Attachment 4

Botanical Report (Weston, 2007)

VEGETATION SURVEYS AND RARE FLORA SEARCHES
Pts LOTS 313 TO 317 HAREWOODS ROAD
West of Minninup Road Reserve

GELORUP

Shire of Capel

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SUMMARY

This report describes methods and presents results of vegetation surveys, condition assessments and searches for rare flora in the western, Vasse and, possibly, Quindalup parts of Lots 313-317 Harewoods Road, Gelorup. The principal objectives of this project are to search the property for Declared Rare and Priority Flora, and to describe and map vegetation units and to assess their condition.

Fieldwork for the project was done by botanist Dr Arthur Weston and assistants in, mainly, spring and summer 2007-2008.

VEGETATION UNITS

Nine vegetation units with native, not-planted plants in them were distinguished on the basis of height, density and dominant species. These vegetation units, and six others with few or no natives in them, and the symbols used for them in the Figure 1, Vegetation Units and Relevé Locations, are:

Upland Associations (4 units)

- Peppermint (*Agonis flexuosa*) Open to Closed Low Forest **Pf**
- Peppermint (*Agonis flexuosa*) Woodland **Pw**
- Tuart (*Eucalyptus gomphocephala*) Open Forest to Woodland **Tfw**
- Tuart (*Eucalyptus gomphocephala*) Woodland **Tw**

Wetland and Transitional Associations (5 units)

- *Baumea articulata (*Jointed Rush) Closed Tall Sedgeland **B**
- *Lepidosperma gladiatum* (Coast Sword-sedge) Open Sedgeland **G**
- *Melaleuca rhaphiophylla* (Swamp Paperbark) Open to Closed Low Forest **M**
- Bulrush (*Typha orientalis*) - *Baumea articulata* Closed Tall Rushland **RB**
- Wattle (*Acacia saligna*) - Peppermint Closed Low Forest **WP**

Vegetation with few, if any, Native Plants (6 units)

- Aliens: mixed grasses and other herbaceous plants **AH**
- Bulrush (*Typha orientalis*) Tall Rushland, mainly Closed **R**
- Bulrush (*Typha orientalis*) Tall Rushland &/over mixed low herbs **RH**
- Bulrush (*Typha orientalis*) Tall Rushland &/over *Isolepis prolifera* Clubrush **RI**
- *Cirsium vulgare* - *Centella asiatica* Closed mixed, mostly alien, Herbland **C**
- Sumpland: open water in spring; herbland in summer **So**

Approximately one-third of the bushland in the project area is of upland units, which intergrade and vary widely in density and relative proportions of dominant trees. Tuart and Peppermint trees are in all of the upland vegetation units with native vegetation in them. Except for a few small areas, the understorey comprises various mixtures of pasture grasses and established alien species (weeds) of grasses and herbaceous plants.

Approximately two-thirds of the bushland in the project area is of wetland units, most of which are dominated by one or more of several established alien species, especially Bulrush (*Typha orientalis*) and Clubrush (*Isolepis prolifera*). However, four native species are dominants of relatively small stands of native wetland and transitional vegetation in Good to Very Good to Excellent condition. These species are *Agonis flexuosa, Acacia saligna, Melaleuca rhaphiophylla* and *Baumea articulata*.

VEGETATION CONDITION

The condition of the bushland vegetation is shown in Figure 2, Vegetation Condition. It is assessed as generally Degraded to Completely Degraded, and even Totally Cleared, largely due to replacement of native shrubs and herbaceous plants in the understorey by aliens. It ranges, on the six-point Keighery-Trudgen scale, from Completely Degraded (CD) to Good (G) and, in a few relatively small areas Very Good to Excellent (VG-E). There are also areas totally cleared of native species (TC).

VEGETATION COMPLEXES

All of the project area, or at least the wetland part of it, is in the Vasse Vegetation Complex, which typically consists of closed scrub of *Melaleuca* species fringing woodlands of *Eucalyptus rudis – Melaleuca* spp. and open forest of *Eucalyptus gomphocephala – E marginata – Corymbia calophylla.*

FLORISTIC COMMUNITY TYPES

It would be impossible to assign most, if not all, of the vegetation of the Gelorup project area to any floristic community type on the basis of detailed floristic analysis because there is so little native understorey or ground layer vegetation and so few native species left in it.

The location of the lots, the presence of *Agonis flexuosa* and Tuart in most of the upland vegetation, which is on Quindalup South Soil-Landscape Units, and the presence of *Melaleuca rhaphiophylla*, *Gahnia trifida, Acacia saligna, Baumea articulata* and *Centella asiatica* in the wetlands suggest that the floristic groups most likely to be represented in the project area are degraded Floristic Community Types (FCTs) 12, 17 or 30b, or combinations of them, and possibly FCT 15 (Gibson *et al* 1994).

None of these floristic community types is on the Threatened Ecological Community (TEC) database.

FLORA

Approximately 80 taxa (species, subspecies and varieties) of vascular plants were recorded and identified, at least to genus, during the study. Approximately 45 of the taxa are native, and 36 aliens (weeds). It is estimated that these numbers comprise around 60-70% of the flora of the project area.

No Declared Rare Flora or Priority Flora species was found during the fieldwork, nor were likely habitats for any identified.

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1.0 INTRODUCTION

This report describes methods and presents results of vegetation surveys, condition assessments and searches for rare flora in the western, Vasse and Quindalup parts of Lots 313-317 Harewoods Road, Gelorup. These parts are referred to in this report as 'the project area'.

1.1 LOCATION

The project area is the parts of Lots 313, 314, 315, 316 and 317 Harewoods Road, Gelorup, that are south-west of the western end of Harewoods Road and on the western side of the Minninup Road reserve. Each of the five lots is divided approximately in half by the Minninup Road reserve. There is no road separating the lot parts from each other, but a fence on the eastern edge of the road reserve does that.

The total size of the five lots is 188ha. The size of the western parts, the project area, is 73ha.

1.2 OBJECTIVES

The principal objectives of this project were to:

- describe and map project area vegetation units and condition based upon field work and interpretation of high resolution aerial photography,
- set up and sample between 5 and 10 (depending upon nature and condition of vegetation) floristic quadrats (or relevés) in the project area,
- infer Floristic Community Types from analyses of the quadrat (or relevé) samples,
- search the project area for significant flora, mainly the species of Declared Rare Flora (DRF) and Priority Flora (P) listed in results of Department of Environment and Conservation (DEC) searches of DEC flora databases,
- prepare a report, including descriptions of vegetation and condition and the locations of any rare, or otherwise significant, flora found.

The EPA's *Guidance No. 51* (Environmental Protection Authority 2004) was used in the preparation of this report. As the anticipated scale and nature of the proposed project's impact on native vegetation and flora in the project area would be low, a Level 1 Reconnaissance Survey, as described on Page 39 of *Guidance No. 51*, was undertaken. Also, relevés of stands of native vegetation in the project area in best condition were sampled.

A Level 1 survey consists of the following two stages:

- Background research or 'desktop' study, and
- Reconnaissance survey.

1.3 REGIONAL SETTING

1.3.1 Landforms and Soils

Churchward and McArthur (1978) show two of their landforms-soils units as occurring in the project area. These are the Quindalup (Q) unit, "coastal dunes and beach ridges composed of calcareous sand", and the Vasse (V) unit, "poorly drained plains with variable undifferentiated estuarine and marine deposits". The Churchward and McArthur 1:250 000 scale maps show the Quindalup unit as extending more or less continuously along the coast from the south-western edge of their mapping, at Peppermint Grove Beach, to the northern end, north of Lancelin. They show the Vasse unit as having a patchy occurrence on the western side of the Swan Coastal Plain from the south-western edge of their mapping, at Peppermint Grove Beach, to Mandurah, with small outliers along the Swan River in Perth, South Perth and Nedlands. The northern end of the most southern Vasse occurrence they show is in the vicinity of Harewoods Road, and the next occurrence is in Bunbury.

Mapping by the Department of Agriculture WA, as depicted in Figure 3 of BES (2009), shows the soil-landscape unit of the eastern, wetland side of the project area as Spearwood S3a, and the units of the western, upland side of the project area as Quindalup South Qd and Qp3.

1.3.2 Wetlands

The DEC's Geomorphic Wetlands Database maps about 35ha of the project area as a wetland. The wetland type is shown as Basin Sumpland and the management category as Conservation. The mapped wetland extends from the base of the Quindalup dunes in the west of the project area to just west of the Minninup Road reserve.

The wetland within the project area is part of a much larger (258ha) sumpland that extends uninterrupted for about 8.5km south from Dalyellup. Various parts of this sumpland have been classified as Conservation, Resource Enhancement and Multiple Use categories by the DEC, apparently on the basis of vegetation condition and land tenure.

1.3.3 Vegetation

Heddle *et al.* (1978) and Smith (1974) have mapped the vegetation of Gelorup and the Bunbury and Collie areas at a scale of 1:250 000. The Heddle *et al.* mapping is, like the Churchward and McArthur (1978) mapping, broad-scale (1:250 000), and it often follows the landform-soil boundaries mapped by Churchward and McArthur. Vegetation complexes are mapped as they are presumed to have been in pre-European times, prior to any clearing.

Smith (1974) mapped vegetation at the same scale as Heddle *et al.* (1978) -1:250 000 - but as it was at the time he mapped it, in 1973 and 1974. The units he mapped are Formations, which are defined by plant height, form and cover (or density), and Plant Associations, which are defined floristically, by which species are dominant. The Smith vegetation maps distinguish between formations by the colours of their polygons and use letter symbols to indicate plant associations.

Vegetation Complexes (Heddle *et al.* 1978)

Heddle *et al.* (1978) show two of their vegetation complexes – groupings of plant communities defined in relation to site-vegetation types, landform-soil units and rainfall - as occurring in the project area.

The two vegetation complexes in the project area are the Quindalup Vegetation Complex (55) and the Vasse Vegetation Complex (57); they are more or less coincident with the Quindalup (Q) and Vasse (V) landform-soil units and occur on them. The Quindalup Complex extends more or less continuously along the coast from the south-western edge of the Heddle *et al.* mapping, at Peppermint Grove Beach, to the northern end, north of Lancelin, but the Quindalup Vegetation Complex is narrower at its northern end than the Quindalup landform-soils unit. The Vasse Complex has a patchy occurrence on the western side of the Swan Coastal Plain from the south-western edge of their mapping, at Peppermint Grove Beach, to Mandurah, with small outliers along the Swan River in Perth, South Perth and Nedlands. The northern end of the most southerly Vasse Complex occurrence they show is in the vicinity of Harewoods Road, and the next occurrence is in Bunbury.

The Vasse Vegetation Complex typically consists of closed scrub of species of *Melaleuca*, fringing woodlands of *Eucalyptus rudis – Melaleuca* spp. and open forest of *Eucalyptus gomphocephala – E marginata – Corymbia calophylla*. Twenty nine percent of the Vasse Complex remains on the southern Swan Coastal Plain. This percentage is slightly under the 30% level set by the Environmental Protection Authority (2000) and Environment Australia (2001) below which there should be no more clearing.

Twenty three percent of the Vasse Complex remains in the Greater Bunbury Region, of which 22% is within secure tenure. Within a 15 kilometre radius of the project area, approximately 3761 hectares is vegetated with the Vasse Complex. About 81ha of the Vasse Complex is in either System Six areas or National Parks within 15km of the project area.

Formations and Plant Associations (Smith 1974)

Smith shows the project area as being Peppermint (*Agonis flexuosa*) Low Shrubland (under 2 m high) flanked by Tuart Woodland, in the Spearwood Vegetation System. The southern end of the Peppermint Low Shrubland is on the western side of the Stratham Golf Course, where it is flanked on the west by coastal Open Heath and on the east by Tuart Woodland and Banksia Low Open Forest. The Smith map shows no clearing nor paperbark or other distinctively wetland vegetation in Lots 316 to 317.

The narrow strip of Peppermint Low Shrubland between Harewoods Road and the Stratham Golf Course is the only occurrence of this vegetation unit shown on the Smith map. Part of it has been cleared and developed since Smith mapped it.

2.0 METHODS

The vegetation survey and rare flora search comprised the following three overlapping and interrelated stages:

- preparation for fieldwork, particularly preparation of Table A1 (see Appendix A), familiarization with the appearance of the flora to be searched for, and examination of relevant reports, maps and other information;

- fieldwork to determine units, distribution and condition of vegetation and rare flora habitats and presence or absence of any rare flora listed in Table A1 and any other significant flora, and

- office and herbarium work done following the fieldwork (1) to check identifications of plant specimens collected during fieldwork and (2) to prepare this report.

2.1 PREPARATION FOR FIELD WORK

Preparation for field work entailed provisional description, listing and mapping of vegetation units of the project area and preparing a table of rare flora to be searched for during field work. Methods for field work were chosen during the preparation stage.

2.1.1 Vegetation

Provisional description, mapping and understanding of vegetation of the project area were based upon prior field work in the general area, examining digital aerial photography and reading various publications and maps. Vegetation unit boundaries were checked by examination of digital aerial photography provided by Bayley Environmental Services.

2.1.2 Floristic Community Types

The most accurate way to determine which floristic community types (FCTs) are in a Swan Coastal Plain study area is to select, sample and analyse Gibson-type, 10m by 10m quadrats (plots) using the techniques described by Gibson *et al.* (1994) and Keighery (1994). An essential component of these techniques is the compilation of a complete list of species for each quadrat based upon correctly identified plant specimens. This often requires sampling the quadrat more than once.

It should be possible, however, according to Gibson (pers. comm.) and *Bush Forever* (Government of Western Australia 2000, Volume 2, p. 487), to infer, at least tentatively, which floristic community types, at least of the original 43 described by Gibson et al. (1994), occur in a study area. Inferences of which FCTs occur in particular Bush Forever sites have been made from "information on the floristics of the area and the area's geographic location" (Government of Western Australia 2000, Volume 2, p. 487).

More specifically, inferences can be made by comparing comprehensive lists of species, key species, aerial photography and other information from an area with:

1. the 'Thirty Group Classification' descriptions of floristic community types in Gibson *et al.* (1994, pp. 29-30, 37, 39-45),

2. the sorted two-way Table 12 in Gibson *et al.* (1994, pp. 31-36), which shows species

frequency by community type in Species Groups A through S,

3. the descriptions of community types and maps of locations of their sampling quadrats in Appendix 1 of Gibson *et al.* (1994, pp. 74-159),

4. geomorphological and land system information about the study area and its vicinity (e.g. Agriculture WA 1991 mapping; and, to a lesser extent, the Churchward and McArthur 1978 smaller scale maps),

5. lists of floristic community types, bushland areas and locations of sampling quadrats given in appendices of Gibson *et al.* (1994) and in relevant surveys and reports by consultants and others, and

6. Bushland Plant Survey Recording Sheets for sampled quadrats in similar areas of bushland as near the study area as possible (Department of Environmental Protection 1996).

Looking at sampling quadrat sites of floristic community types recorded nearest the study area and comparing them with plant communities in the study area might also be helpful.

This study used some of these methods as adjuncts to sampling six temporary relevés. The locations of these relevés is shown in Figure 1, and brief descriptions of them are given in Appendix C, along with the coordinates of their locations.

2.1.3 Rare Flora

The first phase of the rare flora search was preparation of a table of taxa of Declared Rare and Priority Flora with distributions and locations that may include the broader area. This table was compiled from the results of searches of three databases carried out by the Wildlife Branch of Department of Environment and Conservation (DEC). These three DEC databases are *Threatened (Declared Rare) Flora* (Summary of Threatened Flora Data), *Declared Rare and Priority Flora List* and *Western Australian Herbarium Specimen* (WAHERB). The searches were for Declared Rare and Priority Flora taxa recorded in the general vicinity of the project area and up to 10 km or more from it.

Table A1 in Appendix A lists the taxa in the results of the DEC rare flora database searches. The table also lists conservation codes, distributions, localities, growth forms, habitats and flowering times.

2.1.4 Significant Vegetation

Guidance No. 10 (Environmental Protection Authority 2003, pp. 54-56) provides information about conservation and reservation status of vegetation complexes of the southern Swan Coastal Plain.

There are no publications that provide information about conservation and reservation status of vegetation units in the general area, but Gibson *et al.* (1994), English and Blyth (1997) and WA Threatened Species &Communities Unit do so for floristic community types and threatened ecological communities.

Table A2 in Appendix A lists Threatened Ecological Communities recorded in the general vicinity of the project area. The table was compiled from the results of a DEC Wildlife

Branch search of its *Threatened Ecological Community* database for Threatened Ecological Communities recorded up to 10 km or more from the project area.

2.2 FIELD WORK

The field work component of the study was undertaken by botanist Dr. Arthur Weston, colleagues and assistants on 4 August, 30 September, 1 and 29 October and 15 November 2007 and 23 January 2008. Observations on structure and floristic composition of vegetation were recorded, condition of the vegetation was assessed and rare flora were searched for. More detailed descriptions of vegetation structure and floristics were made at relevé sites and other waypoints. Locations of waypoints are shown in Figure 1, and coordinates of the relevé waypoints are listed in Appendix C.

The classification system used for describing vegetation and the six-point scale used for assessing vegetation condition are based upon Keighery (1994), Muir (1977) and Government of Western Australia (2000, Vol. 2, p. 493), and from Keighery (1994), Trudgen (1991) and Government of Western Australia (2000, Vol. 2, pp. 493-494), respectively.

The part of the system for descriptions of vegetation used in this report is:

Canopy cover /Form, height	100% - 70%	70% - 30%	30% - 10%	10% - 2%
Trees 10-30m Trees < 10m	Closed Forest Closed Low Forest	Open Forest Open Low Forest	Woodland Low Woodland	Open Woodland Open Low Woodland
Shrubs > 2m Shrubs 1-2m Shrubs < 1m	Closed Tall Scrub Closed Heath Closed Low Heath	Open Tall Scrub Open Heath Open Low Heath	Tall Shrubland Shrubland Low Shrubland	Open Tall Shrubland Open Shrubland Open Low Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Also Sedges: Sedgelands. Rushes: Rushlands. etc.				

The six-point condition scale is, basically:

P	Pristine	No obvious signs of disturbance,
E	Excellent	Vegetation structure intact, disturbance affecting individual species (plants?), weeds are non-aggressive species,
VG	Very Good	Vegetation structure altered, obvious signs of disturbance,
G	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance; basic vegetation structure or ability to regenerate it is retained,
D	Degraded	Basic vegetation structure severely impacted by disturbance; scope for regeneration but not to a state approaching good condition without intensive management, and
CD	Completely Degraded	Vegetation structure not intact; the area completely or almost completely without native species ('parkland cleared').
TC		Vegetation structure destroyed and native species absent

The 'TC' is an additional condition point which is used for areas that were completely cleared of native vegetation, often with a grader or bulldozed or ploughed.

Flora and vegetation units and condition were recorded at waypoints, in relevés and elsewhere, and provisional vegetation descriptions and map boundaries were confirmed and revised.

Specimens of dominant and characteristic plants not readily identifiable in the field, or with help from keys and descriptions in Wheeler *et al.*(2002), Marchant *et al.* (1987), Hussey *et al.* (1987, 2007), other floras and articles were collected for subsequent identification. Voucher specimens of uncommon and possibly significant plants were also collected and pressed.

2.3 AFTER FIELD WORK

After returning from field work, pressing of plant specimens collected during the field work was completed, and the pressed specimens were dried. The specimens were identified by checking them against FloraBase (2008), a variety of keys and descriptions in floras and taxonomic works, only some of which are referred to in this report, by consulting other botanists, and, after fumigation, by comparing them with specimens in collections in the Western Australian Herbarium in South Perth.

During the process of identification and following it, the names of the plants identified were checked against the tables in Appendix A and other lists of significant flora, including Atkins 2006, 2008b)

The provisional vegetation descriptions and boundaries were revised, refined and finalised, and the significance of vegetation units, vegetation complexes and floristic community types in the project area was assessed in terms of conservation significance and reservation status.

Maps were drawn to show boundaries and condition of vegetation units in the project area, and locations of significant flora recorded.

3.0 RESULTS AND DISCUSSION

3.1 VEGETATION

3.1.1 Vegetation Units

Nine vegetation units with native, not-planted plants in them were distinguished on the basis of height, density and dominant species. These vegetation units, and six others with few or no natives in them, and the symbols used for them in the Figure 1, Vegetation Units and Relevé Locations, are listed below. Photographs of them are in Figure 3 and Appendix C.

Upland Vegetation Units (4 mapped units)

- Peppermint (*Agonis flexuosa*) Open to Closed Low Forest **Pf**
- Peppermint (*Agonis flexuosa*) Woodland **Pw**
- Tuart (*Eucalyptus gomphocephala*) Open Forest to Woodland **Tfw**
- Tuart (*Eucalyptus gomphocephala*) Woodland **Tw**

Wetland and Transitional Vegetation Units (5 mapped units)

- *Baumea articulata* (Jointed Rush) Closed Tall Sedgeland **B**
- *Lepidosperma gladiatum* (Coast Sword-sedge) Open Sedgeland **G**
- *Melaleuca rhaphiophylla* (Swamp Paperbark) Open to Closed Low Forest **M**
- Bulrush (*Typha orientalis*) - *Baumea articulata* Closed Tall Rushland **RB**
- Wattle (*Acacia saligna*) - Peppermint Closed Low Forest **WP**

Vegetation with few, if any, Native Plants (6 mapped units)

- Aliens: mixed grasses and other herbaceous plants **AH**
- Bulrush (*Typha orientalis*) Tall Rushland, mainly Closed **R**
- Bulrush (*Typha orientalis*) Tall Rushland &/over mixed low herbs **RH**
- Bulrush (*Typha orientalis*) Tall Rushland &/over *Isolepis prolifera* Clubrush **RI**
- *Cirsium vulgare - Centella asiatica* Closed mixed, mostly alien, Herbland **C**
- Sumpland: open water in spring; herbland in summer **So**

Upland Vegetation

Approximately one-third of the bushland in the project area is a mosaic of upland units, which intergrade and vary in density and relative proportions of the two dominant trees. Tuart and Peppermint trees are in all of the upland vegetation units with native vegetation in them. Except for a few small areas, the understorey comprises various mixtures of pasture grasses and other established alien species (weeds) of grasses and herbaceous plants. The most common or conspicuous native understorey species include the shrubs *Rhagodia baccata, Diplolaena dampieri, Myoporum caprarioides, Templetonia retusa, Leucopogon parviflorus* and *Spyridium globulosum,* the lianes *Hardenbergia comptoniana* and *Clematis linearifolia,* the herbaceous species *Acanthocarpus preissii* and the sedge *Lepidosperma gladiatum.*

A small area of upland vegetation assessed as being in best condition, due to paucity of weeds in it, is Relevé 6. The species recorded in this relevé, and in the other five relevés, are listed in Appendix B, the relevés are illustrated and briefly described in Appendix C, and their locations are shown in Figure 1.

Wetland Vegetation

Approximately two-thirds of the bushland in the project area is of wetland units, most of which are dominated by one or few of several established alien species, especially Bulrush (*Typha orientalis*) and Clubrush (*Isolepis prolifera*). However, four native species are dominants of relatively small stands of native wetland and transitional vegetation in Good to Very Good to Excellent condition. These species are *Agonis flexuosa, Acacia saligna, Melaleuca rhaphiophylla* and *Baumea articulata.*

The stands of wetland vegetation dominated by native species are the *Acacia saligna* - Peppermint Closed Low Forest (**WP**) in the north-east corner of the project area, and the *Melaleuca rhaphiophylla* (Swamp Paperbark) Open to Closed Low Forests (**M**) and *Baumea articulata* (Jointed Rush) Closed Tall Sedgelands (**B**) in western parts of the wetlands. Aliens are prominent in the understoreys of Swamp Paperbark Forests, but there are few understorey plants, either native or alien, in the *Baumea articulata* Sedgelands.

The *Lepidosperma gladiatum* (Coast Sword-sedge) Open Sedgeland in the south-eastern part of the project area has a native dominant and dense understorey, but the understorey has very few, if any, native plants.

3.1.2 Vegetation Condition

The condition of the bushland vegetation is shown in Figure 2. It is assessed as generally Degraded to Completely Degraded, and even Totally Cleared, largely due to replacement of native shrubs and herbaceous plants in the understorey by aliens. It ranges, on the six-point Keighery-Trudgen scale, from Completely Degraded (CD) to Good (G) and, in a few relatively small areas, Very Good to Excellent (VG-E). There are also areas totally cleared of native species (TC).

The native understorey in the upland bushland is generally sparse and is largely replaced with weeds. A few small understoreys of dense *Diplolaena dampieri* shrubs or *Lepidosperma gladiatum* sedges are exceptions.

Most of the herbaceous layer in the wetland also comprises alien species, and most of the wetland has no overstorey. The exceptions are the *Acacia saligna* - Peppermint Closed Low Forest (**WP**) in the north-east corner of the project area, and the *Melaleuca rhaphiophylla* (Swamp Paperbark) Open to Closed Low Forests (**M**) and *Baumea articulata* (Jointed Rush) Closed Tall Sedgelands (**B**) in western parts of the wetlands.

3.1.3 Floristic Community Types and Threatened Ecological Communities

It would be impossible to assign most, if not all, of the vegetation of the Gelorup project area to any floristic community type on the basis of detailed floristic analysis because there is so little native understorey or ground layer vegetation and so few native species left in it.

The location of the lots, the presence of *Agonis flexuosa* and Tuart in most of the upland vegetation, which is on Quindalup South Soil-Landscape Units, and the presence of *Melaleuca rhaphiophylla*, *Gahnia trifida, Acacia saligna, Baumea articulata* and *Centella asiatica* in the wetlands suggest that the floristic groups most likely to be represented in the project area are degraded Floristic Community Types (FCTs) 12, 17 or 30b, or combinations

of them, and possibly FCT 15 (Gibson *et al* 1994).

The name, reservation status and conservation status given by Gibson *et al.* (1994) for each of these Floristic Community Types are, respectively:

• FCT 12	*Melaleuca teretifolia* and / or *Astartea* aff. *fascicularis* shrublands	Well reserved	Low risk
• FCT 15	Forests and woodlands of deep seasonal wetlands	Well reserved	Vulnerable
• FCT 17	*Melaleuca rhaphiophylla – Gahnia trifida* seasonal wetlands	Well reserved	Low risk
• FCT 30b	Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands	Well reserved	Susceptible

None of these floristic community types is on the Threatened Ecological Community (TEC) database, but FCT 25, Southern *Eucalyptus gomphocephala - Agonis flexuosa* woodlands, might have been represented immediately east of the project area prior to its degradation. FCT 25 is listed in Gibson *et al* (1994) as Poorly reserved and Susceptible and has been proposed for listing on the Threatened Ecological Communities database.

3.2 FLORA

The approximately 80 taxa (species, subspecies and varieties) of vascular plants recorded and identified, at least to genus, during the field trips are listed in Appendix B. The list includes 45 native taxa and 36 aliens (weeds). It is estimated that these numbers comprise around 60-70% of the flora of the project area.

No Declared Rare Flora or Priority Flora species was found during the fieldwork, nor were likely habitats for any identified.

3.3 LIMITATIONS

No attempt was made to record all of the taxa in the project area, and it is probable that some were not seen. Some species may occur in the project area but be identifiable only rarely; e.g. only during the first spring or two after a fire.

The vegetation categories described and mapped here are sometimes broad and cover ranges of variation which cannot, for various reasons, be satisfactorily delimited either on the ground or on high resolution aerial photography. And condition ratings are often given as ranges and percentages because they also, like vegetation units, cover mosaics and continua.

4.0 ACKNOWLEDGEMENTS

Panairama printouts, aerial photographs and other information and assistance were provided by Phil Bayley. Clem Love, Indrani Weston and Elisha Mueller assisted with fieldwork.

Assistance by Mike Hislop and staff of the Western Australian Herbarium and other botanists in identifying plant specimens and access to the Western Australian Herbarium collections, which was essential for carrying out the project, are greatly appreciated.

5.0 REFERENCES

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FIGURES

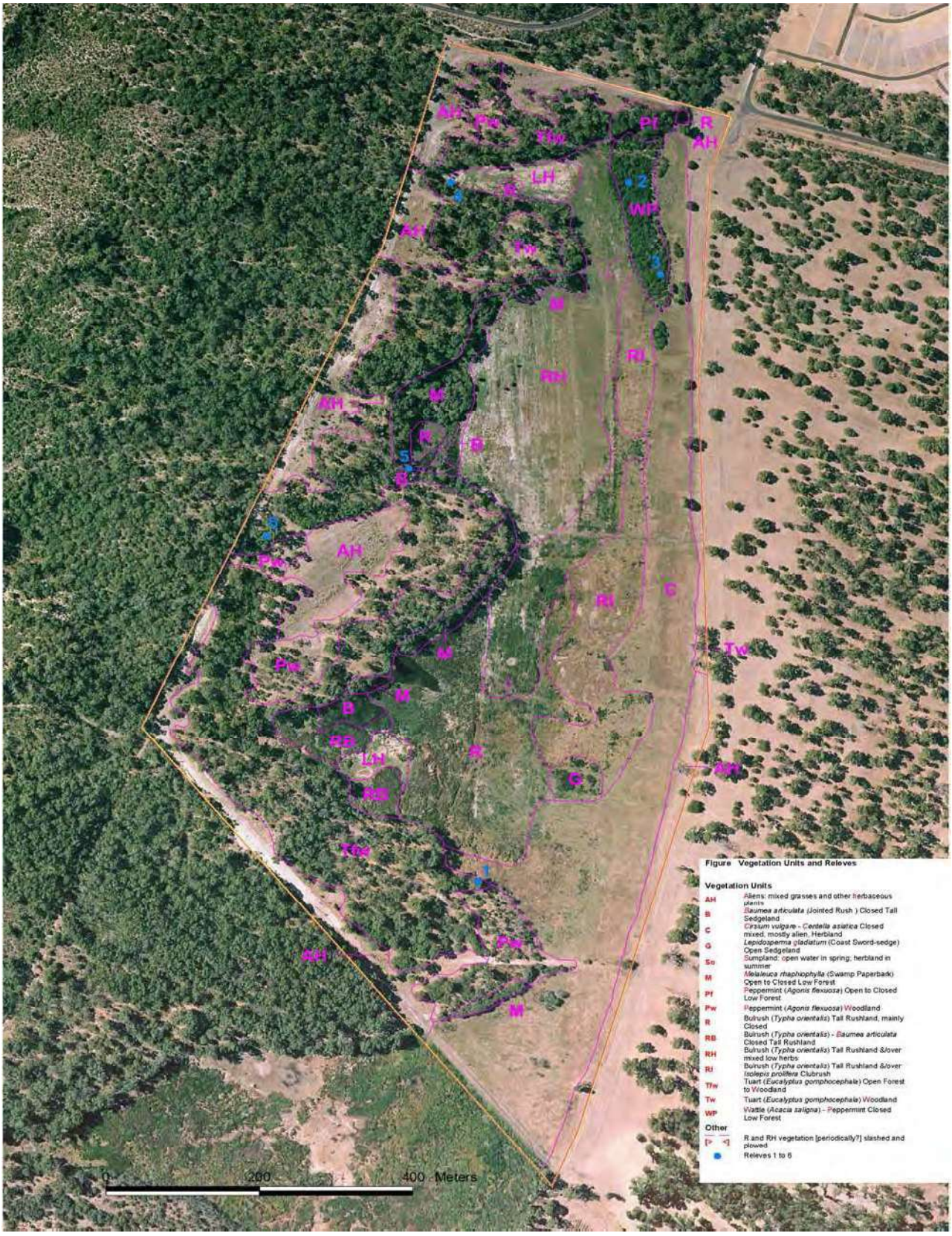

FIGURE 1 Vegetation Photographs Units and Relevé Locations

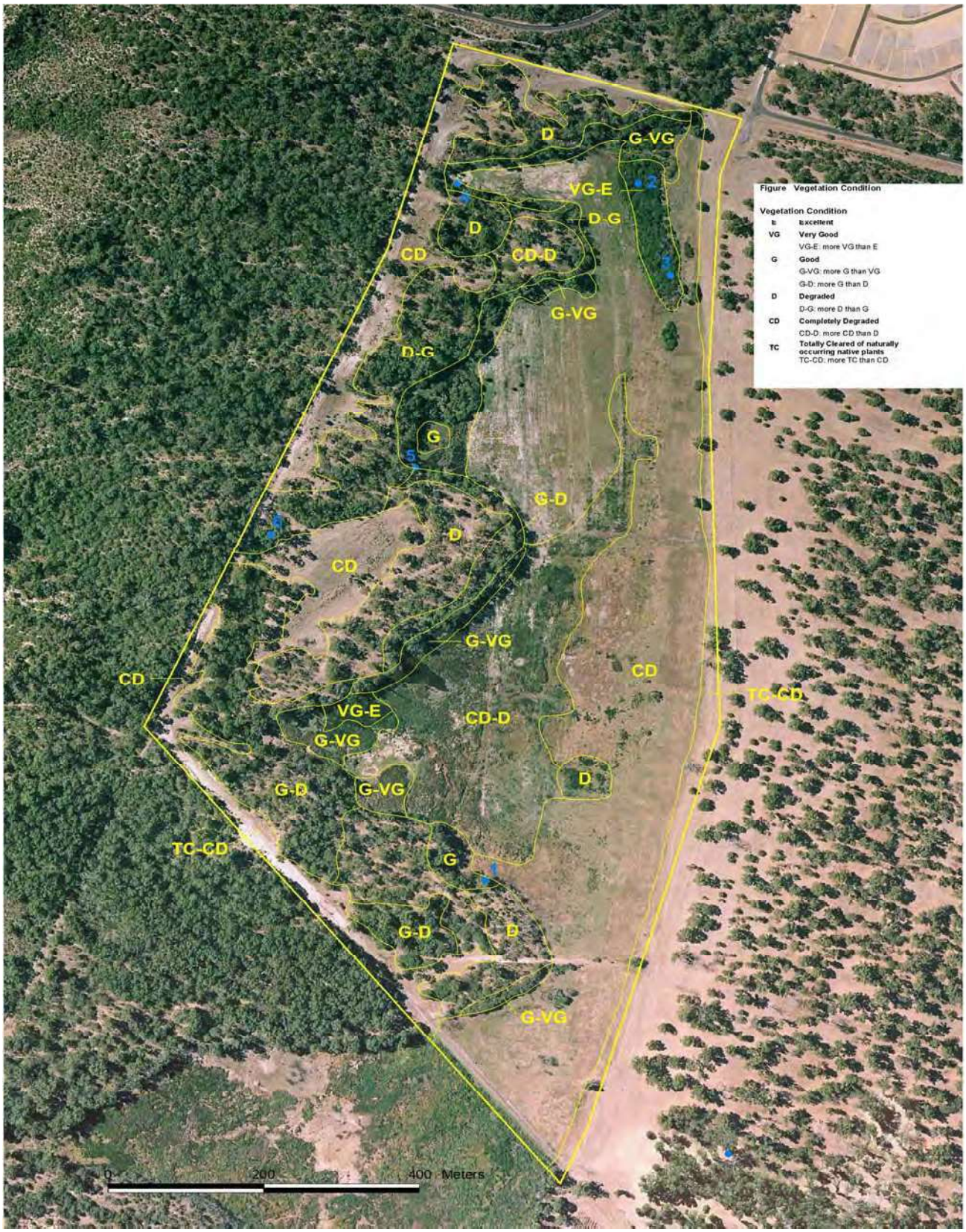

FIGURE 2 Vegetation Condition [and Relevé Locations]

A. Veg. unit AH (foreground) **-** **Trachyandra divaricata* (brown), exotic grasses and forbs and, on left, Peppermint tree.
Veg. unit WP (central line of 'shrubs') **–** Orange Wattle **-** Peppermint Closed Low Forest.
Veg. unit C (between **AH** and **WP**) **-** **Cirsium vulgare* - *Centella asiatica* Closed mixed, mostly alien, Herbland.
Veg. unit Tfw (background) **-** Tuart Open Forest to Woodland.
Veg. unit M (right of Peppermint and on right edge; both are between **WP** and **Tfw**) **-**Swamp Paperbark Open to Closed Low Forest.

(Photograph ASW.07.VIII.1-15 – looking SW from S of NE corner of project area)

B. Veg. unit So (foreground) **-** Sumpland: open water in spring; herbland in summer.
Veg. unit WP (central line of 'shrubs') **–** Orange Wattle **-** Peppermint Closed Low Forest.
Veg. unit RH (between **So** and **WP**) **-** Bulrush Tall Rushland (slashed) with mixed low herbs.
Veg unit Pf or Pw (in centre beyond **WP**; there is more left [N] of it) **-** Peppermint Open to Closed Low Forest or Woodland
Veg. unit AH (on right behind Peppermint trees) **-** Aliens: mixed grasses and other herbs
In background (in Gelorup East project area and beyond) **–**Unit AH, Banksia, Peppermints, Tuarts.

(Photograph ASW.07.VIII.1-23 – looking E towards Photopoint **B** from near Relevè 4; R4 is behind Peppermint on right)

C. Veg. unit R (foreground) **-** Bulrush (*Typha orientalis*) Tall Rushland, mainly Closed.
Veg. unit B (dark, in left centre beyond **R**) **-** *Baumea articulata (*Jointed Rush) Closed Tall Sedgeland.
Veg. unit RH (in centre and right centre) **-** Bulrush Tall Rushland (ploughed and slashed) with and over mixed low herbs.
Veg. unit M (in far centre beyond **B** and **RH**) **-** Swamp Paperbark Open to Closed Low Forest.
Veg. units Tfw and **Tw** (background) **-** Tuart Open Forest to Woodland, and Tuart Woodland

(Photograph ASW.07.VIII.1-18 – looking E towards Photopoint **B** from near Relevè 4; R4 is behind Peppermint on right)

FIGURE 3 Vegetation Photographs

APPENDIX A

DECLARED RARE AND PRIORITY FLORA WITH DISTRIBUTIONS AND HABITATS WHICH MAY INCLUDE LOTS 313 TO 317 HAREWOODS ROAD GELORUP

Contents

Appendix A

Declared Rare and Priority Flora and Threatened Ecological Communities with Distributions and Habitats which may include Lots 313 to 317 Harewoods Road Gelorup

Introduction

Table A1 lists the 35 taxa (species, subspecies and varieties) of Declared Rare (R) and Priority (P) Flora Table A2 lists 5 Threatened Ecological Communities (TECs) that are listed in Department of Environment and Conservation databases as having been recorded in the broader vicinity of the Lots 313 to 317 project area. The list was compiled from the results of searches of four databases carried out by the Database Officers of the Species and Communities Branch, Department of Environment and Conservation (DEC), in August 2007. These four DEC databases, and the symbols for three of them in Table A1, are *Threatened (Declared Rare) Flora* (Summary of Threatened Flora Data) [**ThrFlor**], *Declared Rare and Priority Flora List* [**D-P List**], *Western Australian Herbarium Specimen* (WAHERB) [**WA Herb**] and *Threatened Ecological Community*.

The DEC database searches were for Declared Rare and Priority Flora taxa recorded within 10km of information about conservation codes, distributions, locality records, growth forms, habitats and flowering times. The parameters requested for the searches were:

- the *Declared Rare and Priority Flora List* database for the locations: Bunbury, Capel, Dalyellup, Minninup, Peppermint Grove,

- the *Western Australian Herbarium Specimen* database for records in the rectangle defined by the coordinates 33^0 20' - 33^0 30' S and 115^0 30' - 115^0 38' E,

- the *Threatened (Declared Rare) Flora* database for records in the rectangle defined by the coordinates 33^0 20' - 33^0 30' S and 115^0 30' - 115^0 38' E and

- the *Threatened Ecological Community* database for records in the rectangle defined by the coordinates 33^0 20' - 33^0 30' S and 115^0 30' - 115^0 38' E.

The printouts also provided some information about conservation codes, localities and distributions, and flowering times. Most of the additional information in Table A1 about conservation codes, distributions, locality records, growth forms, habitats and flowering times was obtained from Atkins (2006, 2008), FloraBase (2007, 2008), Hoffman and Brown (1998) and Paczkowska and Chapman (2000). The information about distributions, localities, growth forms, habitats and flowering times is not always comprehensive. Information about growth form and habitat is at least indicative and should be useful in assessing how likely rare flora is to occur in a given area.

Five of the taxa listed in Table A1 are R: Declared Rare Flora, but only two of them - *Caladenia huegelii* and *Eleocharis keigheryi* - were in the results of the database searches as having been recorded within 10 km of the Gelorup property. One plant of *Caladenia huegelii* was recorded south to south-east of there, and *Eleocharis keigheryi* plants were recorded in a clay pan 9 km from Boyanup along the railway line from there to Capel. None of the habitats in the project area is believed to be suitable for either species.

The 35 taxa of rare flora listed in Table A1 are the principal taxa, but not the only ones, searched for in Lots 313 to 317 in spring 2007 and summer 2008. The cover letter with the printouts from the sets of the database search results emphasizes that "the information supplied should be regarded as an indication only of rare flora that may be present". There may well be rare, or otherwise significant, flora in the area other than the taxa listed in the

printouts. Item 7 in the Attachment provided with DEC database search results states that:

> "It should be noted that the supplied data do not necessarily represent a comprehensive listing of the rare flora of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area."

Four of the 20 taxa McCutcheon searched for in 2001 and 2002 in the parts of Lots 313-317 that are east of the Minninup Road reserve (Bayley Environmental Services 2009) are no longer Priority listed, and four others are no longer mapped, in FloraBase, as occurring south of Mandurah, Yalgorup or Pinjarra. These latter four are *Jacksonia sericea, Pithocarpa corymbulosa, Platysace ramosissima* and *Stylidium striatum*. Four others –McCutcheon's 'Less Likely' Taxa *Chordifex gracilior, Synaphea odocoileops, Synaphea petiolaris* subsp. *simplex* and *Verticordia densiflora* var. *pedunculata* – are not listed in the results of the 2007 database searches.

DEC Flora Conservation Codes

The following copy of the second page of Atkins (2008b) lists the conservation code symbols used by the DEC for Declared Rare and Priority Flora, and it gives their definitions. Table A1 uses 'DRF' instead of 'R' and 'P1' etc instead of '1' etc.

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.

X: Declared Rare Flora - Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, 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.

Note, the need for further survey of poorly known taxa is prioritised into the three categories depending on the perceived urgency for determining the conservation status of those taxa, as indicated by the apparent degree of threat to the taxa based on the current information.

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Table A1
Declared Rare and Priority Flora Recorded in Gelorup and up to 10 km from Lots 313-317 Harewoods Road, Gelorup
(as of August 2007)

D-P List	Thr Flor	WA Herb	SPECIES / TAXON	FAM CODE	CONS CODE	DISTRIBUTION / LOCALITIES	Flowers	Form / Habitats
D	-	-	Acacia flagelliformis	163	4	Harvey, Eaton, Bunbury, Capel, Busselton, Donnybrook	(May-) Jul-Sep	Rush-like, erect or sprawling shrub, 0.3–0.75(–1.6) m high; fl. yellow. Sandy soils. Winter-wet areas.
-	-	2	Acacia semitrullata	163	3	Yallingup, Donnybrook, Harvey, Yarloop, Collie	(May-) Jun-Aug (Oct)	Low shrub with slender, erect stems and pungent phyllodes, (0.1–)0.2–0.7(–1.5) m high; fl. cream, white. White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas.
D	-	-	Amperea micrantha	185	2	Mokine, Yoongarillup, Capel, Whicher Range, Ruabon NR	Sep-Oct (Nov)	Low, spreading, thin and weak-stemmed, bushy perennial herb, 0.1–0.3 m high; fl. brown, Sandy soils.
-	-	1	Anthotium junciforme	341	4	Wattle Grove, Midland, Bayswater, Serpentine, Upper Swan, Kenwick, Busselton, Scott River Plain, Albany	(Nov-) Dec-Mar	Open, erect to prostrate, grass-like, tufted, perennial herb, 0.05–0.4 m high; leaves linear to terete, 0.5-1 mm wide; fl. blue, violet, purple (rarely white or pink), terminal on stalks longer than leaves, 12-40 cm long. Sandy clay, clay. Winter-wet depressions, drainage lines. Low in landscape in eucalypt woodlands or winter-wet flats, depressions, drainage lines.
D	-	-	Aponogeton hexatepalus	025	4	Perth, Pinjarra, Capel, Bunbury, Boyanup, Nannup	(Jul-) Aug-Sep (Oct-)	Rhizomatous or cormous, aquatic perennial herb; leaves straplike, the floating part of which is broader than the submerged part; fl. green, white. Mud. Shallow freshwater: ponds winter pools on clayey soils, rivers, claypans.
D	-	-	Boronia humifusa	175	1	Capel, Tutunup, Kalamunda	Jun/Sep	Low-growing, wiry perennial herb, 0.1–0.2 m high fl. pink, red. Gravelly clay loam over laterite. Jarrah-marri open forest.
D	-	-	Boronia tetragona	175	3	Capel, Busselton, Whicher Range, Cowaramup	Oct-Dec	Perennial herb, 0.3–0.7 m high; leaves sessile, entire, with papillate margins; branches quadrangular; sepals ciliate; fl. pink, red. Black/white sand, laterite, brown sandy loam. Winter-wet flats, swamps, open woodland.
D	-	-	Caladenia busselliana	066	R	Marybrook, Capel	(Sep-) Oct	Tuberous, perennial herb, 0.2–0.3 m high; fl. green, yellow, cream. Sandy loam. Winter-wet swamps.
D	1	-	Caladenia huegelii	066	R	Perth - Capel	Aug-Oct	Large, few-flowered spider orchid w. large labellum that is dark red (& white) and has long fringing hairs that are usually white and often divided at tip; leaves & stem w. long thin spreading hairs at base. Grey or brown sandy (possibly also clay loam) soils in banksia and eucalypt woodlands and open forests which are, usually, low in the landscape and, at least

								near Perth, usually have *Dasypogon bromeliifolius* and *Phlebocarya ciliata*.
D	1	9	Caladenia speciosa	066	4	Myalup, Eaton, Yarloop, Ludlow, Gingin, Capel	Sep-Oct	Spider orchid; fl. mainly white (to pink); labellum fringe hairs long and red to, distally, shorter and white. White, grey or black sand; generally in *Banksia* and jarrah woodland, especially after summer fires.
D	-	1	Chamaescilla gibsonii	054F	3	Muchea, Ellen Brook, Yule Brook, Drakesbrook, Capel	Jun/Sep	Clumped tuberous herb. fl. blue. Clay to sandy clay. Winter-wet flats, shallow water-filled claypans.
D	-	-	Chamelaucium roycei ms	273	R	Capel, Tutunup	(Aug-) Oct-Dec	Bushy shrub, 0.3–1.5 m high; leaves -/+ terete, pungent; fl. white, pink. Sandy clay, clay, lateritic soils. Winter-wet flats, swamps, stream banks.
-	1	-	Conostylis pauciflora subsp. pauciflora	055	4	Yarloop, Dawesville, Yalgorup NP	(Jun-) Aug-Oct	Stoloniferous, yellow-flowered herb. Eucalypt, peppermint, banksia woodlands on grey sand, deep or shallow over limestone, on lower and middle slopes of stabilised dunes.
D	-	-	Dryandra squarrosa subsp. argillacea (now *Banksia s.* subsp.*a.*)	090	R	Ruabon, Tutunup, Whicher Range, Upper Capel	(Jun-) Jul-Aug (-Nov)	Erect, open, non-lignotuberous shrub, 1.2–4 m high; fl. yellow. White/grey sand, gravelly clay or loam. Winter-wet flats, clay flats.
-	-	1	Eleocharis keighery	032	R	'Kenwick, Lesueur, Cataby, Wannamal, Ellenbrook, Boyanup, Waterloo, Julimar, Lesueur	Aug–Nov	Rhizomatous, clumped, perennial, grass-like sedge, to 0.4 m high; fls. terminal, green. Clay, sandy loam. Emergent in freshwater: creeks, claypans.
D	-	-	Eryngium ferox ms	281	3	Collie, Pinjarra, Capel, Kulunilup NR	Oct, Nov	Erect, open, tuberous herb, 0.1–0.3 m high; fl. green. Grey to brown loamy to sandy clay, brown cracking clay. Winter-wet flats, swamps, dried claypans, ridges.
D	-	-	Eryngium pinnatifidum subsp. palustre ms	281	3	Arrowsmith-Capel Serpentine, Kenwick, Forrestdale, Bullsbrook	Oct-Nov	Herb; *Melaleuca* shrublands and low open vegetation on winter-wet sandy-clay flats; (MET: swales in Quindalup dunes). vegetation on winter-wet sandy-clay flats.
D	-	-	Franklandia triaristata	090	4	Capel, Tutunup, Jarrahwood, Argyle	Aug-Oct	Erect, lignotuberous shrub, 0.2–1 m high; fl. 4-lobed, white (& cream, yellow, brown, purple). White or grey sand.
-	1	-	Hibbertia spicata subsp. leptotheca	226	3	'Yalgorup, Lancelin, Burns Beach	Sep-Nov (Jul-Dec)	Mound or semi-prostrate small shrub. Mainly limestone heath.
D	-	-	Isopogon formosus subsp. dasylepis	090	3	Capel. Ludlow, Busselton, Ruabon, Scott R, Yoongarillup	Jun-Dec	Low, bushy or slender, upright, non-lignotuberous shrub, 0.2–2 m high; fl. pink, purple, red. Sand, sandy clay, gravelly sandy soils over laterite. Often swampy areas.
D	4	3	Lasiopetalum membranaceum	223	3	Capel, Dwellingup, Yandup, Australind, Dawesville, Yanchep	Sep-Dec	Small shrub with cordate leaves; Sand, mainly over limestone and in tuart woodland.
D	-	-	Logania wendyae	302	1	Capel, Dardanup	Oct	Decumbent dwarf shrub, to 0.17 m high; fl. white, blue. Brown clay to sandy clay, laterite gravel.
D	-	-	Mitreola minima	302	3	Woolbernup Hill, Walpole, Capel	(Oct-) Nov-Jan	Slender, erect annual herb, 0.025–0.04 m high; fl. white. Grey sand. Peaty swampy areas.
-	1	-	Platysace ramosissima	281	3	Yalgorup, Lancelin, Boonanarring, Gingin, Bullsbrook NR	Oct-Nov	Perennial herb with ribbed or angular stems. Heath on Spearwood sand or limestone.

D	-	-	Pultenaea skinneri	165	4	Collie, Binningup, Boyanup, Whicher Rng, Bunbury, Nannup	Jul-Jan	Slender shrub, 1–2 m high; fl. yellow, orange, red. Sandy or clayey soils. Winter-wet depressions.
D	-	-	Rhodanthe pyrethrum	345	3	Bullsbrook-Waterloo-Denmark, Capel, Kenwick, Forrestdale	Sep-Oct (-Dec)	Erect, slender annual, herb, 0.05–0.2 m high; fl. white, yellow. Clay, sandy clay. Winter-wet depressions, clay pans, swamps.
-	1	1	Schoenus benthamii	032	3	Mogumber, Kenwick, Busselton, Manypeaks	Oct–Nov	Tufted, perennial sedge, 0.15–0.45 m high; fl. brown. White, grey sand, sandy clay. Winter-wet flats, swamps.
D	-	-	Stylidium leeuwinense	343	3	Capel, Scott River, Milyeannup, Shannon River, Walpole-Nornalup NP	Feb-May	Erect perennial herb, 0.15–0.6 m high, Leaves adpressed to stem, lanceolate, 0.2-0.5 cm long, 0.6-1 mm wide, apex acute, margin hyaline or margin hyaline and fimbriate, glabrous; inflorescence racemose; fl. pink. Grey to black peaty sand. Winter-wet habitats and depressions. Shrubland, heath, sedgeland or low woodland.
D	-	-	Stylidium longitubum	343	3	Midland, Busselton, Arthur River, Jandakot	Nov (Oct–Dec)	Very small, erect annual (ephemeral) herb, 0.05–0.12 m high; fl. pink, with distinct red line across near throat. Grey sandy clay over clay; winter wet flats; *Melaleuca viminea* shrubland.
-	1	-	Stylidium maritimum	343	3	Yalgorup - Breton Bay, Cervantes, Nilgen, Bold Park, Drovers Cave NP	Sep-Dec	Tufted, linear-leaved triggerplant; Sand dunes and depressions in limestone.
D	-	-	Stylidium striatum	343	4	Gooseberry Hill, Armadale, Flynn Block, Beverley, Capel, Boyanup	Oct-Nov	Rosetted perennial herb, 0.15–0.55 m high; leaves erect, oblanceolate to spathulate, 1.5-4 cm long, 1.5-6 mm wide, apex acute to acuminate, margin entire, glabrous, striate; scape sparingly glandular on inflorescence axis, glabrous below; inflorescence racemose; fl. yellow. Brown clay loam over laterite. Hillslopes. Jarrah/Marri forest, Wandoo woodland.
D	-	-	Synaphea hians	090	3	Busselton, Collie, Ludlow, Capel, Crooked Brook	Sep-Oct (Jul–Nov)	Prostrate or decumbent shrub, 0.15–0.6 m high, to 1 m wide; leaves lobed, fan-like; fl. yellow. Sandy soils. Rises.
D	-	-	Tetratheca parvifolia	182	3	Capel, East of Donnybrook, Collie	Oct	Small shrub, 0.2–0.3 m high; leaves small; fl. pink.
D	-	-	Verticordia attenuata	273	3	Ruabon – Tutunup (Busselton), Bunbury, Capel	Jan (Dec–May)	Shrub, 0.4–1 m high; fl. pink. White or grey sand. Winter-wet depressions.
-	-	1	Villarsia submersa	303A	4	Gunapin, Boyanup, Lake Muir, Denmark, Forrestdale, Kenwick, Frankland River, Lane Poole	Sep-Oct (Aug–Nov)	Rooted aquatic, extremely slender, perennial herb; leaf blades elliptic, floating; fl. white, floating. In freshwater 0.05-0.6 m deep. Pools, lakes, swamps, winter-wet clay depressions, claypans.

Table A2
Results of DEC Database Search for Threatened Ecological Communities
in the Broader Vicinity of Gelorup
(as of September 2007)

TEC No.	FCT/ SCP No.	TEC/SCP Name/Description	Conserv. category	Plot	Distance from site
14	SCP18	Shrublands on calcareous silts of the Swan Coastal Plain (SCP)	Vulnerable	HAY05	5.5km NNE
14	SCP18	Shrublands on calcareous silts of the SCP	Vulnerable	myHAY03	5.7km NNE
22	SCP1b	*Eucalyptus calophylla* woodlands on heavy soils of the southern SCP	Vulnerable	R116703	9km E
32	SCP07	Herb-rich saline shrublands in clay pans	Vulnerable	mySwamp01	6km NE
32	SCP07	Herb-rich saline shrublands in clay pans	Vulnerable	Swamp02	6km NE
33	SCP08	Herb-rich shrublands in clay pans	Vulnerable	HAY01	6.3km NNE
33	SCP08	Herb-rich shrublands in clay pans	Vulnerable	myHAY01	6.3km NNE
33	SCP08	Herb-rich shrublands in clay pans	Vulnerable	myHAY02	6km NNE
34	SCP09	Dense shrublands on clay flats	Vulnerable	MANEA01	7km NE

APPENDIX B

Vascular Flora Recorded in the Gelorup West Project Area

Contents

APPENDIX B

Vascular Flora Recorded in the Gelorup West Project Area

Introduction

The approximately 80 taxa (species, subspecies and varieties) recorded and identified in the Gelorup West project area in spring 2007 and summer 2008 are listed in Table B1.

The Table B1 list includes 45 native taxa and 36 aliens (weeds). No Declared Rare Flora was found during the field work, nor were likely habitats for any identified.

The table lists families alphabetically and species alphabetically within families. The names used for taxa follow the curent Max 3.1.2.215 database. An asterisk (*) preceding the taxon name indicates that the species is alien, a weed.

Table B1
Vascular Flora Recorded in the Gelorup West Project Area
during 2007 and 2008

Family Code	Family and Taxon Names	Id	R1	R2	R3	R4	R5	R6	Notes
011C	**Dennstaedtiaceae**								
	Pteridium esculentum	11	X					X	
20	**Typhaceae**								
	*Typha orientalis	8				X	X		
31	**Poaceae**								
	Austrostipa ?compressa	40						X	
	*Bromus diandrus	24	X						
	*Cynodon dactylon	81							
	*Ehrharta longiflora	17	X					X	
	*Holcus lanatus	22	X	X	X				
	*Paspalum distichum	68				X			
32	**Cyperaceae**								
	Baumea articulata	33					X		
	Baumea juncea	84		X					
	Baumea rubiginosa	67				X			
	*Carex ?divisa (or appressa)	70		X					
	Ficinia nodosa	59							
	Gahnia trifida	6			X				
	*Isolepis prolifera	1							
	Lepidosperma angustatum	28	X						
	Lepidosperma gladiatum	5	X	X	X			X	
	Tetraria capillaris	39						X	
35	**Araceae**								
	*Zantedeschia aethiopica	20	X						
054C	**Dasypogonaceae**								
	Acanthocarpus preissii								
054F	**Anthericaceae**								
	Caesia ?micrantha	58							
	Thysanotus ?manglesianus	41						X	
	Tricoryne elatior	56							

Family Code	Family and Taxon Names	Id	R1	R2	R3	R4	R5	R6	Notes
054G	**Asphodelaceae**								
	*Trachyandra divaricata	43						X	
60	**Iridaceae**								
	*Romulea rosea	46						X	
66	**Orchidaceae**								
	Caladenia latifolia	19	X					X	
87	**Moraceae**								
	*Ficus carica	65		X					
88	**Urticaceae**								
	Parietaria debilis	53							
103	**Polygonaceae**								
	*Acetosella vulgaris	75					X		
105	**Chenopodiaceae**								
	Rhagodia baccata subsp. baccata	7	X	X	X			X	
113	**Caryophyllaceae**								
	*Cerastium glomeratum	47						X	
	*Petrorhagia dubia	35							
	*Stellaria ?media	45						X	
119	**Ranunculaceae**								
	Clematis linearifolia	62							
131	**Lauraceae**								
	Cassytha ?racemosa	69				X			
138	**Brassicaceae**								
	*Heliophila pusilla	54							
163	**Mimosaceae**								
	Acacia rostellifera	85		X					
	Acacia saligna	2		X	X			X	
165	**Papilionaceae**								
	*Dipogon lignosus	63							
	Hardenbergia comptoniana	23	X					X	
	Isotropis cuneifolia	60							
	*Medicago ?polymorpha	32	X						
	*Melilotus indicus	36						X	
	Templetonia retusa								
167	**Geraniaceae**								
	*Geranium sp.	16	X					X	
	Pelargonium ?littorale	14	X						
168	**Oxalidaceae**								
	Oxalis ?perennans	44						X	
175	**Rutaceae**								
	Diplolaena dampieri	37						X	
185	**Euphorbiaceae**								
	*Euphorbia sp.	21	X					X	
215	**Rhamnaceae**								
	Spyridium globulosum	42		X				X	
226	**Dilleniaceae**								
	Hibbertia cuneiformis	13	X	X	X			X	
273	**Myrtaceae**								
	Agonis flexuosa	4	X	X	X			X	
	Eucalyptus gomphocephala	10	X					X	
	Melaleuca rhaphiophylla	9							
275	**Onagraceae**								

Family Code	Family and Taxon Names	Id	R1	R2	R3	R4	R5	R6	Notes
	Epilobium ?billardiereanum	82							
276	**Haloragaceae**								
	Haloragis ?brownii	77							
281	**Apiaceae**								
	Apium prostratum	78							
	Centella asiatica	64		X					
	Daucus glochidiatus	50						X	
	Trachymene pilosa	57							
293	**Primulaceae**								
	*Anagallis arvensis	30	X					x	
302	**Loganiaceae**								
	Logania vaginalis	61							
303	**Gentianaceae**								
	*Centaurium ?erythraea	83							
303A	**Menyanthaceae**								
	Villarsia violifolia	74					X		
305	**Asclepiadaceae**								
	*Gomphocarpus fruticosus	31	X						
307	**Convolvulaceae**								
	Dichondra repens	12	X						
313	**Lamiaceae**								
	*Mentha pulegium	76							
315	**Solanaceae**								
	*Solanum ?laciniatum								
	*Solanum linnaeanum	25	X						
	*Solanum nigrum	15	X						
316	**Scrophulariaceae**								
	*Verbascum virgatum	52							
326	**Myoporaceae**								
	Myoporum caprarioides	66		X	X				
331	**Rubiaceae**								
	*Galium ?murale	49						X	
	Opercularia ?hispidula	55							
	*Sherardia arvensis	48						X	
340	**Lobeliaceae**								
	Lobelia anceps	79							
345	**Asteraceae**								
	*Arctotheca calendula	27	X						
	*Carduus pycnocephalus	26	X					X	
	*Cirsium vulgare	29	X		X				
	*Cotula coronopifolia	34							
	Olearia axillaris	38						X	
	*Sonchus oleraceus	18	X						

APPENDIX C

Relevés

(the area in each relevé is under to much under 10m from centre post)

Relevé	Way-point	Position: easting mE northing mN	Alt. m	First Date	Photo in Fig. C1 ASW.	Vegetation Description and Condition and notes
R1	385	50 H 370576 6301375	4.45	1 Oct 2007	07.VII.1-15	Tuart Woodland over Peppermint Open Low Forest over Bracken Herbland , Sword-sedge Sedgeland , Kidney Weed Herbland and Grassland of pasture grasses. **Condition**: G-D. No other G vegetation nearby.
R2	434	50 H 370780 6302388	1.09	15 Nov 2007	07.XI.1-05	Orange Wattle (- Peppermint) Open (to Closed) Low Forest or Tall Scrub over Berry Saltbush Heaths (to Tall Scrubs) over Sword-sedge Sedgeland to Open Sedgeland, Kidney Weed Herbland to Open Herbland and Grassland of pasture grasses. **Condition**: G-VG.
R3	435	50 H 370832 6302255	23.7	15 Nov 2007	07.XI.1-04	Peppermint Low Woodland over Orange Wattle Closed Low Forest or Tall Scrub over Berry Saltbush Open Heath over Saw-sedge Sedgeland **Condition**: locally E, including slender, tangled *Myoporum caprarioides* Closed Heath to west.
R4	436	50 H 370537 6302379	2.77	15 Nov 2007	07.XI.1-03	Bulrush (- *Baumea rubiginosa*) Closed Rushland over ?Water Couch Grassland. **Condition**: G
R5	446	50 H 370494 6301962	?	23 Jan 2008	07.XII.1-04A	Tuart Open Forest over (1) Jointed Rush Closed Rushland, (2) Bulrush Closed Rushland and (3) Mixed alien (-*Villarsia violifolia*) Closed Herbland. **Condition**: (1) VG-E, (2) and (3) CD
R6	103	50 H 370315 6301868	7	1 Oct 2007	07.VII.1-22	Tuart Woodland to Open Forest over Peppermint Open Low Forest over Diplolaena Closed Tall Scrub over Sword-sedge Closed Sedgeland. **Condition**: E-G. The best condition in the area.

Names and Abbreviations

(names are from FloraBase 2009)

Common	Scientific	Common	Scientific
Berry Saltbush	*Rhagodia baccata*	Kidney Weed	*Dichondra repens*
Bracken	*Pteridium esculaentum*	Peppermint	*Agonis flexuosa*
Bulrush	*Typha orientalis*	Saw-sedge	*Gahnia trifida*
Diplolaena	*Diplolaena dampieri*	Sword-sedge	*Lepidosperma gladiatum*
Jointed Rush (a sedge)	*Baumea articulata*	Tuart	*Eucalyptus gomphocephala*
( )	less common	Water Couch	*Paspalum distichum*
E - Excellent	VG - Good	G – Good	D – Degraded	CD - Completely Degraded

Relevé 1. (Photograph ASW.07.VIII.1-15)

Relevé 2. (Photograph ASW.07.XI.1-05)

Relevé 4. (Photograph ASW.07.XI.1-03)

Relevé 3. (Photograph ASW.07.XI.1-04)

Relevé 5. (Photograph ASW.07.XII.1-04A)

Relevé 6. (Photograph ASW.07.VIII.1-22)

Figure C1

Photographs of Relevés