorporates four management zones for conservation, coastal areas, passive recreation and ecotourism. The use of management zones recognises that different areas of the park have different management priorities and requirements. Acceptable uses and developments were defined for each zone.

The theme for Usher Dalyellup Region Park's Concept Plan reflects the intent of the vision statement by conserving the environmental and landscape attributes of the park, providing for public enjoyment, and developing a framework that will assist in the management of these attributes. Activities planned for the park have an emphasis on passive recreation and appreciation of the natural and cultural attributes of the park through ecotourism, education and research.



One of the most important aspects of the Concept Plan is access, for both management and recreation. The plan incorporates existing infrastructure such as roads, tracks, firebreaks and car parks. The park will have a co-ordinated network of formal walking and cycle tracks suitable for all fitness and mobility levels. This network is based largely on existing tracks, with surplus existing tracks to be closed and rehabilitated. Management access tracks were also included. Links through the park between existing and future planned subdivisions adjacent to the park were incorporated, which will enable greater access by pedestrians and cyclists between residential areas, schools and commercial centres.

As part of the proposed structure plan for the Dalyellup residential subdivision to the south of the park, an area was set aside on the north-western corner of the subdivision as a potential site for



to establish an ecotourism centre within the park, providing people with the opportunity to experience and learn about the natural features of the area. This facility would be purpose designed using non-toxic material and sustainable technology. School groups and tour operators would be able to access the centre.

Implementation of the Management Plan

An important issue relating to implementation of the plan is the responsibility for management of the park, as there is currently no designated manager for the entire park. The proposed strategy is for the City of Bunbury to chair and facilitate the formation of the Usher Dalyellup Interim Management Committee.

In the long term, Usher Dalyellup Region Park may be included as part of a

short-stay chalet-style accommodation. This area is situated near the Tuart forest and the beach. This site presents the best opportunity

proposed Regional Park for the South Bunbury area that stretches on an east-west transect from the Indian Ocean to the Preston River.

We welcome your comments

You are invited to forward any suggestions or comments you have on the Draft Management Plan and Concept Plan for Usher Dalyellup Region Park to either of the contact points listed at the bottom of the page. The closing date for public comments is **Monday, April 22nd, 2002**. The complete Management Plan and Concept Plan is available for viewing at the City of Bunbury Library on Parkfield Street, Bunbury, and at the Shire of Capel Library in Forrest Road, Capel.

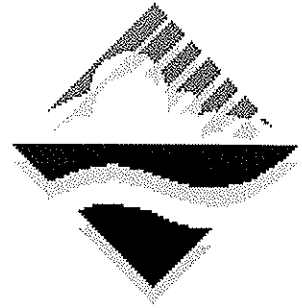
David Kaesehagen
 Director, Environmental Scientist
 Ecoscape (Australia) Pty Ltd
 9 Stirling Highway
 NTH FREMANTLE WA 6159
 Telephone: 9430 8955



Natasha Pauli
 Environmental Scientist
 Ecoscape (Australia) Pty Ltd
 9 Stirling Highway
 NTH FREMANTLE WA 6159
 Telephone: 9430 8955

Facsimile Message

Department of Environmental Protection



ATTENTION: ERIC BUDGEON
9780 8268

FROM: Gary Williams

DATE: 2 October 2000

TELEPHONE: (09) 222 7136

PAGES:

SUBJECT: HAY PARK PROPOSED SPORTS FACILITIES

MESSAGE:

In reply to your letter concerning the proposed extension of sports facilities at Hay Park I wish to advise that the bushland area to the east of the existing sports facilities has environmental significance.

The following points are raised by the Department of Environmental Protection in relation to the bushland.

- The vegetation is in good condition and the vegetation type appears to be unusual and may not occur anywhere else in the Bunbury Region;
- The wetlands in the Hay Park bushland area contain plant communities not found elsewhere on the Swan Coastal Plain and have regional affinities with a rare regional floristic plant community; and
- A significant population of priority 4 fauna Southern Brown Bandicoots occurs within Hay Park with evidence that they range extensively throughout the site.

Any proposals to develop the bushland should be referred to the Environmental Protection Authority (EPA) for assessment pursuant to Section 38 of the Environmental Protection Act. The proposals should be accompanied by sufficient information (including flora and fauna surveys) to enable the EPA to review the proposal and set an appropriate level of environmental assessment.

The City of Bunbury should not proceed with the proposed extensions until the proposal has been referred to the EPA for environmental assessment.

Department of Environmental Protection

Westralia Square, 141, St Georges Terrace, Perth, Western Australia, 6000.

Facsimile: 9322 1598 Telephone: 9222 7000

City of Bunbury
PO Box 21
BUNBURY WA 6231ower

Your ref: BC3 070203
Our ref:
Enquiries: Gary Williams
Phone: 9222 7136

Attention: Bill Carlsen

Dear Sir

SPORTS FACILITIES HAY PARK - BUNBURY

The following advice and comments are provided in reply to your letter dated 7 February 2003 concerning the proposed extensions to the sports facilities at Hay Park.

As previously advised by the Department of Environmental Protection the remnant vegetation in the area of the proposed extensions is a vegetation type that is unusual and may not occur anywhere else in the Bunbury region. Furthermore, the bushland in the vicinity of Hay Park has been the subject of considerable public concern recently. In making any decision on the proposed extensions to the sports facilities at Hay Park the EPA will be mindful of these matters.

The Environmental Protection Authority (EPA) Service Unit considers that the proposal has potentially significant environmental impacts which require that it be referred to the EPA pursuant to *Environmental Protection Act 1986* (the Act).

The EPA's Administrative Guidelines for the referral of formal proposals pursuant to the Act require that a referral be made on the appropriate form (attached). The Guidelines and the referral form are also available on the EPA's web site at www.epa.gov.au.

In addition to the completion of the above form the EPA Service Unit also requires the following information to be provided so that the EPA can review the proposal and set an appropriate level of assessment:

| Factors | Additional information required |
|--------------------|--|
| Remnant vegetation | <ul style="list-style-type: none"> • Describe and map the vegetation units, in the area that will be impacted by the proposed extensions, in suitable detail so that it can be placed in a regional context (Map should show reference plots, vegetation structure and floristic components); • Describe and map the vegetation condition, in the area that will be impacted by the proposed extensions, using a recognised condition scale such as used in Bush Forever, in suitable detail to place in regional context; • Describe the presence or likely presence of significant flora (Declared Rare Flora, Priority flora and other significant flora). |

The above information should be forwarded by fax (9322 1598) or by post to the Department of Environmental Protection, PO Box K822, Perth WA 6842. Please mark it to the attention of the person cited above.

Yours sincerely

KJ Taylor
 Director
 Environmental Impact Assessment

27 February 2003

WILLIAMS Gary

From: (CEO) Greg Trevaskis
Sent: Friday, 4 February 2005 12:15
To: WILLIAMS Gary
Subject: RE:

Dear Gary,

Please find attached a copy of the report to Council in relation to a proposed athletics track/cycle facility in Hay Park, Bunbury.

I have also attached 2 file notes from meetings held here at the City for your further information.

The report and notes should provide a reasonable background to the issue and I would be happy to answer any questions once you have had a chance to read this information.

In my view, the issue is revolving around the following concepts:-

The athletics lobby believe the area (within the notional wetland area) is not of any significant environmental value through historic degradation and land use. This group is referring to previous advice from yourself (letter dated 27th February 2003) that a review process can be undertaken and that the area under consideration should not be considered of any great environmental value.

The athletics lobby believe this site is clearly the best location for the proposed facility after having reviewed all other options over the past 20 years. Council's recreation officer also arranged for an environmental assessment to be provided by GHD consultants. Sport representatives are of the opinion that the GHD report throws doubt on the validity that the preferred site cannot be accessed on environmental grounds. I shall provide a copy of the GHD report if you are interested.

The City's town planning and environmental planning staff are of the firm view that that the proposed site for the athletics track at Hay Park is a classified conservation category wetland and contains threatened ecological communities. Accordingly, the proposed development must trigger a formal assessment process by the EPA and approval would most likely be denied due to the environmental significance of the site.

This environmental concern strongly suggests that major delays will occur to the project as a result of the investigations and assessment required. This view supports the identification of an alternative site.

Thank you for agreeing to attend a workshop along with your technical staff. The workshop will be held on Thursday, 17th February 2005 at 5.30 pm on the 10th floor, Bunbury Tower, 61 Victoria Street, Bunbury. Other attendees will be local athletic, cricket, bicycle and sporting representatives, some Councillors and relevant staff from the City of Bunbury (about 10-15 in number).

It is my hope that the workshop will be an opportunity for community representatives and Councillors to ask questions of the EPA in relation to the process, opportunities or obstacles associated with the proposed athletic/cycling facility. Associated discussion will provide the opportunity to appreciate the EPA's views on the proposal in greater detail and without third-party interpretation.

I look forward to meeting you on the 17th February and should you have any questions please do not hesitate to contact me.

Regards

Greg Trevaskis

Chief Executive Officer

City of Bunbury

04/02/05

www.bunbury.wa.gov.au

Ph: 08 9780 8244

Fax: 08 9780 8206

-----Original Message-----

From: WILLIAMS Gary [mailto:gary.williams@environment.wa.gov.au]

Sent: Friday, 4 February 2005 11:27 AM

To: (CEO) Greg Trevaskis

Subject:

Gary Williams
Senior Environmental Officer
Planning & Infrastructure Branch
EPA Service Unit
ph 9222 7083
fax 9322 1598

04/02/05



CITY OF BUNBURY

FILE NOTE

| | | | |
|--|---|---|---|
| NAME OF CONTACT: Greg Trevaskis, CEO | | FILE REF: | F106 |
| CONTACT ADDRESS: City of Bunbury | | DATE: | 14 July 2004 |
| TYPE OF CONTACT: (Insert tick as appropriate) | | | |
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Informal Meeting | <input type="checkbox"/> Internal Meeting | <input type="checkbox"/> Other (<i>Specify</i>) |
| PRESENT: Cr Wayne Major & Cr Hart. Council Officers: Greg Trevaskis, Bill Carlsen, Jason Foster, Brian Lewis & Eric Budgen. | | | |
| SUBJECT: Meeting held in Council Administration Centre, Boardroom on Thursday 8 th July 2004 at 5.30 pm. | | | |
| NOTES: | | | |
| <ol style="list-style-type: none"> 1. General discussion occurred in relation to the proposed establishment of an athletics track near the SWSC on the N/W corner of the Hay Park wetlands area. 2. Jason advised the community committee was first made aware of issues/ constraints surrounding its proposal in 2002. 3. The Department of Environment has indicated to Council Staff and via follow up correspondence dated the 6 July 2004 that it would not support the proposed athletics track in its current form. Furthermore, The entire area is identified as a 'Conservation' Category Wetland (CCW). These highest priority wetlands are the highest tier of classification and should be afforded all manner of protection, and thus development is not supported. 4. Jason highlighted concerns/issues surrounding the current proposal that would impact upon remnant vegetation. Two threatened ecological communities (TEC's) have been identified within the bushland area of Reserve 30601 within Hay Park as occurring within the current proposal that has been tabled by the Hay Park Development Committee. These communities are known as type 8- 'Herb rich shrublands in claypans' and type 18- 'Shrublands on calcareous silts'. Both of these vegetation community types are currently listed as 'vulnerable'. Their significance is recognised by state regulatory and planning requirements and under the proposed new land clearing legislation. A high priority is placed on the conservation of these communities. Jason indicated that the occurrence of these species in that area would trigger an EPA assessment process. Advised on the unlikelihood of the proposal (in its current tabled form) of gaining support under current legislative framework. Suggested the Committee should look at alterations to the plan and alternative sites with the immediate area to minimise any impact on the vegetation communities and any unnecessary delays to development of such facilities. 5. Eric indicated that earlier advice from the EPA (17 Feb 2003) had provided a process to be followed that may provide for the disputed area to be assessed, and if a case could be mounted to highlight the degraded state of the area, a recreational use may be consented to. 6. General discussion occurred on whether the site was in a degraded state and what the position of the various government environment agencies may be. The Department of Environment has provided a position regarding this matter see correspondence of 6 July 2004 | | | |

7. Cr Major advised that the local athletics club and Hay Park Committee were of the view that this site would be the best for locating a new athletics track due to:-

- a. Proximity to SWSC and other facilities,
- b. Car parking facilities
- c. Minimum impact on other fields within Hay Park

Jason advised that as a part of pre-planning and feasibility site investigations that a few options for possible location should have been considered; as not only does the site in question have significant environmental constraints and limitations. Aside from the significant environmental issues and constraints, the site works that would be necessary in an area of such low lying nature would be significant as apposed to other potential sites within a close vicinity.

Cr Major also conceded that if State agencies could not support or allow access to the wetlands/environment zone as proposed, it would be beneficial to meet and thoroughly explore all issues.

8. It was agreed for Greg Trevaskis to contact:-

- a. Gary Williams, Perth EPA Services Unit
- b. Mike McKenna, Bunbury DOE

to arrange a meeting with Council (as per representative attending this meeting) for the purpose of clarifying the environmental vs recreational opportunities at this location at Hay Park.

Greg undertook to arrange the meeting within 2-3 weeks.

The meeting concluded at 6.45 pm.

COMPLETED BY: GREG TREVASKIS

POSITION: CHIEF EXECUTIVE OFFICER



CITY OF BUNBURY

FILE NOTE

| | | | |
|--|---|---|---|
| NAME OF CONTACT: Greg Trevaskis, CEO | | FILE REF: | F106 |
| CONTACT ADDRESS: City of Bunbury | | DATE: | 20 July 2004 |
| TYPE OF CONTACT: (Insert tick as appropriate) | | | |
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Informal Meeting | <input type="checkbox"/> Internal Meeting | <input type="checkbox"/> Other (<i>Specify</i>) |
| PRESENT: Maree Ward (Environment Protection Authority, Perth) and Mike McKenna (SW Department of Environment) | | | |
| Cr Wayne Major & Cr Hart. Council Officers: Greg Trevaskis, Bill Carlsen, Jason Foster & Eric Budgen. | | | |
| SUBJECT: Meeting held in Council Administration Centre, Boardroom on Tuesday 20 th July 2004 from 10.55 am. | | | |
| NOTES: | | | |
| <ol style="list-style-type: none"> 1. Greg welcomed Maree and Mike to the meeting and outlined preliminary plans for establishing an athletics track in Hay Park. 2. Mike believed Council was presenting 2 different views:- <ol style="list-style-type: none"> a. Build an athletics track within the wet-lands area (located adjacent to SWSC). b. Classify the whole area in the regional open space. 3. Greg suggested Council is supportive of both but seeks to clarify the restrictions and opportunities for recreation use and designated wetland. Is there any opportunity for a small area to be annexed from the wetlands (like a frame area in planning terms) to provide for the athletics track? Greg asked Mike how hard is the line – is it a clear demarcation or can an area within the wetland be provided? 4. Mike believed the whole wetland has a high classification and the athletics field should not be allowed within this area. 5. Maree indicated that what she was hearing from the characteristics of the site, that a number of studies would be required by the EPA ie fauna studies, threatened species, drainage, on-going management etc. Section 38 is the EPA referral for assessment. Timeframes with appeals rights etc could take up to 12 months – 2 years or more. Maree believed that Council was able to seek use of the site but formal assessment would probably deny the project due to the classification and environmental characteristics of the site. 6. General discussion occurred about nearby development, possible drainage and the importance of remnant wetland vegetation. 7. Cr Dave Hart asked if the athletics track was re-orientated so that the field was in a north-south direction – would this be permissible? Maree said this may be possible but would require formal assessment. 8. Mike's view of the north/south orientation was that it would cause less impact but still require full assessment, even though it is degraded. The value of the land would still require very stringent control and assessment hurdles to be overcome to have this site approved. Jason and Maree confirmed this view. | | | |

9. Maree advised that if the site was used and some of the wetlands were destroyed/removed, Council could offer some other wetland/reserve area to compensate the conservation estate ie. buying land and giving to CALM to manage. This may assist approval for the proposed project.

10. Maree concluded by saying that the athletics track could be possible but would be subject to tough hurdles and community consultation. If Council could look at an alternative then we should possibly do so.

The meeting concluded at 11.30 am.

COMPLETED BY: GREG TREVASKIS

POSITION: CHIEF EXECUTIVE OFFICER

Proposed Site Investigation Area

