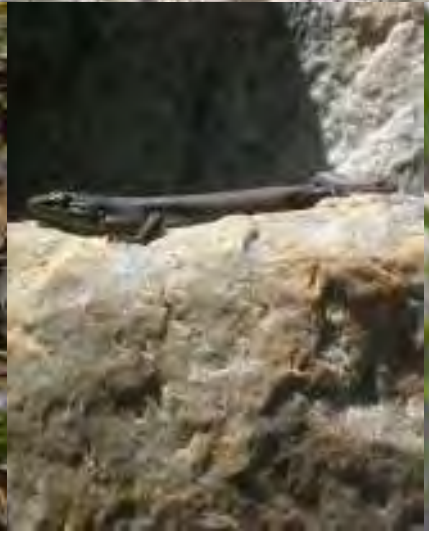



Fitzgerald River National Park Improvement Project

Culham Inlet to Hamersley Inlet

Vegetation and Flora




FITZGERALD RIVER NATIONAL PARK IMPROVEMENT PROJECT CULHAM INLET to HAMERSLEY INLET

VEGETATION & FLORA

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A report prepared for
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Cover photos: Clockwise from top left: *Microcorys longiflora, Anthocercis fasciculata, Kunzea similis, Pimelea physodes* (Qualup Bell), view west from East Mt Barren, *Adenanthos ellipticus* (Oval-leaf Adenanthos), Napolean Skink, *Stylidium galioides* (Yellow Mountain Triggerplant), *Hibbertia papillata* (©G.F.Craig 2010).

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Executive Summary

Main Roads Western Australia is undertaking upgrade works as part of the Fitzgerald River National Park (FRNP) Improvement Project in the Shire of Ravensthorpe on behalf of the Department of Environment and Conservation. The works will involve widening and sealing the current alignment of Hamersley Drive, spur roads, and provision of new carparks and turn-arounds between Culham Inlet and Hamersley Inlet. It is likely that the works will require the clearing of up to 10 m of native vegetation on either side of the existing gravel road from the current centerline and some road realignments.

Vegetation and flora surveys are being carried out in a staged process. The first report on Stage 1 from Culham Inlet to Hamersley Inlet Road (10 km) was finalized in November 2009 (Craig and Hickman 2009). This second report amalgamates the results from Stages 1, 2 and 3, which includes Hamersley Inlet Road and the spur roads to Four Mile Beach, Barrens Beach, Mylies Beach (East and West), Cave Point and West Beach (a further 11 km) and the recreation nodes. Concept plans are still being developed for Stage 4, the Hamersley Inlet recreation nodes, and will be surveyed at a later date.

Vegetation

The survey area mainly lies in the Barren Ranges system of Beard (1976). Thirteen vegetation units were mapped and described. Most of the vegetation comprises four units of 'Barren Ranges thicket' – one characterized by *Adenanthos venosus* on shallow soils over outcropping quartzite at the base of East Mt Barren and wave-cut bench, two predominantly on laterised soils, *Dryandra quercifolia* and *Eucalyptus preissiana/ D. quercifolia,* and *Melaleuca papillosa* on valley slopes where schist is exposed.

Three units are associated with consolidated limestone, *Eucalyptus angulosa* is typical with either *E. falcata* or *Calothamnus macrocarpus,* and on the eastern side of Hamersley Inlet a woodland of *E. utilis* is found. Dune sands support scrub thicket with *Melaleuca lanceolata* or *Banksia speciosa.*

Deeper, sandy soils have typical coastal plain vegetation of the Qualup system that includes *Eucalyptus pleurocarpa.* Two units were recognized that were characterized by either *Banksia repens* or *Banksia baxteri.*

On the fringes of the inlets a wetland community of *M. cuticularis* grows. Inland drainage lines support *Eucalyptus occidentalis* dominated plant associations.

Vegetation condition

The majority vegetation is in excellent condition, although the record hot temperatures (48^{o}C) in January 2010 severely scorched many species. Plant associations appear to be recovering following the October 2006 fire that burnt parts of the survey area east of West Beach road. Weeds, including the Weed of National Significance *Asparagus asparagoides* (bridal creeper) and noxious *Trachyandra divaricata* (dune onion weed) were found at the Ranger station and Barrens Beach respectively. Weed infestations were also recorded at the Four Mile Beach carpark and campsite, East Mylies Beach carpark and beach access path and Hamersley Inlet.

Declared Rare and Priority flora

Field surveys carried out in 2009 identified six Declared Rare flora (DRF) - *Adenanthos ellipticus, Eucalyptus burdettiana, Eucalyptus coronata, Kunzea similis* subsp. *similis, Stylidium galioides* and *Verticordia pityrhops* - growing on the wave-cut bench on the south side of East Mt Barren, in the proposed area of disturbance.

Both 2009 and 2010 surveys identified the Priority Two species - *Calothamnus macrocarpus, Gonocarpus hispidus, Hibbertia papillata* and *Leptospermum confertum* occur between Mylies Creek and Culham Inlet. The Priority Three *Microcorys longiflora* grows on West Beach road.

Seven Priority Four species, *Acacia argutifolia, Anthocercis fasciculata, Dampiera deltoidea, Jacksonia compressa, Leucopogon compactus, Melaleuca papillosa* and *Pimelea physodes* are spread across the survey area. Another four Priority Four's, *Lechenaultia superba, Hakea hookeriana, Corybas limpidus* and *Pleurosphascum occidentalis* have been collected near Hamersley Drive or spur roads in the past, but were not found in the proposed impact area during this survey. The latter two need flowers or fruiting bodies respectively, to be identified.

In addition, two Significant species, *Lepidosperma* sp. Fitzgerald River (AS George 9935), *Lepidosperma* sp. GFC8831 were found.

Since the first survey (Craig and Hickman 2009), *Acacia moirii* subsp. *dasycarpa* and *Lissanthe pleurandroides* have been deleted from the Priority flora list.

Threatened Ecological Communities

No listed Threatened or Priority Ecological Communities were found during the field survey, although a community of ecological significance is located on the wave-cut bench that extends south of East Mt Barren. These micro-wetlands are sedge-dominated communities that are fed by freshwater from further upslope. They occur within the *Banksia speciosa* vegetation unit and were too subtle to map individually.

Recommendations

The wave-cut bench on the seaward side of East Mt Barren is the one of the most botanically significant areas in the Fitzgerald River National Park and the south coast. The following recommendations were made following the 2009 survey of Stage 1:

- keep road verges and spur drains to the absolute minimum width/size allowed by road design;
- consult an expert in freshwater habitats to assess the ecological value of the micro-wetlands;
- ensure that sub-surface drainage to and from the micro-wetlands is not impeded by the road base;
- have an on-site inspection of the wave-cut bench with biologists and surveyor/ road engineer present;
- design a high quality walk trail along the wave-cut bench, linking the carparks at the east and west ends of East Mt Barren;
- weed invasion and plant disease have the greatest potential to impact the high biological and conservation value of the FRNP. Road materials (including water) must come from weed- and disease-free areas, so that they are not imported by either the material itself or the machinery carting it.

Additional recommendations following 2010 surveys of Stages 2 and 3:

- an on-site inspection during winter-spring 2010 by DEC's Environmental Officer should be carried out at all campsites, Barrens Beach and Mylies Beach East to familiarize the areas of weed infestation and formulate a weed management program for coming years;
- eradication of weeds, particularly the *Asparagus asparagoides* (bridal creeper) and *Trachyandra divaricata* (dune onion weed) should be carried out at the recreation nodes before flowering in late winter - spring;
- it is essential that the gravel from recreational sites that require rehabilitation is not translocated to other sites within the FRNP;
- construction materials for recreation facilities must be checked for *Theba pisana* (white Italian snail), especially if they have been stored in Hopetoun;
- *Corybas limpidus* (P4) and *Pleurosphascum occidentalis* (P4) need to be surveyed in late winter – spring.

1. Introduction

Purpose

Main Roads Western Australia (Main Roads) is undertaking upgrade works between Culham Inlet and Hamersley Inlet in the Fitzgerald River National Park (FRNP) on behalf of the Department of Environment and Conservation (DEC). The works will involve widening and sealing of Hamersley Drive, spur roads and carparks for tourism purposes. It is likely that the works will require the clearing of up to 10 m of native vegetation on either side of the existing gravel roads from the current centre line.

Main Roads require biological surveys for the above project. The purpose of the surveys is to provide an appropriate examination and description of the receiving environment to ensure that all aspects of biological/ecological significance are identified and recorded. The results of the biological survey will assist in the preparation of an Environmental Impact Assessment and an Environmental Management Plan or other referral documents.

Background

The proposal to upgrade roads in the Fitzgerald River National Park was first announced on the 30 January 2009 by the Honorable Colin Barnett Premier; Minister for State Development with the intent to offset the economic effect of the closure of the Ravensthorpe nickel mine. The State Government committed to a long term measure of support to increase economic viability of the towns of Ravensthorpe and Hopetoun in the Shire of Ravensthorpe.

The road upgrade is intended to inject funds into the communities of Hopetoun and Ravensthorpe by providing opportunities for local sub-contractors to be employed through the construction process. Economic benefits will also flow to service providers in the local towns through the delivery of this project.

Study Area

Figure 1 details the location of the biological survey. The survey is restricted to an area 25 m either side of the existing road alignment, including all spur roads and the car park loop roads which have been identified by DEC's Landscape Architects. Eventually, the survey area is to include borrow and gravel pits, base course and sub-base pits, spoil sites, proposed works camp and compound areas, stockpile sites and any other areas to be disturbed.

This report amalgamates information from Stage 1, and includes new data from Stages 2 and 3. Stage 4 will be provided in a separate report.

Stage 1
The first stage included 10 km of Hamersley Drive, from Culham Inlet to the Hamersley Inlet Road intersection. An interim report was provided to Main Roads WA in November 2009 (Craig and Hickman 2009). An addendum, which included locations of the Declared Rare *Verticordia pityrhops,*, was provided in December 2009 (Craig 2009).

Stage 2
The second stage surveyed a further 11 km and included Hamersley Inlet Road to Hamersley Inlet, to both the Shire of Ravensthorpe and DEC camping areas, plus the spur roads to Four Mile Beach, Barrens Beach, Mylies Beach (East and West), Cave Point and West Beach. These were surveyed between January and April 2010.

Stage 3
The recreational sites at the end of each spur road are currently being designed by DEC. The carparks and small loop roads between Culham Inlet and West Beach had draft concept plans available in June 2010 and were surveyed in July.

Stage 4

The Hamersley Inlet campsites (Shire and DEC) still require substantial planning and will need to be fully surveyed at a later date. This stage will be provided in a separate report.

Other biological studies

Separate reports that form part of the biological studies for the *FRNP Improvement Project* have been prepared by:

1. Gillian Craig and Ellen Hickman surveyed Stage 1 of the Hamersley Drive upgrade (Craig and Hickman 2009)

2. Ellen Hickman surveyed the vegetation and flora at the proposed gravel pits on Location 6382 Steeredale Road, Hopetoun (Hickman 2009);

3. Andrew Chapman has assessed the implications for fauna (Chapman 2009, Chapman 2010 in prep);

4. Malcom Grant has surveyed for dieback *Phytophthora* and other plant pathogens.

Figure 1: Survey area in Fitzgerald River National Park – Hamersley Inlet to Culham Inlet

2. Methods

The botanical surveys were carried out by Gillian Craig, except for the Declared Rare eucalypts on East Mt Barren which were surveyed independently by Ellen Hickman (Craig and Hickman 2009). The results of those surveys have been included here to provide complete documentation of the flora between Hamersley Inlet and Culham Inlet.

Desktop

A search was made of the Department of Environment and Conservation's (DEC) Threatened Flora Database (DEFL), WA Herbarium database (WAHerb) and the Declared Rare and Priority Flora Species List. The search co-ordinates requested were NW corner: 33°45'S 119°45'E SE corner: 33°57' 120°14'E. A search was undertaken of the DEC Threatened Ecological Communities database.

The Commonwealth's Threatened Flora database was searched to determine the category under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act) for listed Threatened flora.

The flora database information was imported into OziExplorer® software to determine those species likely to occur in the impact area. Digital orthophotos of the Whoogerup (2003- pre-burn) and Ravensthorpe (2007 – post-burn) map sheets were provided by DEC to use as base imagery.

Scientific licences and a Regulation 4 Authority permit were obtained from DEC to take flora within the Fitzgerald River National Park. Permission to use digital information was obtained from DEC's Species and Community Branch, Kensington.

Previous reports and publications relevant to the region were reviewed.

K.R. Newbey relevés
During 1985 and 1986, the late Ken Newbey recorded plant taxa in 309 relevés in the park with permanent quadrats marked at 65 of these sites for fauna sampling (Chapman and Newbey 1987). The plant species data from all Newbey's relevés within and immediately adjacent to the study area were databased using the Perth herbarium's MAX V3 software. Since 1987 there has been considerable revision of the taxonomy, therefore the author updated Newbey's species names to current taxonomy and changed species names to those which are known from the area, e.g. *Isopogon attenuatus* became *I. polycephalus,* and *I. buxifolius* became *Isopogon* sp. Fitzgerald River. This information was used to provide an initial species list for the area.

Eucalypts on East Mt Barren
DEC Albany's threatened flora files for *Eucalyptus coronata* and *Eucalyptus burdettiana* were reviewed by Ellen Hickman, specific locations of all known population on and around East Mt Barren were identified and plant numbers were summarised to get an overview of each species.

Orthophotos from the Ravensthorpe sheet (2003 – pre-burn and 2007 – post-burn) were provided by DEC for use in the field.

Field survey

Hamersley Drive, spur roads and carparks
The survey was carried out according to the *Environmental Protection Authority's Draft Guidance No.51* (EPA 2004). Each side of the road, new alignments and proposed walk paths identified by DEC were traversed on foot, between the verge and up to 25 m into the undisturbed vegetation. Along each traverse, boundaries of vegetation units (based on changes in species composition) and threatened flora were marked as waypoints on the GPS using the GDA94 datum.

Relevés were recorded and a digital photo taken of representative vegetation units. Common species were recorded, ie more than five plants were observed in the general vicinity, in a plotless 10 m x 10 m quadrat for shrubs (< 2 m tall), sedges and herbs, and 20 m x 20 m for tall shrubs (> 2 m tall) and eucalypts. Vegetation structure, based on a modified Muir classification (Appendix 2), was recorded.

The condition of the vegetation was noted. The usual vegetation condition scales, e.g. Keighery (1994) were not considered suitable for this survey, as there is minimal disturbance of the vegetation, except by fire. Specific locations of weeds were GPSed. It must be noted, however, that some of the recreation sites (Four Mile and Hamersley Inlet campsites) were surveyed in summer and early autumn, prior to any germination of annual weeds.

Stage 1

Surveys were carried out along Hamersley Drive on 22nd, 25th and 29th September, 1st, 12th, 16th and 23rd October 2009. Sites of nominated Declared Rare Flora at East Mt Barren were GPSed again with a surveyor on 21st December 2009.

Stages 2 & 3

Surveys along Hamersley Inlet Road, the spur roads and recreation nodes between Culham Inlet and West Beach were carried out on 20th- 21st January, 12th and 22nd February, 10th March, 8th and 16th April, and 8th July 2010.

The weather was mostly cool to warm (16^{o}C – 21^{O}C max), the hottest day was in April with 24^{O}C. Days were sunny or intermittently overcast with a slight to moderate winds.

Plant specimens were verified using the author's private herbarium (previously verified in the Perth Herbarium), Albany and Ravensthorpe Regional Herbaria, and the Perth Herbarium; nomenclature follows that of WAHERB, except for *Dryandra.* Voucher specimens will be lodged in the Perth and Ravensthorpe herbaria.

Waypoints were downloaded from the GPS to OziExplorer®, then divided into individual files for each species of declared rare or priority flora.

Eucalypts on East Mt Barren

Foot traverses of all the populations identified from the Threatened Flora file review of *Eucalyptus coronata* and *E.burdettiana* on and around East Mt Barren were carried out on 29th and 30th September, 1st, 2nd, 21st, 22nd, 23rd and 24th October 2009 by Ellen Hickman. The weather was cool to warm (15^{o}C – 28^{o}C max) and sunny or overcast with slight to moderate winds.

Most plants were marked as waypoints on a Garmin GPS 60 using the GDA94 datum. A proportion of each species was also tagged using sheep tags. The tags were of two shades of green to distinguish the two species and scribed with the species initials and a number in sequence (ie EC001, EC002 to EC500 for *E.coronata*, and EB001, EB002 to EB500 for *E.burdettiana*). When the tags ran out the plants were simply marked with a waypoint.

Plants of each species identified as growing within 25 m on either side of the Hamersley Drive road were waypointed and flagged with blue flagging tape, but not tagged.

Areas of vegetation known to have plants of either species that were not burnt in the 2006 fire proved to be too thick to traverse by foot so estimations of plant numbers were made by interpreting aerial photography.

Waypoints and tracks were downloaded from the GPS using DNR Garmin software. The waypoints were exported as text files to be imported into Excel to allow for sorting the data into individual files for each species. These were then imported into Arcview to provide shape files of each species location on and around East Mt Barren. The tracks were saved as shape files for direct import into Arcview.

Analysis of data

Tracks and waypoints were downloaded from the GPS units using OziExplorer® software. Tracks and waypoints were saved as .plt/.wpt and .txt files (UTM/UPS and hddd.ddddd^{o}), the latter allows importing of data into Excel® spreadsheets.

Plant species were recorded in a MAX V3 data table, a software program developed by DEC's Western Australian herbarium which links datasets to the Census of Western Australian Plants master list. The 'relevé number' was entered into the database.

To assist in clarifying the vegetation units, Anne Rick used PRIMER® multivariate analysis to produce dendrograms that grouped relevés on the basis of species similarity. Both Newbey's (Chapman and Newbey 1987) and the author's data were included in the analysis. Only perennial species were included, and for the Newbey data, only those species with $\geq$ 0.5 abundance. Relevés with only a few species recorded were excluded as they skewed the data.

Once the vegetation units had been clarified using the PRIMER® analysis, species lists for each unit were prepared. Vegetation units were mapped using a combination of field data, PRIMER® analysis and interpretation of orthophotos.

Digitising

Digital files including waypoints of each species of threatened flora encountered during the survey and line work of the vegetation map (1:10 000 scale) were sent to Meredith Spencer in 2009 and Janet Newell in 2010 (DEC Albany) for digitising. Final maps were provided as shapefiles for compatibility with ArcMap.

3. Desktop Assessment

Physical Environment

Climate

A Mediterranean climate of warm to hot summers and cool, wet winters is generally experienced. The nearest weather station is Hopetoun North, for which the last 13 years of data is available (Table 1). Mean maximum temperature recorded at Hopetoun in the hottest month (February) is 26^{o}C. Mean minimum temperature in the coldest months (July-August) is 8^{o}C. The highest recorded temperature of 48 ^{o}C was recorded on 6 January 2010, while the lowest of -0.3 ^{o}C was in July 2000. Frosts have been recorded by farmers in the catchment during winter and spring, but are usually rare on the coast.

The rainfall is typical of a Mediterranean climate with a pronounced winter maximum and a long dry summer. The mean annual rainfall on the coast is about 500 mm, but has been highly variable over the past 10 years with the maximum of 610 mm in 2001, followed by a very dry year in 2002 when only 274 mm fell. Sporadic heavy rainfall events can occur in summer as a result of cyclonic events in the north of the State - the highest monthly rainfall of 185 mm was recorded in January 2000.

Annual evaporation is generally 1500 mm.

Morning wind speeds are typically 17-22 km/h and increase in the afternoon to average 20-29 km/h. On the hottest recorded day, i.e. 6 January 2010, the strong winds from the NNW had only 5% Relative Humidity at 3 pm (BOM, 2010), the strongest wind gust was not recorded!

Climate Change is predicted to impact the south coast of Western Australia. Changes in temperature and rainfall patterns may lead to changes in the physical condition of the region and to the growing season, incidence of frost and flood events etc.

Table 1: Climate data for Hopetoun North (BOM 2009)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Maximum temperature															
Mean maximum temperature (°C)	25.2	25.8	25	23.3	21.6	19.2	18.2	18.9	20.5	21.4	23.1	24.4	**22.2**	14	1996 2009
Minimum temperature															
Mean minimum temperature (°C)	15.2	15.7	14.3	12.6	10.5	8.5	7.7	7.9	8.7	10	12.2	13.9	**11.4**	14	1996 2009
Rainfall															
Mean rainfall (mm)	48.6	18.1	29.3	44.5	36.8	49.5	66.3	54.1	49.1	39.5	37.4	24	**496.4**	13	1996 2009
Highest rainfall (mm)	185	72.4	69.4	138	78.4	106	126	127	109	70.4	97.2	54.6	**609.8**	13	1996 2009
Date	2000	1997	2006	2007	1999	2005	2001	2001	1996	2008	2008	2008	2001		
Lowest rainfall (mm)	0	0.2	0	0	8.2	14.4	30	19.6	5.2	14.4	1.4	3.2	**274**	13	1996 2009
Date	1998	2008	2008	2008	2002	2002	1996	1996	2000	2006	2007	2006	2002		
Mean number of days of rain	6.5	5.4	7.8	11.5	12.5	13.8	15	14.8	13.9	10.9	8.1	6.7	**126.9**	13	1996 2009

Geology and Soils

The Barren Ranges group of hard massive Proterozoic quartzites rise into a small abrupt mountain at East Mt Barren (about 275 m) with a pediment 90 m above sea level that fronts onto the sea, creating one of the most striking coastlines of the south coast. Soils on the mountain and pediment are rocky and skeletal. The 90 m platform at the base of East Mt Barren is a wave-cut bench formed during the Tertiary when sea levels were about 100 m higher than today. The ranges at that time would have been isolated islands at the time of deposition of the Plantagenet sediments that form the coastal plains.

The coastal plain that formed during the Tertiary to the west of East Mt Barren rises gently inland from the coast to about 150 m altitude. These Plantagenet Group of sediments consist of thin-bedded mudstones and siltstones which are overlain by Quarternary drift sands on the seaward margin of the plain. The surface has developed a clearly differentiated profile with a superficial layer of bleached sand overlying a band of ironstone nodules over a mottled loam.

Numerous intermittent streams flow directly to the sea, flooding after heavy rain and usually dry up in summer, except Mylies Creek which maintains pools of water either side of Hamersley Drive. Water runoff is generally brackish, becoming more saline as volumes decrease.

A major fault east of East Mt Barren provides the boundary of the Esperance plain developed by Tertiary Plantagenet sediments. Again Quaternary sands have overlain the pediments on the lower, eastern slopes of the mount.

Previous biological surveys

Vegetation and flora surveys have been carried out by:

- Beard (1976, 1979) mapped the vegetation at 1:250 000 scale;
- Aplin and Newbey (1990 a & b) described the vegetation and flora of the FRNP;
- Chapman and Newbey (1995) established a series of monitoring quadrats for flora and trap lines for fauna across the FRNP (Appendix 6);
- Chapman and Newbey (1987) documented plant species, landform, geology and soil data for 309 vegetation sites in the FRNP;
- Lamont and Witkowski (1995 and 1999) have measured the response to fire of *Banksia* species growing near Hopetoun;
- in 2007, DEC Albany established monitoring plots north of Hamersley Drive, to determine vegetation response to the October 2006 fire. The fire followed from a prescribed burn between Eyre Range and East Mt Barren to achieve some 'break up' of the 1989 wildfire.

Assessment of the state of biological knowledge and its relevance to the FRNP can be found in:

- Hopper and Gioia (2004) discuss the evolution and conservation of the south-west's flora in the context of the area being an International biodiversity hotspot. The FRNP is recognized as an area of particularly high diversity within the south-west;
- Deegan (2005 and 2006) prepared a bibliography and review of the state of knowledge of the Fitzgerald Biosphere;
- a list of the 1,665 plant taxa known from the Park is given in Newbey and Hickman (2008);
- Barrett et al (2009) identified fire sensitive ecosystems in the South Coast region;
- a Regional Strategic Management Plan for threatened species and ecological communities (Gilfillan et al. 2009) and Recovery Plan for those in the Fitzgerald Biosphere (Newell et al. 2010).

Fitzgerald Biosphere Reserve

The national park is the core area of the Fitzgerald Biosphere which is a part-tenured management concept recognised by UNESCO's Man and the Biosphere program. The Fitzgerald Biosphere Reserve is recognised as being a 'hotspot' within one of Earth's 34 global biodiversity 'hotspots'. The FRNP has approximately 1,660 plant taxa, containing over one-quarter (29%) of the south-west's flora.

The protection of biodiversity is increasingly seen as a global concern. This change in perspective has been associated with an increasing number of international instruments addressing biodiversity conservation issues. Some of these instruments, such as those relating to Biosphere Reserves, have been given some recognition in the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999.* Moreover, the Environmental Protection Authority has recognised the importance of maintaining ecosystem/ecological processes for ecologically sustainable management (EPA 1999).

The government of Western Australia occasionally discusses the *Biodiversity Conservation Act* in Parliament. This Act proposes to enhance legislation for the protection, restoration and sustainable use of our native plants, animals and other native organisms. The government recognises that "all of our natural biodiversity is important and it is our responsibility to ensure that our biodiversity is conserved" (Government of WA 2002).

Vegetation Classification

The survey area lies in the South West Botanical Province and the Esperance Biogeographic Region (after Cresswell and Thackway 1995) and is in the Barren Ranges System described by Beard (1973, 1976), although the coastal dunes have affinity with the Fanny's Cove System. These systems include four types of pediments:

- the small mountains of the Barren Ranges group supporting Barren Ranges thicket – the most consistent species being *Eucalyptus preissiana* and *Dryandra quercifolia*;
- small adjacent portions of coastal plain on sandy lateritic soil supports *Eucalyptus pleurocarpa* mallee-heath;
- river trenches with mallee, including *Eucalyptus redunca, E. uncinata* and *E. conglobata;*
- areas of coastal drift sand with coastal scrub – *Eucalyptus angulosa* and *Melaleuca pentagona* being typical.

Threatened Ecological Communities

The search of DEC's Threatened Ecological Communities database found no known occurrences of threatened ecological communities in the study area (M. Hunter, pers.comm.). However, there are occurrences of the following ecological communities within approximately 5 km of the survey area:

- The 'Vulnerable' threatened ecological community – 'Thumb Peak - Mid-Mount Barren - Woolburnup Hill (Central Barren Ranges) *Eucalyptus acies* mallee heath' ;

- The 'Priority 1' ecological community – 'Very open mallee over *Melaleuca* sp. Kundip (GF Craig 6020) dense heath'.

Declared Rare and Priority Flora

The WAHERB and DEFL searches found 40 species in the vicinity of the survey area, including eight Declared Rare flora. After ovelaying their locations on an orthophoto, this number was reduced to 22 species being recorded in the survey area (Appendix 1.2). Six Declared Rare flora were located on or near East Mt Barren (Table 2).

DEC updated the conservation codes in March 2010 (Smith 2010), one species which was widespread in survey area, *Acacia moirii* subsp. *dasycarpa* was deleted from the list. Another known from the general area *Lissanthe pleurandroides* was also deleted.

Table 2: Declared Rare flora near Hamersley Drive

Species Name	DEC Conservation Code	EPBC Act
Adenanthos ellipticus	R	Vulnerable
Eucalyptus burdettiana	R	Endangered
Eucalyptus coronata	R	Vulnerable
Kunzea similis subsp. *similis*	R	-
Stylidium galioides	R	Vulnerable
Verticordia pityrhops	R	Endangered

4. Field Investigation

Vegetation

The survey area lies in the Barren Ranges system of Beard (1973, 1976), except for the coastal dunes which are more typical of the Fanny's Cove system. Two vegetation types are characteristic of the Qualup system. Appendix 3 provides eight maps at 1:10 000 scale of the project area and species lists for each of the 13 vegetation units.

Most of the vegetation comprises four units of 'Barren Ranges thicket' (Table 3) – one characterized by *Adenanthos venosus* [**Adven**] on shallow soils over outcropping quartzite at the base of East Mt Barren, two on predominantly on lateritised soils with *Dryandra quercifolia* predominant [**Dque**], but in areas including large patches of *Eucalyptus preissiana* [**Epre/Dque**]. *Melaleuca papillosa* [**Mpap**] grows on valley slopes where schist is exposed. Small winter-wet depressions support low heath characterized by *Melaleuca pulchella,* but these were too small (<1 ha) to map.

Consolidated limestone formed during the Quaternary period (about 125,000 years ago) along the coast. The mallee *Eucalyptus angulosa* is typical, and where sandy soils are deeper, *Calothamnus macrocarpus* or *C. quadrifidus* grow [**Eang/Cmac**]. More sheltered sites have taller mallees with a scrub understorey - *E. falcata* and *Melaleuca pentagona* are common [**Eang/Efal**]. Inland and east of Hamersley Inlet, the inlet slope of the high limestone ridge, supports a woodland of *E. utilis* (Coastal Moort) [**Euti**] 5-7 m high over low shrubs. The density of shrubs increases towards the top of the ridge and tall mallees, *E. falcata, E. angulosa* and *E. conglobata* subsp. *perata* are also found.

Unconsolidated coastal dunes support dense thickets of *Melaleuca lanceolata* [**Mlan**] with pockets of *Acacia rostellifera; M. nesophila* is abundant at some sites. The exposed seaward slopes are stabilized by *Scaevola crassifolia* and *Spinifex hirsutus.*

The *Banksia speciosa* [**Bspe**] unit is typically found on the coastal plain east of Culham Inlet. Its occurrence on the wave-cut bench at the base of East Mt Barren is unusual and coincides with the wetter, sandy soils where run-off and seepage from upslope creates micro-habitats. The unit is a mosaic of tall *Banksia* shrubs with pockets of sedge-land in the wettest areas.

Inland, deeper, sandy soils have typical coastal plain vegetation of the Qualup sytem. - *Eucalyptus pleurocarpa* is an indicator species. In the survey area *Banksia repens* was a common component [**Eple/Brep**]. Well-drained areas of colluvial sand support a *Banksia baxteri* shrubland [**Bbax**].

Drainage lines comprise *Eucalyptus occidentalis* (Yate) [**Eocc**] dominated plant associations. *Melaleuca cuticularis* [**Mcut**] (Saltwater Paperbark) fringe the inlets with a samphire understorey.

Table 3: Vegetation units in the Fitzgerald River National Park

Vegetation Unit	Vegetation structure	Typical Species
Quartzite & schist (BARRENS SYSTEM):		
Adven	Heath	*Adenanthos venosus, Taxandria conspicua* ssp*. abrupta, Regelia velutina*
Dque	Open mallee-thicket/scrub	*Dryandra quercifolia, Eucalyptus pleurocarpa, Banksia lemanniana*
Epre/Dque	Mallee-thicket/scrub	*Eucalyptus preissiana, Dryandra quercifolia*
Mpap	Heath	*Melaleuca papillosa*
Coast (BARRENS/ FANNY"S COVE SYSTEM):		
Shallow sand over consolidated limestone -		
Eang/Cmac	Open mallee-heath	*Eucalyptus angulosa, E. pleurocarpa, Calothamnus macrocarpus*
Eang/Efal	Mallee -scrub	*Eucalyptus angulosa, E. falcata, Templetonia retusa, Melaleuca pentagona*
Euti	Woodland	*Eucalyptus utilis, E. conglobata* ssp*. perata*
Dune sand -		
Mlan	Scrub thicket	*Melaleuca lanceolata, M. nesophila, Acacia rostellifera, Scaevola crassifolia*
Bspe	Scrub thicket - sedge	*Banksia speciosa, Anarthria laevis*
Coastal plain (QUALUP SYSTEM):		
Eple/Brep	Open mallee-heath	*Eucalyptus pleurocarpa, Banksia repens, Adenanthos cuneatus*
Bbax	Scrub heath	*Banksia baxteri*
Creeklines & wetlands:		
Eocc	Woodland	*Eucalyptus occidentalis, Rhagodia preissii*
Mcut	Shrubland	*Melaleuca cuticularis*

Declared Rare and Priority Flora

Six species of Declared Rare flora were found adjacent to Hamersley Drive, principally on the wave-cut bench south of East Mt Barren or on the western flanks of the mountain. Twelve species of Priority Flora were located in the survey area, however a further four which had been collected previously were not found. A summary of each species is given below and full details of GPS locations and population numbers given in Appendix 4.

Declared Rare flora **(Figure 2)**

***Adenanthos ellipticus* Oval-leaf Adenanthos (Vulnerable)**

Endemic to the Fitzgerald River National Park, this species grows on the summit and south-west slopes of East Mt Barren, extending onto the wave-cut bench south of the mountain. It is a relatively slow growing plant that is killed by fire, but regenerates readily from seed. Field observations (Robinson and Coates 1995) suggest a high susceptibility to *Phytophthora* dieback.

This population was surveyed by DEC Albany in 2008 and estimated to be 30,000+ mature plants and approximately 10,000 seedlings in the burnt area (2006 prescribed burn). In addition, *Adenanthos ellipticus* is known to occur on Thumb Peak and West Mt Barren. Less than 1% of the East Mt Barren population will be impacted by the Hamersley Drive upgrade.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	350	0.9	0.7
[1] East Mt Barren	40,000+		
[2] Thumb Peak	10,000+		
[2] West Mt Barren	1,000+		

[1] DEC Albany 2008
[2] Robinson & Coates 1995

***Eucalyptus burdettiana* Burdett Gum (Endangered)**

Burdett gum is a multi-stemmed mallee, up to 4m high. It has smooth bark and glossy green leaves 9 cm long and 1.7 cm wide. It has stalkless clusters of 7 to 11 flowers on a flattened flower stalk. The floral tubes are not fused and they have very long, horn-shaped bud caps that are slightly warty. This species only grows on and around East Mt Barren.

Prior to this survey *E.burdettiana* was recognised to occur in 2 populations, with population 1 divided into 5 sub-populations (1A, 1B, 1C, 1D & 1E). The total number of plants was believed to be 239, however these numbers fluctuated across visitation from the 1980's to 2000's particularly in populations 1A and 1B. Ellen Hickman's survey estimates the population to consist of 3500 – 4000 plants, with 1571 plants actually waypointed. 42 plants were identified within the 25 m road buffer. Therefore the plants deemed to be under threat from the proposed road works constitutes 1.2% of the entire population on East Mt Barren.

Population 1E was visited but no plants located and after review of notes on this population it is believed to be equivalent to population 1C. *E.burdettiana* plants were found on all slopes of East Mt Barren with the exception of the extreme eastern slopes, populations 1A, 1B, 1C and 1D all merge and as such the subdivision of these populations is irrelevant. Specific comments on each population are presented in Appendix 4.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	42	1.2	1.2
East Mt Barren	3580		

***Eucalyptus coronata* Crowned Mallee (Vulnerable)**

The Crowned Mallee is a small multi-stemmed, smooth-barked mallee up to 2.5 m high, with bluish-green leaves 12 cm long and 3 cm wide. Strongly ribbed buds occur in threes on a broad flattened stalk. The large fruits have a broad disc and domed, protruding valves that look like a crown.

Prior to this survey *E.coronata* was recognised to occur in 4 populations, from East Mt Barren, Eyre Range, Whoogarup Range and Mid Mt Barren. The total plant numbers was estimated at 215, with 150 of these plants known from East Mt Barren, within 2 sub-populations 1A on the eastern slopes consisting of 100 plants and 1B the summit consisting of 50 plants. Ellen Hickman's survey amended the population number on East Mt Barren to approximately 2000 plants, with 461 plants actually waypointed. Nine plants identified within the 25 m road buffer. Therefore the plants deemed to be under threat from the proposed road works constitutes 0.5% of the entire population on East Mt Barren.

Since populations 1A and 1B merge on the southern slopes of East Mt Barren the division into sub-populations is irrelevant. Specific comments on each population are presented in Appendix 4. *E.burdettiana* and *E.coronata* population overlap near the summit and on the south-eastern slopes of East Mt Barren.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	9	0.45%	<0.45%
East Mt Barren	2,000		
Annie Peak	unknown		
Whoogerup Range	unknown		
Mid Mt Barren	unknown		

***Kunzea similis* subsp. *similis* (EPBC - not listed)**

Endemic to East Mt Barren, the only known population is on the wave-cut bench, south-west of the mountain. The closely related subsp. *mediterranea* is only known from Bandalup Hill. A survey by Craig (2000) found the population extends for approximately 300 m x 450 m (= 13.5 ha) and was restricted to areas of shallow sand over outcropping quartzite. At that time the population was estimated to be approximately 1,000 plants which were unevenly distributed. This population was surveyed again by DEC Albany in 2009 and estimated to be 3,600 plants in 10 ha. No seedling recruitment was found where the 2006 prescribed burn had escaped into the population.

The densest areas of plants grow in shallow depressions on the bench and in the gullies which drop-off the bench towards the ocean. Here, *Kunzea similis* grows to 1.2 m tall, in an *Adenanthos venosus* vegetation unit.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	100	2.8	2.8
[1] East Mt Barren	3,600		

[1] DEC Albany 2009

***Stylidium galioides* – Yellow Mountain Triggerplant (Vulnerable)**

Endemic to the Eyre Range, a plant with trailing stems that apparently roots at the nodes, which makes it difficult to count the number of plants in a population/area. It is common on East Mt Barren and during the eucalypt survey Ellen Hickman observed *S. galioides* along the walk trail to the summit, all over summit, on the south-eastern face above Hamersley Drive, on the north-eastern face up into the gully directly below the summit and in the gully on west side of East Mt Barren.

Along Hamersley Drive, *S. galioides* occurs from the western slopes of East Mt Barren to the eastern carpark on the wave-cut bench, preferring shallow soil amongst outcropping quartzite. Although the table below indicates a significant percentage of plants would be impacted, the widespread occurrence of *S. galioides* on East Mt Barren suggests that in reality only a very small percentage of plants will be affected by the road upgrade.

		% EMB population	% all populations
Hamersley Drive upgrade	500+	<16%	unknown
[1] East Mt Barren	3,000+		
[2] Fortification Hill	scattered		
[2] Annie Peak	common		

[1] E.Hickman pers.comm.
[2] Robinson & Coates 1995

***Verticordia pityrhops* (Endangered)**

Endemic to East Mt Barren, the only known population is on the wave-cut bench, south-west of the mountain, in the same area as *Kunzea similis*. *Verticordia pityrhops* was surveyed by DEC Albany in 2009 and the population estimated to be approximately 2,000 plants in 10 ha. *Verticordia pityrhops* is killed by fire and no seedling recruitment was found where the 2006 prescribed burn escaped into the population. It is very slow to regenerate from seed (Robinson and Coates 1995).

This species was not found during the survey in October 2009, however it was located a couple of months later in December with the surveyor. The low, dark, pine-like shrubs, 0.2-1 m tall grows in the *Adenanthos venosus* vegetation unit. In December the plants were vegetative, but their white calyxes remained on the shrub, despite the seed having been dispersed. Again, no seedling recruitment was found in the 2006 burn area.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	38	2	2
[1] East Mt Barren	+/- 2000		

[1] DEC Albany 2009

Priority Two flora (Figure 3)

Calothamnus macrocarpus

Endemic to the East Mt Barren and immediate environs. A robust shrub that grows in sandy soils between Mylies Creek and Culham Inlet, often in association with the very similar *Calothamnus validus*. Appendix 3 maps the vegetation unit [**Eang/Cmac**] (32 ha) where this species typically grows in association with *Eucalyptus angulosa* in sand over limestone. A large population (300+) occurs on the east bank of Mylies Creek and extends along the coast to East Mylies Beach Road. Another sub-population is found on the low sandplain north of Four Mile Beach.

A scattered population (estimated 1,000) occurs on the wave-cut bench south and south-east of East Mt Barren growing in shallow soil over rocky quartzite.

C. macrocarpus readily resprouts from rootstock following disturbance - some of the largest plants occur on the road verge where plant competition is reduced and there is increased water runoff. A significant number of plants will be affected by the FRNP Improvement Project.

		% EMB population	% all populations
FRNP Improvement Project:			
A. Mylies Beach	297	unknown	unknown
B. Wave-cut bench	156	15%	unknown
C. Four Mile Beach	250	unknown	unknown
1 East Mt Barren	200+		
2 Wave-cut bench	est. 1,000		

1 Robinson & Coates 1995

2 S.Barrett DEC Albany 2008

Gonocarpus hispidus

Endemic to the Eyre Range, an unobtrusive, weak shrub that is known only from the summit and slopes of East Mt Barren and immediate surrounding hills (Robinson and Coates 1995), growing amongst outcropping quartzite. The species shows massive germination when stimulated by fire and on the lower, east slope of East Mt Barren a large population (1,000+) plants occurs upslope of Hamersley Drive in an area burnt in October 2006. This sub-population starts 15 m from the verge, extending north and north-east, and is not likely to be impacted by the road upgrade.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	50	0.05	0.05
[1] East Mt Barren	100,000+		

[1] Robinson & Coates 1995

Hibbertia papillata

Endemic to the Eyre Range, being recorded from East Mt Barren and the Eyre Range only (Wheeler 2004) - the size and extent of the population has not been surveyed. It is apparently frequent on mid- and upper-elevations of the mountain (Horn & Butcher, 1999 voucher collection). *H. papillata* is a common component of the *Adenanthos venosus* vegetation unit on the wave-cut bench and extends for nearly 4 km along Hamersley Drive, around the base of East Mt Barren.

A significant number of plants will be affected by the upgrade of Hamersley Drive.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	est. 500+	unknown	unknown
East Mt Barren	not surveyed		

Leptospermum confertum

Endemic to the Fitzgerald River National Park, known mainly from the summit of East Mt Barren and Thumb Peak. The population on East Mt Barren has not been fully surveyed, although Sarah Barrett (DEC Albany 2005) counted approximately 100 plants adjacent to the walk trail to the summit. A dense thicket of ten plants occurs on the north side of Hamersley Drive, within 10 m of the verge and is likely to be impacted by the road upgrade. They are in the same vicinity as *Eucalyptus burdettiana* and *E. coronata.*

		% EMB population	% all populations
Hamersley Drive upgrade	10	?10%	unknown
[1] East Mt Barren	+/-100		
[2] Thumb Peak	500+		

[1] S.Barret, DEC Albany 2005
[2] Robinson & Coates 1995

Priority Three flora (Figure 3)

Microcorys longiflora
A shrub that grows to 1 m high with dark green leaves and purplish-pink flowers. This species is known from as far west as Cape Riche, although the majority of collections are from peaks (Thumb Peak, Mt Drummond, Eyre Range) in the FRNP where it generally grows in association with *Dryandra quercifolia.*

About 50 plants were found on the slashed road verge of West Beach Road, in a *Dryandra quercifolia* [**Dque**] vegetation unit. Scattered plants were observed in the undisturbed thicket west of the road, however east of the road was burnt in October 2006. The east-west distribution of this sub-population is unknown.

	No. Plants	% FRNP population
FRNP Improvement Project	50+	unknown
FRNP	unknown	

Priority Four flora (Figure 3)

***Acacia argutifolia* East Barrens Wattle**
This species is known from a number of ranges in the Fitzgerald River National Park, including Whoogerup Range, Thumb Peak and Sepulcralis Hill. It extends northward from East Mt Barren through the Eyre Range, occurring at No Tree Hill and eastwards at Kundip (Robinson and Coates 1995). Along Hamersley Drive it is a frequent component of the *Adenanthos venosus* vegetation unit on wave-cut bench.

Although 100+ plants will be affected by the road upgrade, the impact on this species will relatively low.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	est. 100	est. <5%	est. <3%
[1] East Mt Barren	2,000+		
[1] FRNP	830+		
[1] Kundip	3+		

[1] Robinson & Coates 1995

Anthocercis fasciculata
Endemic to the FRNP, found on quartzite peaks and hills from West Mt Barren to East Mt Barren growing in shallow rocky soils. A disturbance opportunist that appears in great numbers after fire and is relatively short-lived (about 5 years). A patch was found immediately east of Mylies Creek then small groups of plants from near the eastern carpark on the wave-cut bench downslope to the Ranger station– all areas which had been burnt in October 2006. In addition, Ellen Hickman observed many patches of *A. fasciculata* on East Mt Barren during the eucalypt survey.

About 100 plants may be affected by the road upgrade, although many of these are adjacent to the existing section of bitumen road that extends uphill from the Park entrance, so presumably won't be impacted.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	100	est. <2%	est. <1%
[1] East Mt Barren	1,000+		
[1] West Mt Barren	500+		

[1] Robinson & Coates 1995

***Corybas limpidus* Crystal Helmet Orchid**

A very small orchid which forms dense colonies. Distribution extends from Walpoe to Esperance (Hoffman and Brown 1992). It is known to occur near the camping grounds on the east side of Hamersley Inlet in deep leaf litter under *Melaleuca lanceolata, M. nesophila* and *Eucalyptus utilis.* Flowers are needed to distinguish this species from the closely related *C. despectans* which may occur with or near *C. limpidus* (Robinson & Coates 1995).

C. limpidus was not found during the Summer/Autumn survey of Hamersley Inlet. At the Mylies Beach recreation site, *Corybas* leaves were found beneath *M. lanceolata* between the designated picnic area and Mylies Creek. Further survey of both sites will be required during flowering (August-September) to determine the locations of *C. limpidus* in the FRNP.

Robinson and Coates (1995) recommend that possible weed escapes and vehicle movement in the camping grounds adjacent to the Hamersley Inlet population/s need to be managed.

Reproduced from photo in Ravensthorpe Herbarium – author ?CR Hart.

	No. of plants	% FRNP populations
FRNP Improvement Project	not found	unknown
1 Hamersley Inlet	-	

1 Robinson & Coates 1995

Dampiera deltoidea

A widespread species that is known from Bandalup Hill and from a number of populations in the FRNP, including the Whoogerup Range. It prefers shallow soils over rock (lateritic caprock and quartzite). During this survey, two sub-populations were found on quartz outcrops east of East Mt Barren. These outcrops are near the existing bitumen road, extend beyond the 25 m survey zone and are not likely to be impacted by the upgrade.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	80	unknown	<0.7%
[1] FRNP	6,000		
[1] Bandalup Hill	6,000		

[1] Cockerton and Craig 2000

Hakea hookeriana

A robust shrub that grows to about 2 m high which grows on shallow sand over outcropping quartzite adjacent to the coast. It is endemic to the FRNP and is known from the platform west of West Beach, Thumb Peak and Two Bump Hill. It has previously been collected near Hamersley Drive on the east of East Mt Barren (WAHERB), close to the unburnt/ burnt 2006 boundary.

H. hookeriana was not found in this survey – the known plant/s were probably burnt in 2006 thus only seedlings would be present. Seedlings would be difficult to identify from the similar *Hakea pandanicarpa* subsp. *crassifolia* which may also grow in the area.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	nil seen	unknown	unknown
East Mt Barren	?		
[1] Thumb Peak	100+		
[1] Two Bump Hill	50+		

[1] Robinson & Coates 1995

Jacksonia compressa

A species that is widespread in the FRNP, and known from West Mt Barren, Mid Mt Barren, Woolbernup Hill and East Mt Barren. It was frequent and widespread in the survey area, particularly on disturbed road verges. Hundreds of plants will be impacted by the road upgrade, but *J. compressa* appears to readily re-establish following disturbance. Areas burnt in 2006, including a small sub-population near Cave Point, may not have developed an adequate seed bank for regeneration.

	No. Plants	% all populations
FRNP Improvement Project	1,900	est. <2%
Hamersley Inlet to Culham Inlet	est. 10,000+	

Lechenaultia superba

A species that is usually found within a few years of fire. It has previously been collected near Hamersley Drive, west of East Mt Barren. In this survey it was not found along Hamersley Drive, although Ellen Hickman observed thousands of flowering plants on East Mt Barren during the Septermber 2009 survey, usually in association with *Eucalyptus burdettiana.*

This species is a disturbance opportunist and is not likely to be impacted by the road upgrade.

Photo by Ellen Hickman

Leucopogon compactus

A low shrub, with compact 'pom-pom'-like heads of compact white flowers which is known to frequent coastal scrub heaths in the FRNP. A large population of several thousand plants is known from Quoin Head.

During this project, the largest population was found growing along West Beach road in a *Dryandra quercifolia* [**Dque**] vegetation unit. A few plants were located further to north-west, adjacent to Hamersely Drive in the *Eucalyptus angulosa/ E. falcata* [**Eang/Efal**] vegetation unit. It is not expected to be significantly impacted by road upgrades.

	No. Plants	% all populations
FRNP Improvement Project	25+	unknown
Hamersley Inlet to Culham Inlet	unknown	

Melaleuca papillosa

A species endemic to the FRNP which forms shrub thickets on schist on valley slopes. It covers large areas west of Mylies Creek, and huge patches of flowering plants could be seen extending for hundreds of metres north of Hamersley Drive plus on slopes behind West Beach. These have been mapped as their own vegetation unit [**Mpap**], a total of 64 ha (see Appendix 3).

Seedlings were regenerating in areas that had been burnt in 2006 and an earlier fire (?1989) – apparently a very slow growing species.

It is recommended that this species be deleted from the Priority Flora list.

	No. Plants	% FRNP population
Hamersley Drive upgrade	2,000+	est. <<2%
FRNP	est.100,000+	

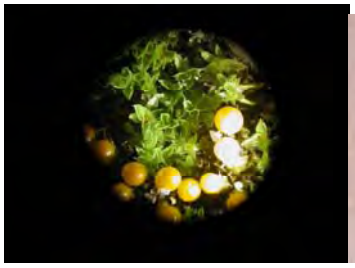
Pimelea physodes

A widespread, attractive low shrub that is found throughout the FRNP, mostly on sandplain. It is also known from the Ravensthorpe Range. Localised patches occur along Hamersley Drive in coastal plain communities. The road upgrade will take a small number of plants.

	No. Plants	% all population
Hamersley Drive upgrade	50	est. <0.2%
FRNP	common	
Ravensthorpe Range	occasional	

***Pleurophascum occidentale* (Moss)**
A moss with a small dense tuft, 2-3 mm high. Leaves are broadly ovate, concave, with a short apical mucro. Fruiting bodies are distinctive orange and are necessary to identify this taxon (R. Cranfield, pers.comm.). It has previously been collected from "sand dunes above West Beach", although the WAHERB lat/long gives the location as the Cave Point carpark

A couple of mosses were collected during the July survey from the proposed carpark and beach access path to West Beach - these have been kept alive to see what fruiting bodies appear. No mosses were evident in the mallee-heath surrounding the Cave Point carpark, possibly because soil detritus levels have not developed enough following the 2006 fire.



Photos courtesy Ray Cranfield

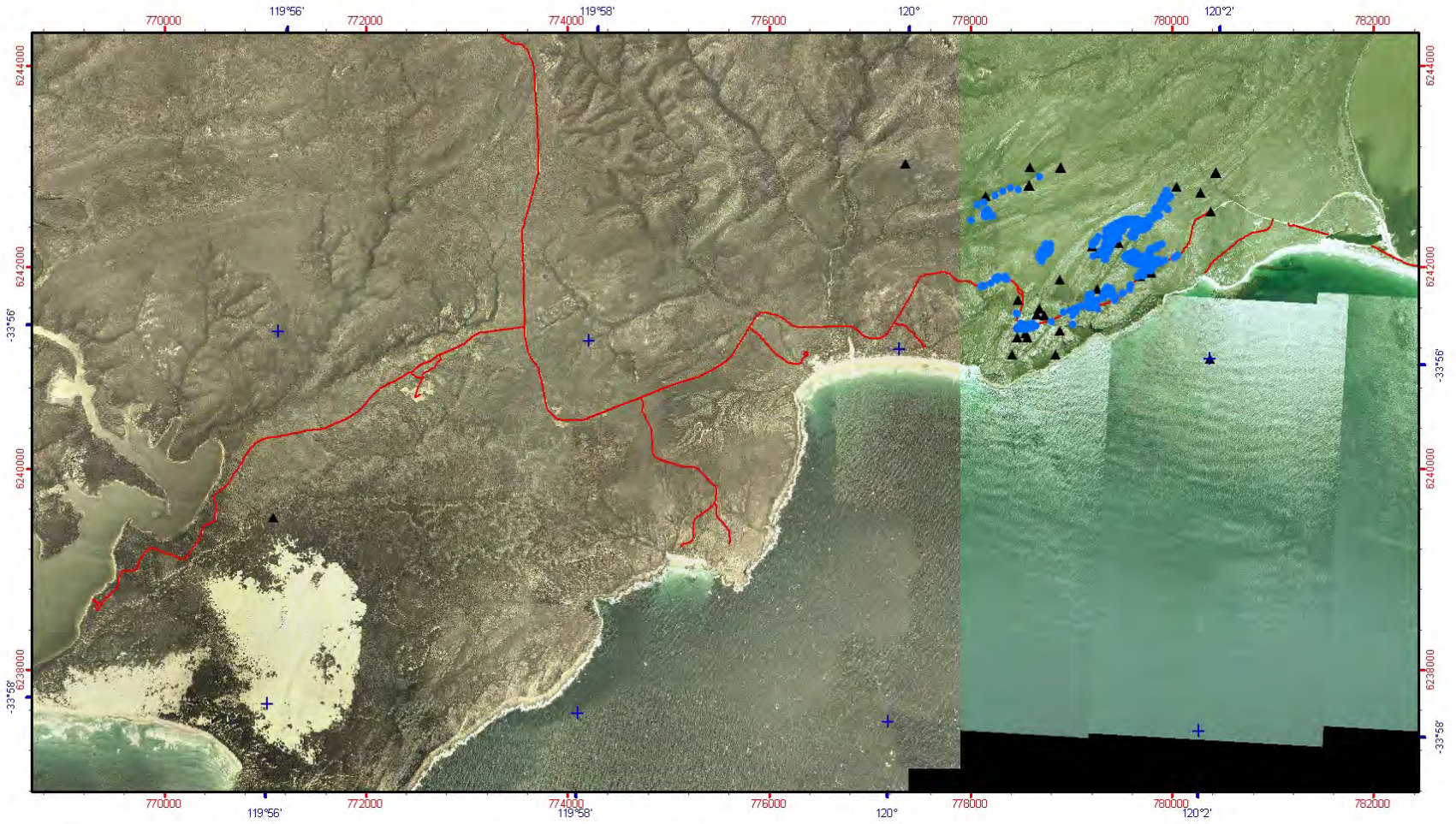
Significant flora

***Lepidosperma* sp. Fitzgerald River** (AS George 9935)
A sedge with relatively soft culms which are spreading, producing untidy tussocks. Culm margins are very scabrous. It is closely related to *L. squamatum* (*s. lat*.) and known from the Ravensthorpe Range, Bandalup Hill and FRNP. This taxon has been recommended Priority 2 listing (Barrett et al., 2009).

This taxon was abundant in the creekline that drains the escarpment above the Ranger station, north of Hamersley Drive. It will not be impacted according to the current concept for the road upgrade, unless the already bitumenised section going up the escarpment is widened or realigned in future.

***Lepidosperma* sp. GFC8831**
A sedge with greyish-green culms which are spreading; culm margins are scabrous. This taxon is very poorly known (R. Barrett, pers.comm.). It was collected immediately west of the Cave Point carpark where a few plants grow in association with the more common *L.* sp. Mt Burdett (which has shiny, yellow-green, smooth-culms) amongst resprouting *Eucalyptus angulosa*.

The current concept plans for the Cave Point carpark will not intrude on this population, however the proposed walk path to Cave Point may impact some plants. It is desirable that the route of the path avoid any *Lepidosperma* sp. GFC8831.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Declared Rare Flora
Hamersley Drive &
Hamersley Inlet Road
Upgrade Project
Legend
DRF (2009/2010 Survey)
DRF (Previous Records)
SOUTH_COAST Unsealed Roads
0 0.5 1 2
Kilometers
1:50,000 (A4)
N
Department of Environment and Conservation
Our environment, our future
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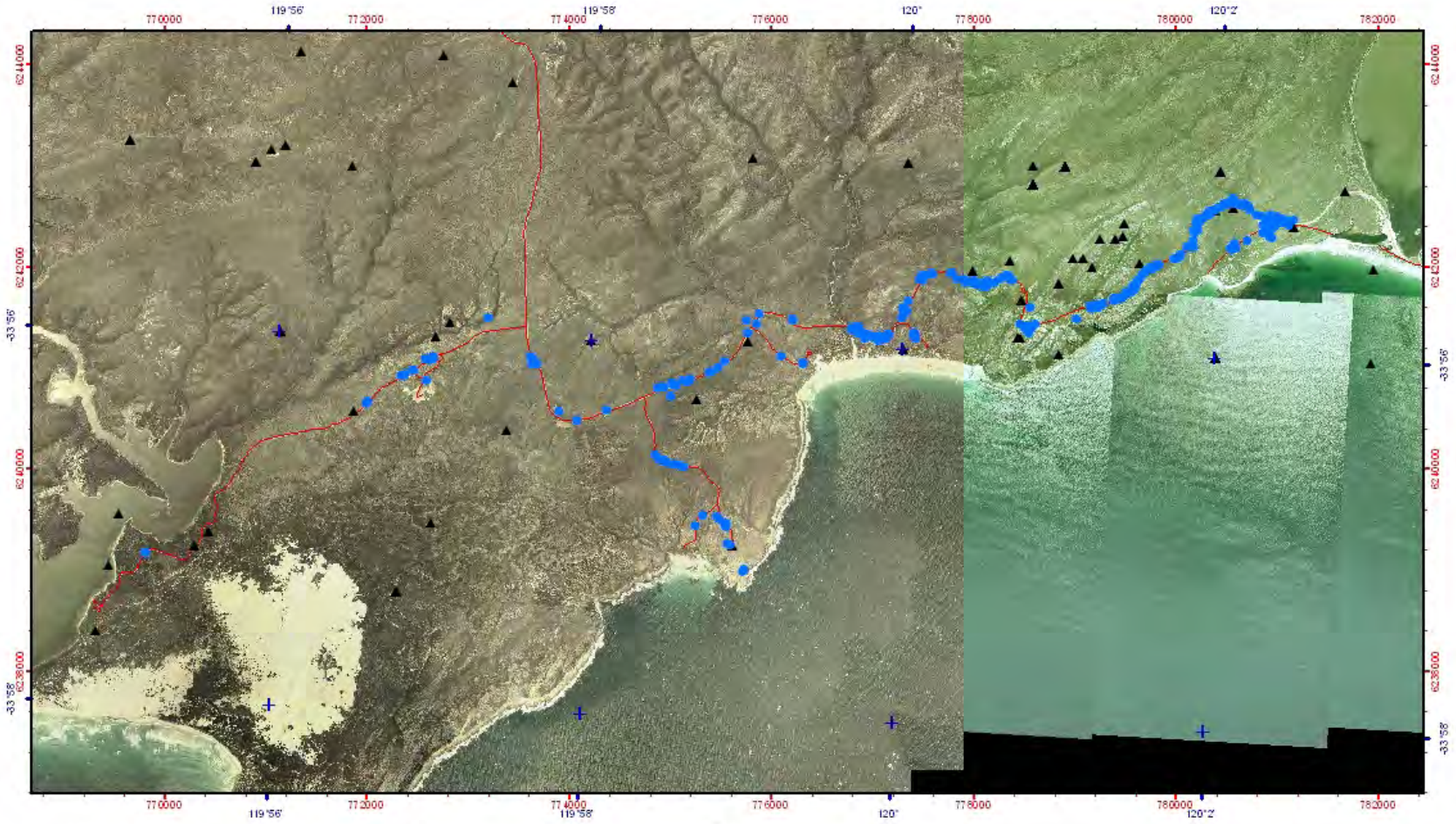
Keiran McNamara
Director General, Department of
Environment and Conservation
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted
Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94
Produced at 15:30pm, on July 18, 2010


Priority Flora Species
Hamersley Drive &
Hamersley Inlet Road
Upgrade Project
Legend
Priority Species (2009/2010 Surveys)
Priority Species (Previous Records)
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Ms Ian McNamara
Director General, Department of
Environment and Conservation
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and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted
Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94
Produced at 15:30pm, on July 16, 2010

Threatened Ecological Communities

No listed Threatened or Priority Ecological Communities were found during the field survey, although a community of ecological significance is located on the wave-cut bench that extends south of East Mt Barren.

Significant Ecological Community

The perched micro-wetlands on the wave-cut bench are considered to be a rare community on the south coast (A. Chapman 2009; S.Comer, pers.comm.). These sedge-dominated communities occur within the *Banksia speciosa* vegetation unit and have permanently wet soil fed by freshwater from further upslope - they were too subtle to map individually. A number of small, freshwater pools were present. According to Chapman (2009) they are significant because "they maintain small patches of mesic environment in an otherwise very fire prone and possibly drying environment".

Currently, Hamersley Drive cuts through these micro-wetlands, but the porosity of the road base does not appear to be impeding water flow. It is imperative that any upgrade does not prevent natural water flow downslope of the road, nor cause unnatural ponding of water on the upside.

Vegetation Condition Assessment

The vegetation was generally in excellent health, although small patches of weeds were observed at some campsites and recreation nodes. These are described in more detail below.

Fire

In 1989, much of the survey area was burnt during a wildfire started by lightning strikes. Now, twenty years later, most of the plant communities have re-established with the majority of plants being sexually mature (producing fruits and seeds).

An escaped prescribed burn in October 2006 burnt most of an area between West Beach Road and the western slopes of East Mt Barren area for a second time. Resuckering species are up to 1 m tall, with many having flowers and/or fruits, while obligate seeder species are still establishing. Sandier soils have some relatively bare patches, although overall the original pre-burn suite of plants appears to be establishing successfully. Notes were taken during the survey of the method of regeneration of plants, ie resuckering from rootstock or obligate seeders (see Appendix 5).

Climate change

Following the hottest day (48^{o}C) on record for Hopetoun in January 2010, along with the strong northerly winds with only 5% relative humidity, many species in the FRNP showed signs of severe scorching. Species along Hamersley Inlet Road that were particularly affected with >70% leaf death on numerous individual plants were *Acacia phlebopetala, A. moirii spp. dasycarpa, Allocasuarina humilis, Andersonia parviflora, Banksia nutans, B. violacea, Daviesia emarginata, D. incrassata* ssp. *reversifolia, D. striata, Dryandra quercifolia, Hakea trifurcata, Isopogon* sp. Fitzgerald River*, Lambertia inermis, Leptospermum* sp. Bandalup and *Petrophile squamata* ssp. northern.

Plant disease

Several aerially-dispersed, canker-causing fungi including species of *Botryosphaeria, Diplodina* and *Zythiostroma,* have been isolated from *Banksia* in the Hopetoun region. Aerial canker *Botryosphaeria ribis,* which kills from the top down, was observed in a few areas, eg in old gravel pits south of Hamersley Inlet Road. In addition, the native dieback *Phytophthora megasperma* is known to occur on East Mt Barren. Plant pathogens appear to be causing decline of a patch of *Banksia speciosa* on the wave-cut bench, north side of Hamersley Drive. A full report on plant diseases and pathogens has been prepared by Malcom Grant.

Weeds

Introduced, exotic species were found at a number of recreation nodes and the Ranger station. The latter location had a few outbreaks of the Weed of National Significance, *Asparagus asparagoides* (bridal creeper).

Barrens Beach carpark has the noxious perennial *Trachyandra divaricata* (dune onion weed), which has also been observed spreading across sand dunes rehabilitating post-fire at Quoin Head. Another perennial *Mesembryanthemum crystallinum* (common iceplant) is also at the Barrens Beach carpark and Four Mile campsite.

Annual weeds, notably *Ehrharta longiflora* (annual veldtgrass), *Conyza* (fleabane), *Sonchus* (sowthistle), *Solanum nigrum* (blackberry nightshade), occur around the Ranger station and Mylies Beach East carpark, beside the path to the beach and adjacent sump.

Ken Newbey (in Chapman and Newbey 1987) recorded numerous annual weeds, mainy from the Asteraceae, Brassicaceae, Carophyllaceae and Poaceae families (see Appendix 5), from near the Shire campsite at Hamersley Inlet. Both DEC and Shire campsites were surveyed in Summer for this project, hence the current level of infestation is unknown.

5. Requirement for Referral or Other Clearances

DEC has ranked plant taxa considered to be threatened under a series of conservation codes, depending on their apparent degree of threat (see Appendix 1). Taxa listed as Declared Rare Flora require permission from the Minister responsible for the Wildlife Conservation Act 1950, if any portion of the plant is to be, or likely to be, disturbed.

The Hamersley Drive upgrade will require permits to take *Adenanthos ellipticus, Eucalyptus burdettiana, Eucalyptus coronata, Kunzea similis* subsp. *similis, Stylidium galioides* and *Verticordia pityrhops.*

Schedule 5 of the *Environmental Protection Act 1986* has 10 principles of clearing. The wave-cut bench at the base of East Mt Barren, is one of the most botanically important sites in the FRNP and along the south coast. It is highly diverse with a large number of short-range endemics, including six species of Declared Rare flora two of which (*K. similis* and *V. pityrhops*) grow nowhere else. Also, a number of micro-wetlands supporting sedge communities important to fauna occur here (see Chapman 2009).

According to Schedule 5, native vegetation should not be cleared if —

1. it comprises a high level of biological diversity;
2. it includes, or is necessary for the continued existence of, rare flora;
3. it is growing in, or in association with, an environment associated with a watercourse or wetland;
4. the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

According to the above criteria, none of the vegetation on the wave-cut bench should have any further disturbance.

Concept plans for the recreational nodes propose installation of new roads and carparks. As well, the intersection of Hamersley Road and Hamersley Inlet Road is proposed for realignment. A number of these sites will require clearing of native vegetation of an area greater than one hectare. It is recommended that Main Roads WA determine the requirement to obtain a permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* from the Department of Environment and Conservation (DEC). Permit applications need to consider impacts including, but not restricted to: biodiversity, rare flora, threatened ecological communities and level of remnant vegetation representation (EPA 2004).

The Deputy Secretary of the Department of Environment, Water, Heritage and the Arts decided on 17 July 2010 that the FRNP Improvement Project is not a “controlled action” under the Commonwealth’s *Environmental Protection and Biodiversity Conservation Act* (EPBC Act). According to this decision, (i) DEC must adhere to a number of strict environment management protocols to mitigate any environmental impacts, and (ii) DEC has committed to mitigating any consequential and cumulative impacts from the development to ensure there is no significant impact upon an EPBC listed species in the future.

6. Conclusions and Recommendations

Stage 1

Stage 1 of the biological survey included 10 km of Hamersley Drive, from Culham Inlet to the Hamersley Drive turnoff and was included in an interim report (Craig and Hickman 2009). The principal findings were that the section of road from about 2 km west of the carpark at the western end of East Mt Barren, to the eastern carpark on the wave-cut bench, was the most critical for road design and engineering. A high number of short-range endemic species grow here, including six Declared Rare flora which will be impacted by the upgrade.

Additionally, on the wave-cut bench there are some ecologically significant micro-wetlands that will require care to ensure that drainage is not impeded by the road (also see Chapman 2009). It was recommended that an expert in freshwater wetlands be consulted to assess the ecological value of these communities.

Further consultation will be required between DEC and Main Roads to determine the preferred biological trade-offs in the road upgrade, particularly on the wave-cut bench. Most of the DRF occur at each end of the bench where outcropping quartzite may limit road construction – it is imperative that the intervening section of sandy soils characterized by the *Banksia speciosa* vegetation unit (which includes many of the micro-wetlands), is not compromised in the upgrade.

As well as the wave-cut bench being one of the most important botanical sites in the FRNP, it is also one of the most scenic. Despite the "No Stopping/Parking" signs along this section of road, tourists regularly stop to admire the plants and views. Although a 'pull-off' area is desirable to appease the tourists, there is no obvious location to put one. An alternative suggestion is to have a high quality, walk trail along the wave-cut bench, linking the carparks at the east and west ends of East Mt Barren.

An on-site inspection was held with the author and a surveyor in December 2009 to get accurate locations of DRF *Eucalyptus burdettiana, E. coronata* and *Verticordia pityrhops* likely to be impacted. In addition, a few large boulders on each side of the road which provide habitat for Napolean skinks *Egernia napoleonis* were marked. In deciding the road alignment, this fauna habitat will need to be considered as well as the threatened flora.

Stages 2 & 3

Stage 2 surveyed a further 11 km and included Hamersley Inlet Road and the spur roads to Four Mile Beach, Barrens Beach, Mylies Beach (East and West), Cave Point and West Beach. Stage 3 included the recreation nodes between Culham Inlet and West Beach.

The summer and autumn surveys identified additional populations of four species of Priority flora which had previously been found during Stage 1. The Priority Three *Microcorys longiflora* was also found, which had not been previously recorded from the area. Two Priority Four species, *Corybas limpidus* and *Pleurophascum occidentale* need to be surveyed in late winter-spring when their flowers or fruiting bodies respectively, are present for identification. Two Significant *Lepidosperma* species were found, one is adjacent to the current Cave Point carpark and needs to be considered when defining the new access path to Cave Point.

Thirteen vegetation units were identified and mapped. They were strongly correlated with the geology and soils, ie quartzite, schist, limestone, dune sand or sand plain. None of these units are considered to be Threatened Ecological Communities.

<u>Exotic pests</u>

Both weed invasion and plant disease have the greatest potential to impact the high biological and conservation value of the FRNP. Road materials (including water) must come from weed- and disease-free areas, so that they are not imported by either the material itself or the machinery carting it. Construction materials for recreation facilities must be checked for White Italian snails *Theba pisana*,

especially if they have been stored in Hopetoun. An infestation of these White Italian snails is now at Quoin Head adjacent to the boardwalk/ beach access path, probably as a result of transporting infested materials to the site.

Eradication of weeds, particularly *Asparagus asparagoides* (bridal creeper) and *Trachyandra divaricata* (dune onion weed) should be carried out at the recreation nodes before flowering in late winter - spring (Moore and Wheeler, 2002). An on-site visit during winter-spring by DEC's Environmental Officer should be carried out at all campsites, Barrens Beach and Mylies Beach East to familiarize the areas of weed infestation and formulate a weed management program for coming years. Most of these sites will require rehabilitation of carparks and the beach access paths where weeds occur. It is essential that the gravel from these sites is not translocated to other sites within the FRNP.

Stage 4

The Hamersley Inlet campsites (Shire and DEC) still require substantial planning and will need to be fully surveyed at a later date. This area includes the known population of *Corybas limpidus* (P4) mentioned above. This stage will be provided in a separate report.

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Charmaine Hickman accompanied Ellen in her scrambles over East Mt Barren in search of eucalypts. Rosemary Jasper confirmed identification of plant specimens at the Perth herbarium. Russell Barrett provided expert taxonomic identifications of *Lepidosperma* and other sedges/rushes, and Mike Hislop a number of Ericaceae.

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Appendix 1: Department of Environment and Conservation's declared rare and priority flora list

Appendix 1.1 Rare flora legislation and guidelines for gazettal

The State Conservation Strategy, Wildlife Conservation Act, 1950, and Conservation and Land Management Act 1984 provide the guidelines and legislative basis for the conservation of the State's indigenous plant and animal species. Under the Wildlife Conservation Act, the Department of Environment and Conservation (DEC) is responsible for the protection of flora and fauna of all lands and waters throughout the State. Section 23F of the Act gives the Minister responsible for the Act statutory responsibility for the protection of those classes of flora declared to be rare.

The Wildlife Conservation Act (1950-1985) protects all classes of indigenous flora throughout the State. Protected flora includes:

Spermatophyta - flowering plants, conifers and cycads
Pteridophyta - ferns and fern allies
Bryophyta - mosses and liverworts
Thallophyta - algae, fungi and lichens

Section 23F of the Act provides special protection to those taxa (species, subspecies, varieties) considered by the Minister to be:

* in danger of extinction - the taxon is in serious risk of disappearing from the wild state within one or two decades if present land use and other factors continue to operate;
* rare - less than a few thousand adult plants of the taxon existing in the wild;
* in need of Special Protection - the taxon is not presently in danger of extinction but is at risk over a longer period through continued depletion, or occurs largely on sites likely to experience changes in land use which could threaten its survival in the wild;

  or

* presumed Extinct - 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.

This is achieved by declaring them to be 'rare' by notice published in the Government Gazette. DEC's Policy Statement No.9 discusses the legislation relating to Declared Rare Flora and outlines the criteria for gazettal.

Under the provisions of Section 23F, the 'taking' of Declared Rare Flora is prohibited by any person on any category of land throughout the State without the written consent of the Minister. A breach of the Act is liable to a penalty of up to $10 000. The legislation refers only to wild growing populations and applies equally to Government officers and private citizens on Crown and private land.

To 'take' in relation to any flora includes 'to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause a permit the same to be done by any means'. This includes not only direct destruction or injury by human hand or machine but also such activities as allowing grazing by stock, introducing pathogens, altering water-tables so as to inundate or deprive the flora of adequate soil moisture, allowing air pollutants to harm foliage, and burning.

The schedule published in the Government Gazette is revised annually to accommodate additions and deletions to the Declared Rare Flora. To qualify for gazettal, plants must satisfy certain requirements as defined in Policy Statement No.9, namely:

* the taxon (species, subspecies, variety) must be well-defined, readily identifiable and represented by a voucher specimen in the State or National Herbarium. It need not be formally

described under conventions in the International Code of Botanical Nomenclature, but such a description is preferred and should be undertaken as soon as possible after listing on the schedule;

* the taxon must have been thoroughly searched for in most likely habitats in the wild by competent botanists during the past five years;

* the searches have established that the plant in the wild is either rare, endangered or deemed to be threatened and in need of special protection.

Plants may be deleted from the Rare Flora schedule where:

* recent botanical survey has shown that the taxon is no longer rare, endangered or in need of special protection;

* the taxon is shown to be a hybrid;

* the taxon is no longer in danger of extinction because it has been adequately protected by reservation of land on which it occurs or because population numbers have increased beyond the danger point.

Appendix 1.2 DEC's Priority Species List

DEC maintains a priority species list to determine for survey of plants of uncertain conservation status. The list comprises some 1000+ taxa that are poorly known and in need of high priority survey or are adequately surveyed but in need of monitoring. The poorly known taxa are possibly at risk but do not meet the survey requirements for gazettal as Declared Rare Flora (DRF), as outlined in Policy Statement No.9. Only those plants considered to be threatened on the basis of thorough survey or presumed extinct can be included on the DRF schedule.

The priority flora list is divided into the following categories according to the degree of threat.

Priority One - Poorly known Taxa
Taxa which are known form 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.

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.

Priority Three - Poorly known Taxa
Taxa which are known from several 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 need of further survey.

Priority Four - Rare Taxa
Taxa which are considered to have been adequately surveyed and which, while being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Appendix 1.3 Declared Rare and Priority Flora recorded in Fitzgerald River National Park survey area

The following list includes all species that have been recorded by the Department of Environment and Conservation between Hamersley Inlet and Culham Inlet (column 1). Species recorded in the near vicinity of Hamersley Drive (according to DEC records) are ticked in column 3, those found during the spring 2009 survey (Craig and Hickman 2009) ticked in column 4 and the recent Summer-Autumn 2010 survey in column 5.

Conservation codes were updated in March 2010 (Smith 2010).

DEC Codes: R – Declared Rare Flora (X – presumed extinct)
P1 – Priority One
P2 – Priority Two
P3 – Priority Three
P4 – Priority Four

Environmental Protection and Biodiversity Conservation Act:
Codes EN – endangered
VU – vulnerable

Species Name	DEC Conserv Code	EPBC Act	Hamersley Drive DEFL & WAHERB	Spring survey 2009	Summer-Autum survey 2010
Adenanthos dobagii	R	EN			
Adenanthos ellipticus	R	VU	✓	✓	
Coopernookia georgei	R	EN			
Eucalyptus burdettiana	R	EN	✓	✓	
Eucalyptus coronata	R	VU	✓	✓	
Kunzea similis subsp. *similis*	R	-	✓	✓	
Stylidium galioides	R	VU	✓	✓	
Verticordia pityrhops	R	EN	✓	✓	
Astartea sp. Fitzgerald (K.R. Newbey 10844)	P2				
Calothamnus macrocarpus	P2		✓	✓	✓
Eremophila chamaephila	P2				
Eucalyptus sinuosa	P2				
Gonocarpus hispidus	P2		✓	✓	
Hibbertia papillata	P2		✓	✓	
Leptospermum confertum	P2		✓	✓	
Pimelea longiflora subsp. eyrei	P2				
Pultenaea brachyphylla	P2				
Stenanthemum cristatum	P2				

Species Name	DEC Conserv Code	EPBC Act	Hamersley Drive DEFL & WAHERB	Spring survey 2009	Summer-Autum survey 2010
Thysanotus brachiatus	P2				
Calycopeplus marginatus	P3				
Eucalyptus arborella	P3				
Gastrolobium stenophyllum	P3				
Lasiopetalum monticola	P3				
Thomasia pygmaea	P3				
Microcorys longiflora	P3				✓
Acacia argutifolia	P4		✓	✓	
Adenanthos labillardierei	P4				
Anthocercis fasciculata	P4		✓	✓	
Corybas limpidus	P4				
Dampiera deltoidea	P4		✓	✓	
Eucalyptus praetermissa	P4				
Eucalyptus x erythrandra	P4				
Hakea hookeriana	P4		✓		
Jacksonia compressa	P4		✓	✓	✓
Lechenaultia superba	P4		✓		
Leucopogon compactus	P4		✓	✓	✓
Melaleuca papillosa	P4		✓	✓	✓
Pimelea physodes	P4		✓	✓	
Pleurophascum occidentale	P4				
Total species	38		20	17	5
Acacia moirii subsp. *dasycarpa*	DELETED		✓	✓	
Lissanthe pleurandroides	DELETED				✓

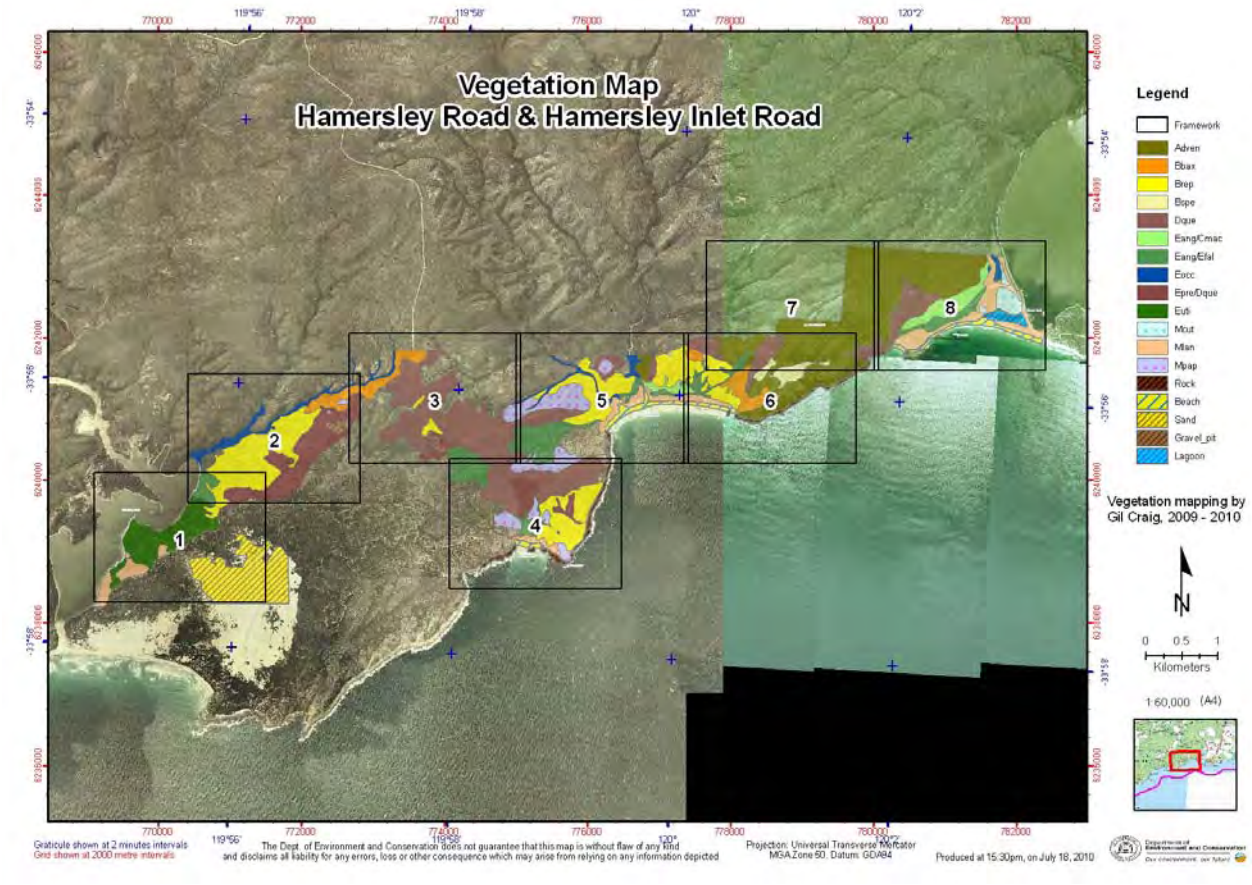
Appendix 2: Muir's (1977) Vegetation Classification

The classification was modified in this project by combining the 'Shrubs 1-1.5 m' and 'Shrubs 1.5 – 2 m' into a single layer, ie Shrubs 1-2 m.

LIFE FORM/ HEIGHT CLASS		CANOPY COVER			
		DENSE 70-100%	MID-DENSE 30-70%	SPARSE 10-30%	VERY SPARSE 2-10%
T	Trees >30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M	Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA	Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB	Trees <5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT	Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS	Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S	Shrubs >2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA	Shrubs 1.5-2m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB	Shrubs 1-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC	Shrubs 0.5-1m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD	Shrubs <0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P	Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H	Hummock grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT	Bunch grass >0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL	Bunch grass <0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J	Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT	Sedges >0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL	Sedges <0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X	Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
	Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

Appendix 3: Vegetation maps and unit descriptions

Appendix 3.1: Coverage of vegetation maps



Appendix 3.2: Vegetation units adjacent to the Hamersley Drive upgrade

Vegetation Unit	Vegetation structure	Typical Species
Quartzite & schist (BARRENS SYSTEM):		
Adven	Heath	*Adenanthos venosus, Taxandria conspicua ssp. abrupta, Regelia velutina*
Dque	Open mallee-thicket/scrub	*Dryandra quercifolia, Eucalyptus pleurocarpa, Banksia lemanniana*
Epre/Dque	Mallee-thicket/scrub	*Eucalyptus preissiana, Dryandra quercifolia*
Mpap	Heath	*Melaleuca papillosa*
Coast (BARRENS/ FANNY"S COVE SYSTEM):		
Consolidated limestone -		
Eang/Cmac	Open mallee-heath	*Eucalyptus angulosa, E. pleurocarpa, Calothamnus macrocarpus*
Eang/Efal	Mallee -scrub	*Eucalyptus angulosa, E. falcata, Templetonia retusa, Melaleuca pentagona*
Euti	Woodland	*Eucalyptus utilis, E. conglobata ssp. perata*
Dune sand -		
Mlan	Scrub thicket	*Melaleuca lanceolata, M. nesophila, Acacia rostellifera, Scaevola crassifolia*
Bspe	Scrub thicket - sedge	*Banksia speciosa, Anarthria laevis*
Coastal plain (QUALUP SYSTEM):		
Eple/Brep	Open mallee-heath	*Eucalyptus pleurocarpa, Banksia repens, Adenanthos cuneatus*
Bbax	Scrub heath	*Banksia baxteri*
Creeklines & wetlands:		
Eocc	Woodland	*Eucalyptus occidentalis, Rhagodia preissii*
Mcut	Shrubland	*Melaleuca cuticularis*

Appendix 3.3: Attributes used for the description of vegetation units

1. *Eucalyptus angulosa / E. falcata (Eang/Efal)*

vegetation unit

map code

Unit area: total area of vegetation unit in project area (ha)

Sampling: number of relevés which had common species recorded by GF Craig (this project) and Ken Newbey (Chapman and Newbey 1987). Appendix 6 gives location of sampling sites.

Muir classification: A modified classification of vegetation structure (Appendix 2); most typical structure determined from botanists' records, although variation is frequent.

Beard Vegetation System: from Beard (1973, 1976) 1:250,000 series vegetation survey

Plant Species are included in the following list if:

15-30 polygons/relevés sampled then $\geq$ 14% occurrence of species;

6-15 polygons/relevés sampled then $\geq$ 20% occurrence of species;

5 polygons/relevés sampled then $\geq$ 40% occurrence of species;

$\leq$ 4 polygons/relevés sampled then all species recorded.

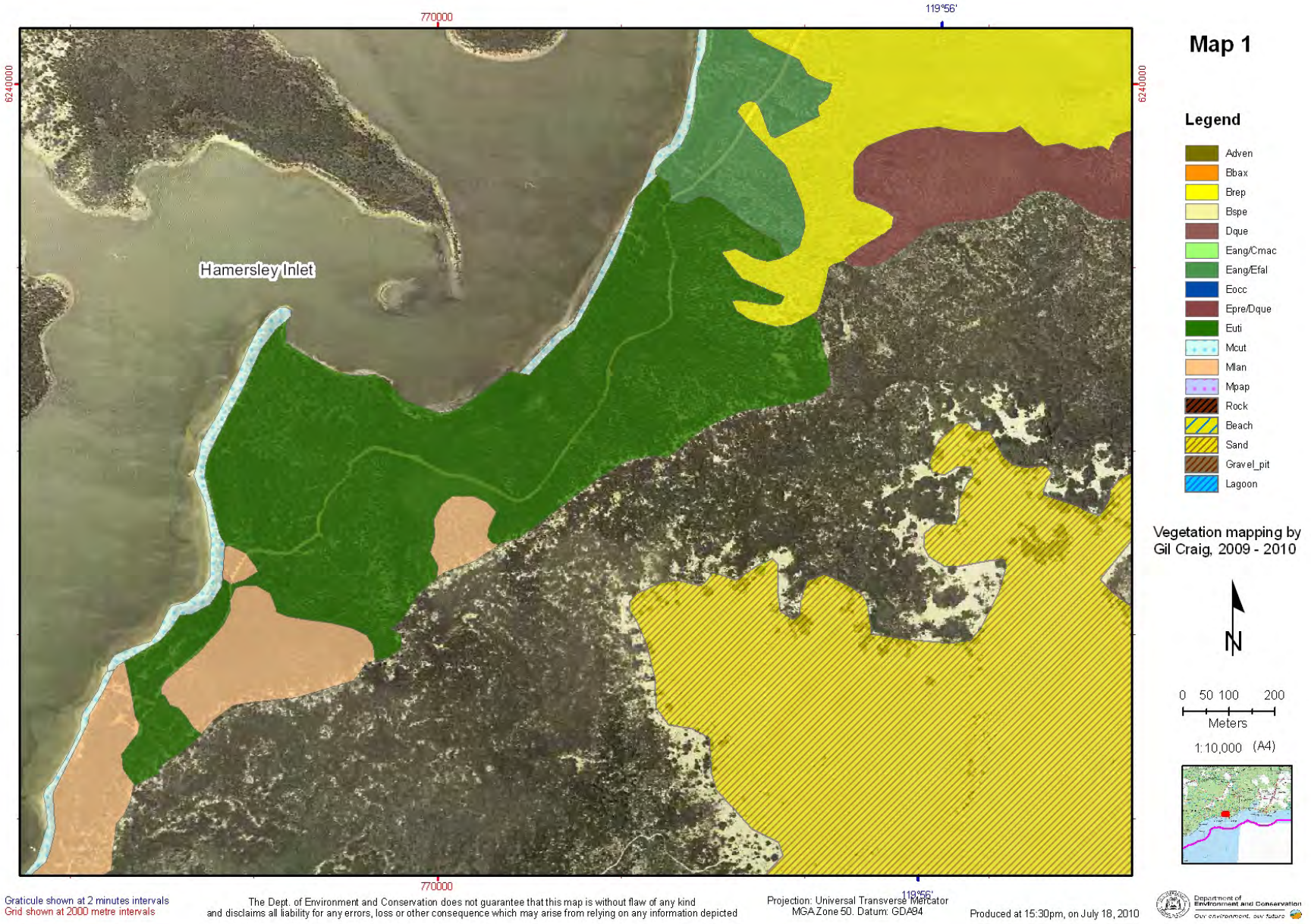
A full list of species for each vegetation unit is provided in Appendix 6.

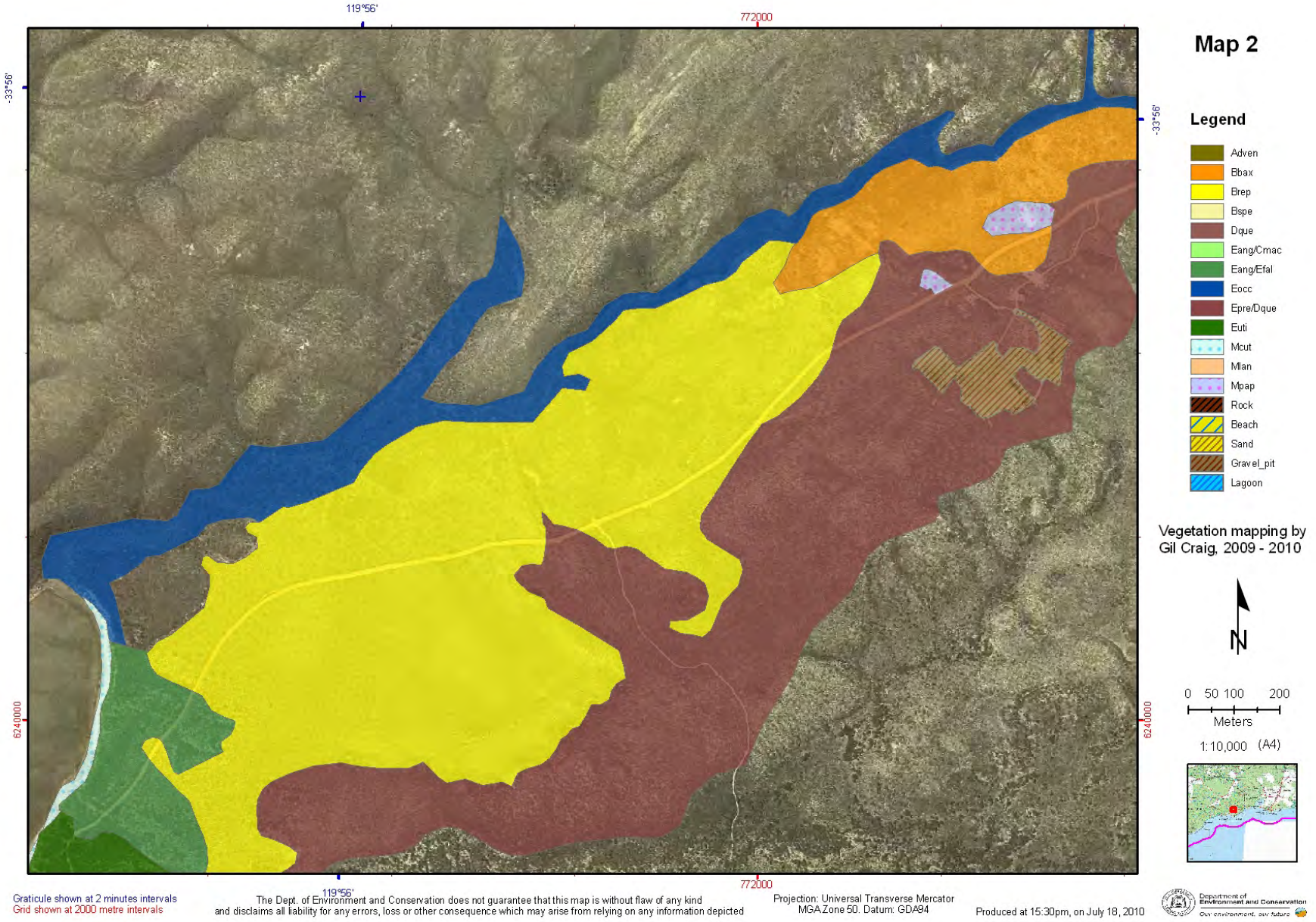
The following definitions were used to describe the life form, ascribed using field observations, of each plant species.
Tree: a plant over 2 m high with a single stem and a usually open-branching habit. Branching may occur a short distance above ground level.
Mallet: a small to medium-sized tree, usually of steep-branching habit and with a conspicuously dense, terminal crown. The base of the trunk is sometimes fluted.
Mallee: a multi-stemmed plant from ground level, usually less than 10 m in height. Mallee forms are produced when several stems of similar size grow from a lignotuber into a mature plant.
Tall shrub: a plant over 2 m tall, usually with more than one main branch below 1.3 m
Mid shrub: a shrub between 1 and 2 m in height
Low shrub: a shrub between 0.5 and 1 m in height
Dwarf shrub: a shrub less than 0.5 m in height
Sedge/sedge-like: a plant of the family Cyperaceae, Restionaceae or Juncaceae
Grass/herb: a plant which is non-woody or woody at the base only, the above ground stems usually being ephemeral

Landform: information noted during survey.

Notes: general field observations.

Photo: information includes photo number, direction, location (relevé number) & GPS location.


770000
119°56'
6240000
Hamersley Inlet
Map 1
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted
Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94
Produced at 15:30pm, on July 18, 2010
Department of Environment and Conservation


119°56'
772000
-33°56'
6240000
Map 2
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
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Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94
Produced at 15:30pm, on July 18, 2010
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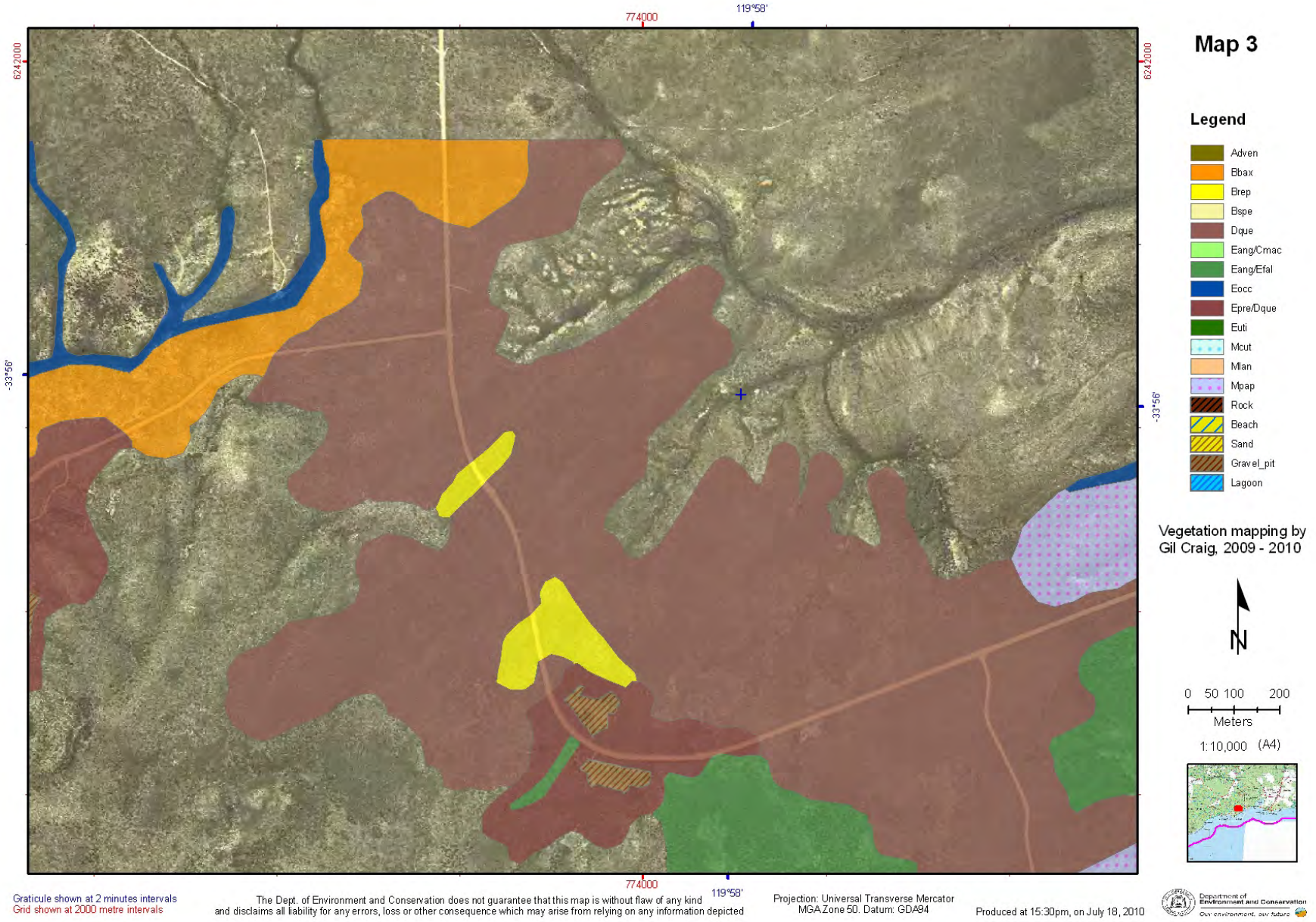
774000
119°58'
6242000
-33°56'
Map 3
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted
Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94
Produced at 15:30pm, on July 18, 2010
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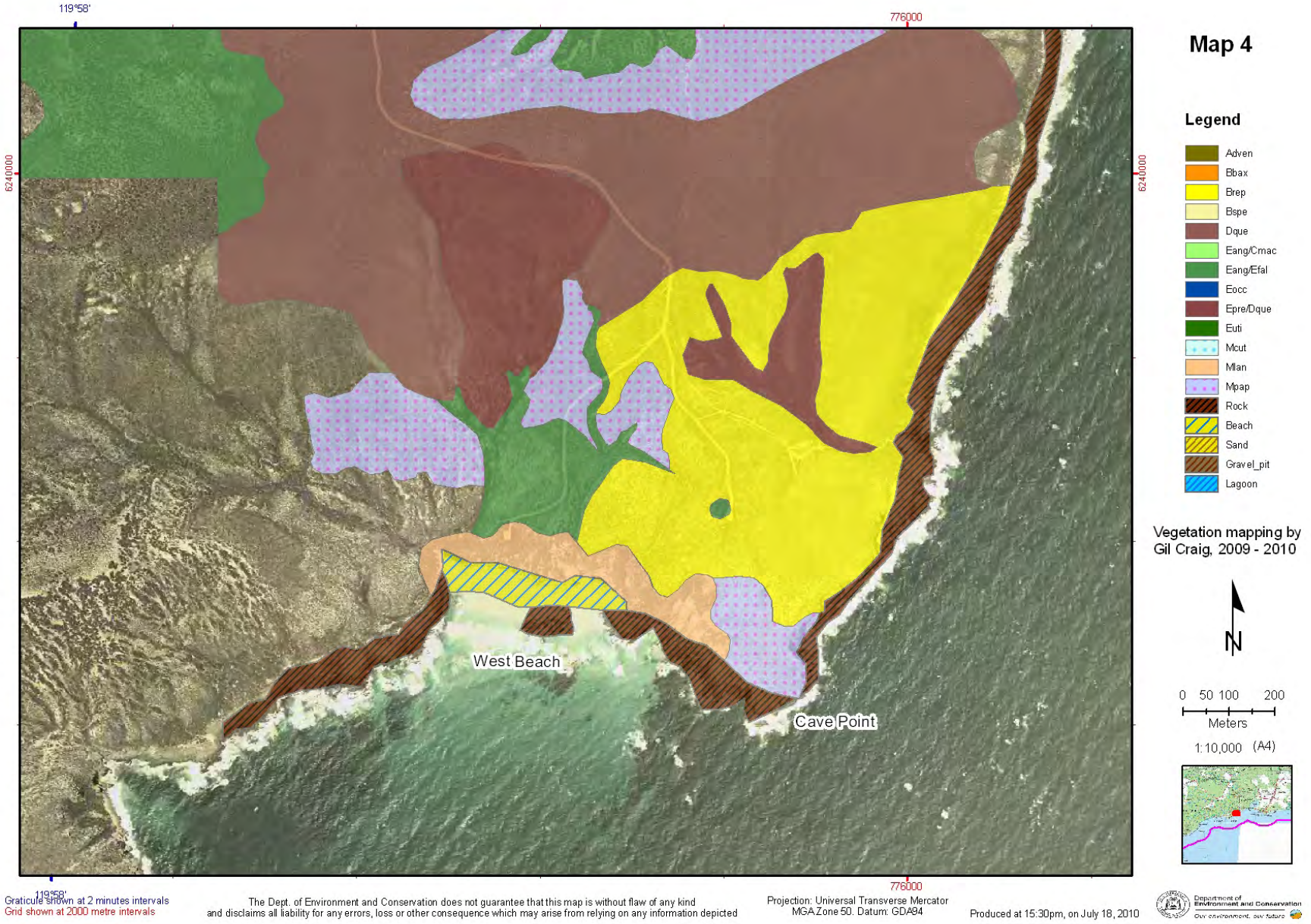
119°58'
776000
6240000
West Beach
Cave Point
Map 4
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
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MGA Zone 50. Datum: GDA94
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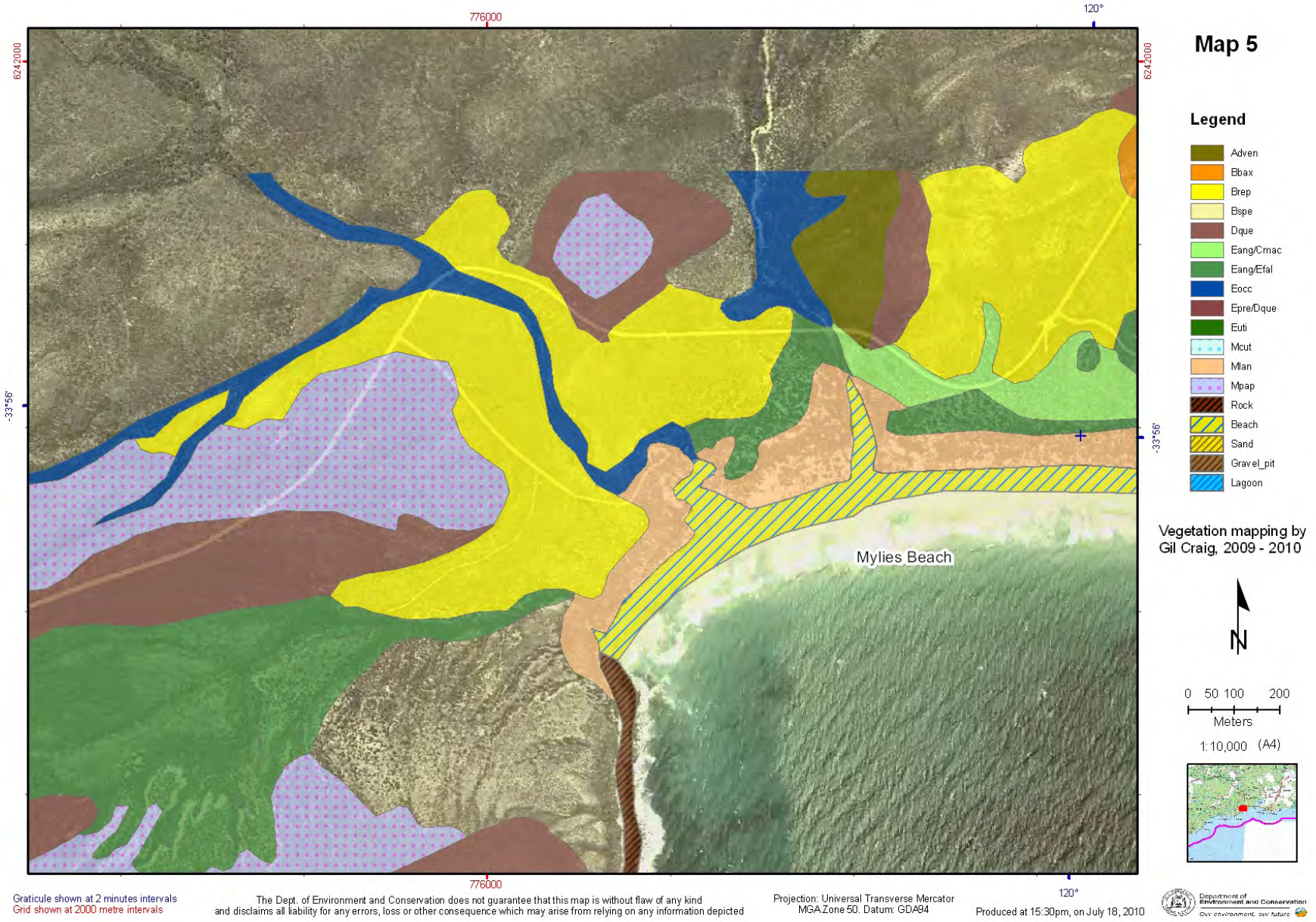
776000
120°
6242000
-33°56'
Mylies Beach
Map 5
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted
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MGA Zone 50. Datum: GDA94
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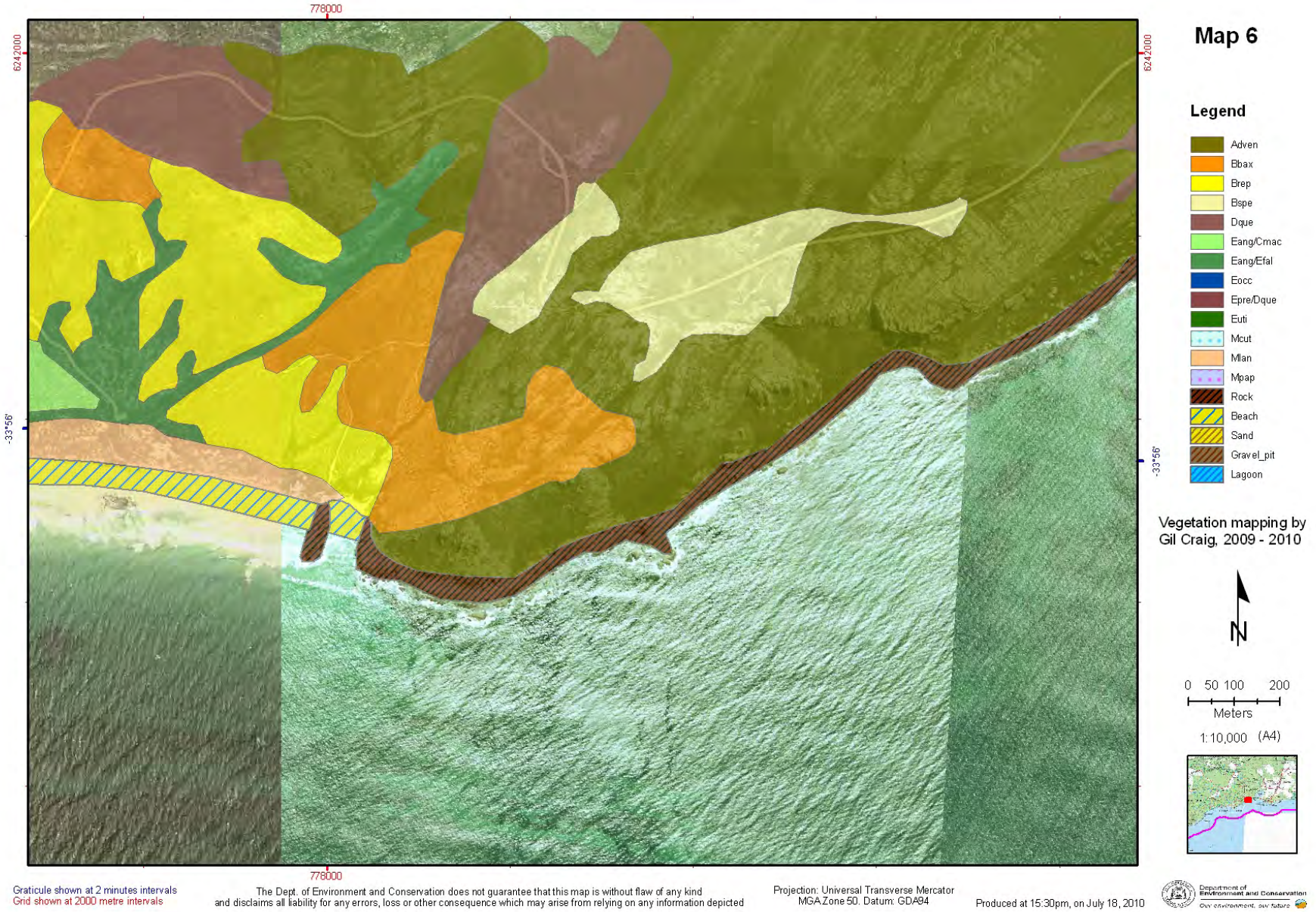
778000
6242000
-33°56'
Map 6
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
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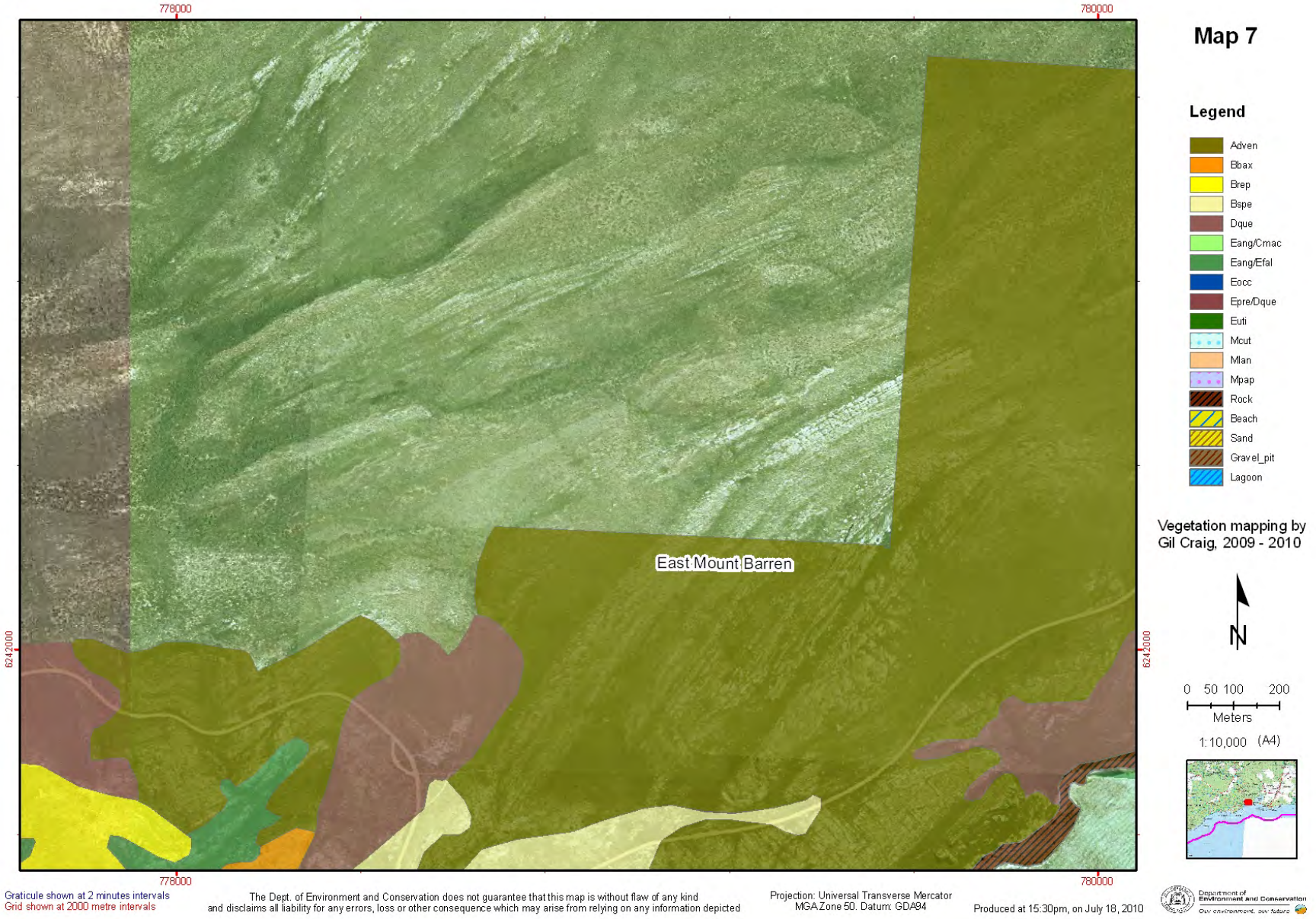
778000
780000
6242000
East Mount Barren
Map 7
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
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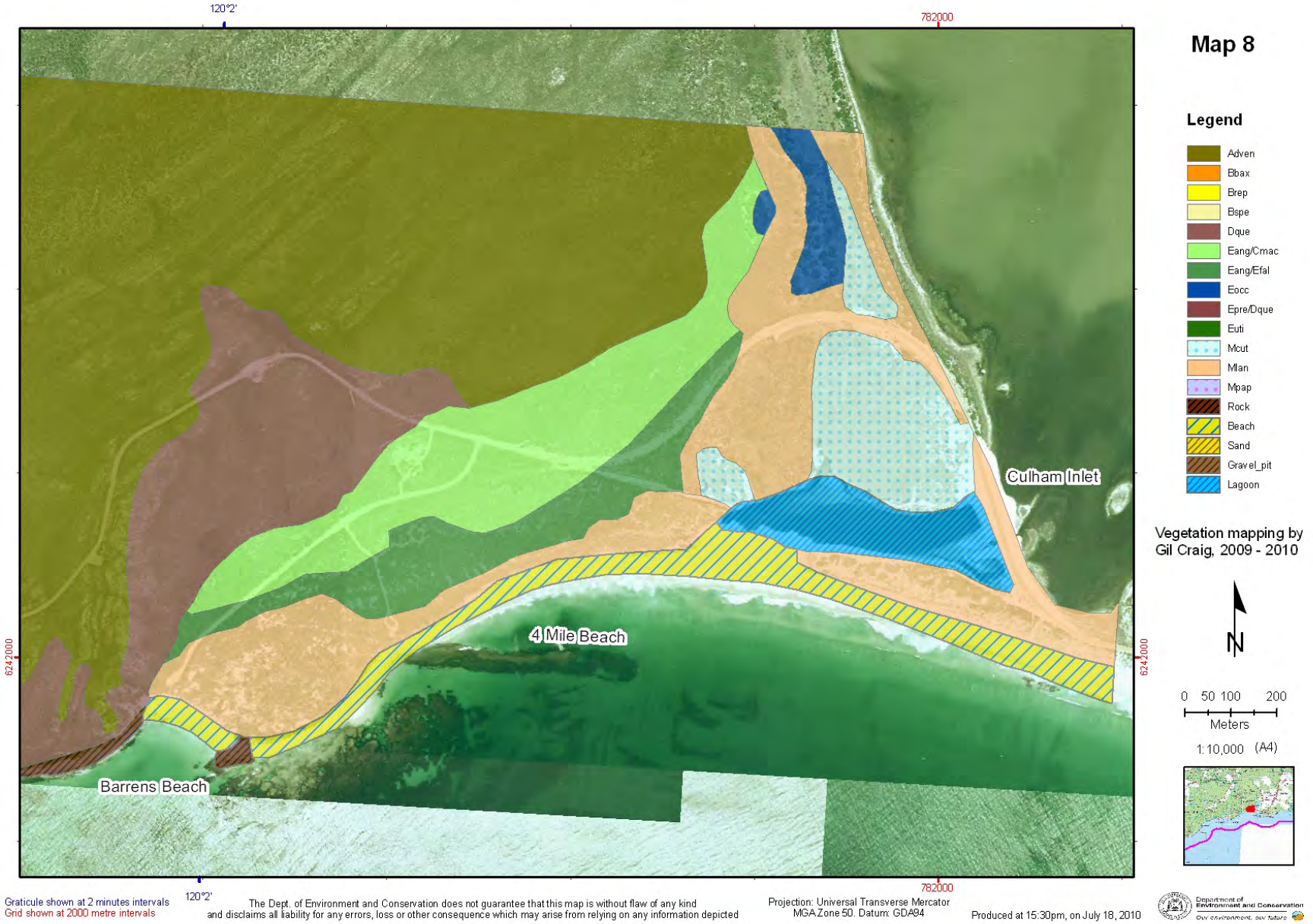
Our environment, our future


120°2'
782000
6242000
Culham Inlet
4 Mile Beach
Barrens Beach
Map 8
Legend
Adven
Bbax
Brep
Bspe
Dque
Eang/Cmac
Eang/Efal
Eocc
Epre/Dque
Euti
Mcut
Mlan
Mpap
Rock
Beach
Sand
Gravel_pit
Lagoon
Vegetation mapping by
Gil Craig, 2009 - 2010
N
0 50 100 200
Meters
1:10,000 (A4)
Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals
The Dept. of Environment and Conservation does not guarantee that this map is without flaw of any kind
and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted
Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94
Produced at 15:30pm, on July 18, 2010
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1. *Adenanthos venosus (Adven)*

Unit area: 294 ha

Sampling: 11 relevés (this project)
3 relevés (Newbey 1987)

Muir classification: Thicket

Beard Vegetation System - Unit: Barrens – edSc (Barren Ranges thicket)

The following common species were recorded:

Tall shrubs: *Regelia velutina*

Mid shrubs: *Adenanthos venosus, Agonis baxteri, Banksia oreophila, Calothamnus macrocarpus, Calothamnus pinifolius, Calothamnus validus, Dryandra quercifolia, Eutaxia neurocalyx ms, Hakea victoria, Hypocalymma strictum, Taxandria conspicua subsp. abrupta, Jacksonia compressa, Melaleuca citrina*

Low shrubs: *Baeckea ovalifolia, Hibbertia papillata, Leucopogon flavescens var. brevifolius, Lysinema ciliatum, Melaleuca striata*

Dwarf shrubs: *Acacia argutifolia, Banksia baueri, Leucopogon conostephioides*

Sedges/sedge-like: *Anarthria laevis, Anarthria scabra, Hypolaena exsulca, Lepidosperma* sp. U1 big heads (A.S. George 11294), *Schoenus sublaxus*

Grasses/herbs: *Sphenotoma squarrosa, Stylidium albomontis, Xanthorrhoea platyphylla*

Landform: Rock quartzite

Notes:

Photo no: dscn6479
Photo direction: NE
Location: R35 – GDA94 -33.92714 120.02425

2. *Dryandra quercifolia (Dque)*

Unit area: 280 ha

Sampling: 13 relevés (this project)
1 relevé (Newbey 1987)

Muir classification: Thicket, Scrub

Beard Vegetation System - Unit: Barrens – edSc (Barren Ranges thicket)

The following common species were recorded:

Mallees: *Eucalyptus pleurocarpa, Eucalyptus preissiana*

Tall shrubs: *Agonis baxteri, Banksia lemanniana, Dryandra quercifolia, Hakea pandanicarpa subsp. crassifolia,*

Mid shrubs: *Daviesia emarginata, Daviesia striata, Dryandra falcata, Dryandra plumosa, Hakea ferruginea, Hakea victoria, Jacksonia viscosa, Melaleuca striata,*

Low shrubs: *Acacia phlebopetala, Allocasuarina humilis, Beaufortia micrantha, Calothamnus gracilis, Goodenia scapigera, Grevillea coccinea, Grevillea nudiflora, Isopogon formosus, Isopogon trilobus, Leptospermum spinescens, Leucopogon carinatus, Leucopogon crassifolius, Lysinema ciliatum, Melaleuca subtrigona, Petrophile seminuda*

Dwarf shrubs: *Acacia moirii subsp. dasycarpa, Andersonia parvifolia, Banksia repens, Banksia violacea, Boronia crassifolia, Gompholobium knightianum, Hibbertia gracilipes, Isopogon polycephalus, Leptospermum sp. Bandalup Hill (G. Cockerton 11001), Taxandria spathulata*

Sedges/sedge-like: *Caustis dioica, Chordifex sphacelatus, Desmocladus flexuosus, Lepidosperma sp. Clathrate (RL Barrett & GF Craig RLB 3570), Lepidosperma sp. Dale River (R Davis 1051), Mesomelaena stygia, Schoenus sublaxus*

Grasses/herbs: *Conostylis vaginata, Dampiera juncea, Stylidium albomontis, Xanthorrhoea platyphylla*

Landform:

Notes:

Dryandra quercifolia (Dque) – cont.

Photo no: dscn6920
Photo direction: W
Location: R9 (burnt Oct 2006) GDA94 -33.93828 119.97257

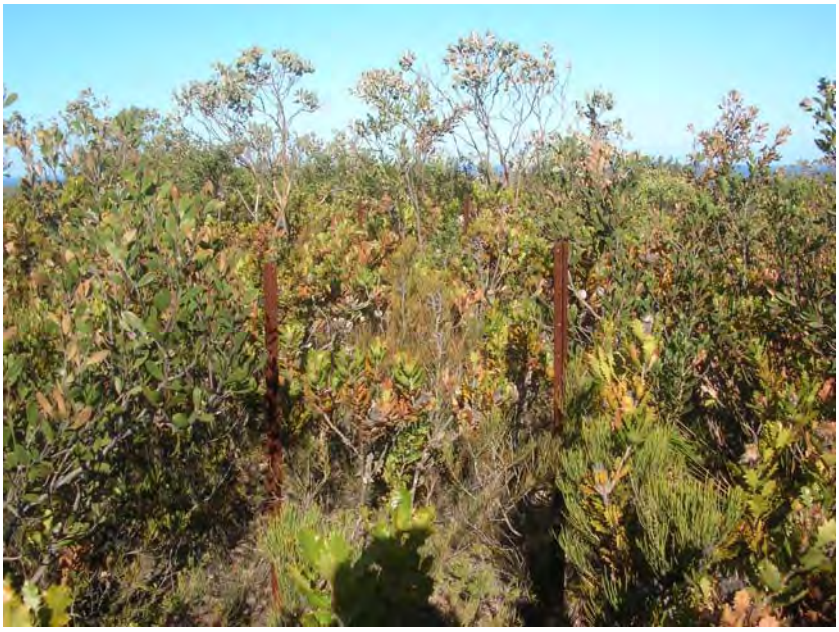


Photo no: dscn7002
Photo direction: S
Location: R74/ FS159/ CN44A GDA94 -33.94354 119.97372

3. *Eucalyptus preissiana/ Dryandra quercifolia (Epre/Dque)*

Unit area: 106 ha

Sampling: relevés (this project)
relevés (Newbey 1987)

Muir classification: Dense Shrub Mallee, Thicket/ Scrub

Beard Vegetation System - Unit: Barrens – edSc (Barren Ranges thicket)

The following common species were recorded:

Mallees: *Eucalyptus pleurocarpa, Eucalyptus preissiana*

Tall shrubs: *Banksia lemanniana*, *Dryandra quercifolia, Hakea pandanicarpa subsp. crassifolia,*

Mid shrubs: *Beaufortia schaueri, Dryandra plumosa,*

Low shrubs: *Allocasuarina humilis, Beaufortia micrantha, Leucopogon crassifolius, Lysinema ciliatum, Melaleuca striata, Taxandria spathulata*

Sedges/sedge-like: *Anarthria scabra, Caustis dioica, Mesomelaena stygia, Schoenus sublaxus,*

Grasses/herbs: *Conostylis vaginata, Xanthorrhoea platyphylla*

Landform:

Notes:

Photo no: dscn6704
Photo direction: W
Location: R46 GDA94 -33.93488 119.95101

4. *Melaleuca papillosa (Mpap)*

Unit area: 64 ha **Sampling:** 2 relevés (this project)

Muir classification: Heath

Beard Vegetation System - Unit: Barrens – edSc (Barren Ranges thicket)

The following common species were recorded:

Mid shrubs: *Agonis baxteri, Banksia lemanniana, Calothamnus pinifolius, Dryandra cuneata, Melaleuca nesophila, Melaleuca papillosa,*

Low shrubs: *Acacia gonophylla, Acacia phlebopetala, Beaufortia micrantha, Calothamnus gracilis, Daviesia incrassata subsp. reversifolia, Dryandra nivea, Grevillea nudiflora, Lasiopetalum compactum, Melaleuca subtrigona, Petrophile teretifolia,*

Dwarf shrubs: *Acacia moirii subsp. dasycarpa, Boronia albiflora, Boronia crassifolia, Gompholobium knightianum, Hibbertia gracilipes, Leucopogon conostephioides, Platysace compressa, Stirlingia anethifolia,*

Sedges/sedge-like: *Desmocladus flexuosus, Gahnia lanigera, Mesomelaena stygia, Tricostularia neesii var. elatior*

Grasses/herbs: *Amphipogon turbinatus, Stylidium albomontis*

Landform:

Notes:

Photo no: dscn6980
Photo direction: SW
Location: R69 GDA94 -33.95357 119.98351

5. *Eucalyptus angulosa/ Calothamnus macrocarpus (Eang/Cmac)*

Unit area: 32 ha

Sampling: 4 relevés (this project)
1 relevé (Newbey 1987)

Muir classification: Open mallee, heath and open low sedges

Beard Vegetation System - Unit: Barrens/ Fanny's Cove – eaSi (Coastal Scrub on drift sand)

The following common species were recorded:

Mallees: *Eucalyptus angulosa, Eucalyptus falcata, Eucalyptus pleurocarpa*

Tall shrubs: *Banksia lemanniana*

Mid shrubs: *Acacia rostellifera, Agonis baxteri, Calothamnus macrocarpus, Calothamnus quadrifidus, Hakea victoria, Leptospermum oligandrum, Melaleuca pentagona, Spyridium globulosum*

Low shrubs: *Acacia cochlearis, Goodenia scapigera, Grevillea nudiflora, Guichenotia ledifolia, Labichea lanceolata subsp. brevifolia, Platysace compressa*

Dwarf shrubs: *Corynotheca micrantha, Gompholobium tomentosum, Hibbertia gracilipes, Hibbertia racemosa, Phyllanthus calycinus*

Sedges/sedge-like: *Anarthria laevis, Desmocladus flexuosus*

Grasses: *Cyathochaeta equitans, Neurachne alopecuroidea*

Herbs: *Stylidium albomontis*

Landform:

Notes:

Photo no: dscn6369
Photo direction: SE
Location: R22 GDA94 -33.93237 119.99812

6. *Eucalyptus angulosa/ E. falcata (Eang/Efal)*

Unit area: 108 ha **Sampling:** 8 relevés (this project)

Muir classification: Shrub mallee, scrub and open low sedges

Beard Vegetation System - Unit: Barrens/ Fanny's Cove – eaSi (Coastal Scrub on drift sand)

The following common species were recorded:

Mallees: *Eucalyptus angulosa, Eucalyptus conglobata subsp. perata, Eucalyptus falcata, Eucalyptus preissiana, Eucalyptus uncinata*

Tall shrubs: *Banksia lemanniana*

Mid shrubs: *Logania buxifolia, Melaleuca pentagona, Pomaderris myrtilloides, Templetonia retusa*

Low shrubs: *Acacia phlebopetala, Acrotriche cordata, Chorizema trigonum, Goodenia scapigera, Grevillea nudiflora, Lasiopetalum quinquenervium*

Sedges/sedge-like: *Gahnia lanigera, Lepidosperma sp. Mt Burdett (M.A. Burgman & C. Layman MAB 3287)*

Grasses/herbs: *Stylidium albomontis*

Landform:

Notes:

Photo no: dscn6762
Photo direction: NW
Location: R56 GDA 94 -33.94508 119.92959

7. Eucalyptus utilis (Euti)

Unit area: 63 ha

Sampling: 3 relevés (this project)
4 relevés (Newbey 1987)

Muir classification: Woodland, open scrub, low scrub, very open herbs

Beard Vegetation System - Unit: Barrens/ Fanny's Cove – eaSi (Coastal Scrub on drift sand)

The following common species were recorded:

Mallets: *Eucalyptus utilis*

Mallees: *Eucalyptus angulosa*

Tall shrubs: *Acacia rostellifera, Melaleuca lanceolata, Melaleuca nesophila, Melaleuca pentagona*

Mid shrubs: *Boronia tetrandra, Chamelaucium axillare, Dodonaea bursariifolia, Pomaderris myrtilloides, Pultenaea heterochila, Rhagodia baccata, Rhagodia crassifolia, Trymalium elachophyllum*

Low shrubs: *Acacia cochlearis, Hibbertia mucronata*

Herbs: *Carpobrotus rossii, Suaeda australis, Tetragonia implexicoma, Zygophyllum glaucum*

Landform: Consolidated dunes - coastal limestone (Quaternary)

Notes: Although *Eucalyptus conglobata* subsp. *perata* is not included within a relevé, it is a frequent component of the **Euti** vegetation unit on the low rises east of Hamersley Inlet.

Photo no: dscn6754
Photo direction: N
Location: R53 GDA94 -33.94902 119.92659

8. Melaleuca lanceolata (Mlan)

Unit area: 76 ha

Sampling: 3 relevés (this project)
8 relevés (Newbey 1987)

Muir classification: Dense thicket, scrub heath and very open low sedges

Beard Vegetation System - Unit: Barrens/ Fanny's Cove – eaSi (Coastal Scrub on drift sand)

The following common species were recorded:

Tall shrubs: *Melaleuca lanceolata*

Mid shrubs: *Acacia rostellifera, Olearia axillaris, Rhagodia baccata, Rhagodia crassifolia*

Low shrubs: *Scaevola crassifolia*

Herbs: *Carpobrotus virescens, Suaeda australis, Tetragonia implexicoma*

Landform: Coastal dunes

Notes: *Melaleuca nesophila* is a frequent component on the coastal dunes in association with *M. lanceolata.*

Photo no: dscn6994
Photo direction: E
Location: R72 GDA94 -33.95201 119.97675

9. Banksia speciosa (Bspe)

Unit area: 14 ha **Sampling:** 3 relevés (this project)

Muir classification: Dense thicket, scrub heath and low sedges

Beard Vegetation System - Unit: Fanny's Cove – xSZc (Scrub heath with Banksia on coastal plain)

The following common species were recorded:

Tall shrubs: *Banksia baxteri, Banksia speciosa, Nuytsia floribunda*

Mid shrubs: *Agonis baxteri, Banksia oreophila, Hakea victoria, Jacksonia furcellata, Leptospermum oligandrum*

Low shrubs: *Adenanthos cuneatus, Allocasuarina humilis, Baeckea ovalifolia, Calothamnus gracilis, Conospermum teretifolium, Eutaxia neurocalyx ms, Hibbertia mucronata, Isopogon trilobus, Lysinema ciliatum, Melaleuca striata, Oligarrhena micrantha, Petrophile teretifolia*

Dwarf shrubs: *Banksia baueri, Hibbertia gracilipes, Leucopogon conostephioides, Leucopogon flavescens var. brevifolius*

Sedges/sedge-like: *Anarthria prolifera, Anarthria scabra, Caustis dioica, Chordifex sphacelatus, Desmocladus fasciculatus, Hypolaena exsulca, Lepidosperma sp. U1 big heads (A.S. George 11294), Mesomelaena stygia, Schoenus caespititius*

Grasses/herbs: *Conostylis vaginata, Johnsonia acaulis, Lechenaultia heteromera*

Landform: Wave-cut bench

Notes: This unit is typically found on the coastal plain east of Culham Inlet. Its occurrence on the wave-cut bench at the base of East Mt Barren is unusual and coincides with the wetter, sandy soils where run-off and seepage from upslope creates micro-habitats. The unit is a mosaic of tall *Banksia* shrubs with pockets of sedge-land in the wettest areas.

Photo no: dscn6446
Photo direction: E
Location: R31 GDA94 -33.93066 120.0152

10. Eucalyptus pleurocarpa/ Banksia repens (Eple/Brep)

Unit area: 222 ha

Sampling: 17 relevés (this project)
3 relevés (Newbey 1987)

Muir classification: Very open shrub mallee, Open scrub, Heath and Low sedges

Beard Vegetation System - Unit: Qualup – e_{26}SZc (*Eucalyptus pleurocarpa* mallee-heath)

The following common species were recorded:

Mallees: *Eucalyptus pleurocarpa*

Tall shrubs: *Banksia lemanniana, Hakea pandanicarpa subsp. crassifolia,*

Mid shrubs: *Agonis baxteri, Allocasuarina acuaria, Grevillea tripartita, Hakea corymbosa, Hakea victoria, Jacksonia viscose, Templetonia retusa*

Low shrubs: *Acacia cochlearis, Adenanthos cuneatus, Allocasuarina humilis, Banksia violacea, Calothamnus gracilis, Conospermum floribundum, Conospermum teretifolium, Dryandra cuneata, Dryandra obtusa, Grevillea coccinea, Grevillea nudiflora, Isopogon polycephalus, Isopogon trilobus, Leptospermum spinescens, Leucopogon crassifolius, Leucopogon fimbriatus, Lysinema ciliatum, Melaleuca striata, Melaleuca subtrigona, Petrophile teretifolia, Taxandria spathulata,*

Dwarf shrubs: *Acacia moirii subsp. dasycarpa, Astroloma prostratum, Banksia repens, Boronia crassifolia, Conothamnus aureus, Daviesia incrassata subsp. reversifolia, Gompholobium knightianum, Gompholobium scabrum, Hibbertia gracilipes, Leptospermum sp. Bandalup Hill (G. Cockerton 11001), Leucopogon conostephioides, Stirlingia anethifolia,*

Sedges/sedge-like: *Anarthria prolifera, Anarthria scabra, Caustis dioica, Chordifex sphacelatus, Desmocladus flexuosus, Lepidosperma carphoides, Lepidosperma sp. Mt Burdett (M.A. Burgman & C. Layman MAB 3287), Lyginia barbata, Mesomelaena stygia, Schoenus brevisetis, Schoenus caespititius, Schoenus sublaxus, Tricostularia neesii var. elatior*

Grasses *Amphipogon turbinatus*

Herbs: *Conostylis vaginata, Dampiera juncea, Lechenaultia heteromera, Patersonia lanata, Stylidium albomontis, Tripterococcus brunonis, Xanthorrhoea platyphylla*

Landform: Coastal plain

Notes:

Eucalyptus pleurocarpa/ Banksia repens (Eple/Brep) – cont.

Photo no: dscn6839
Photo direction: S
Location: R64/ FS158/ CN40A (burnt Oct 2006) GDA94 -33.93212 119.98507

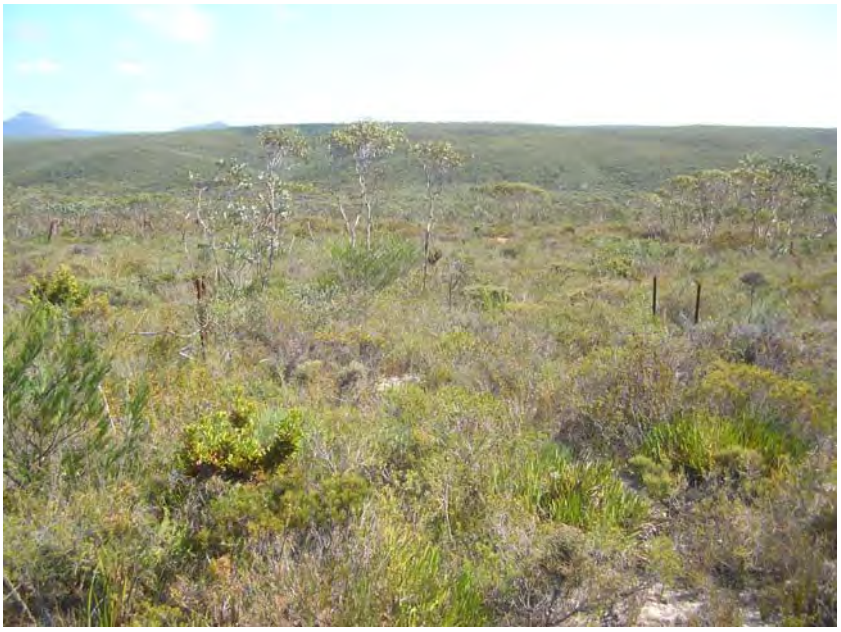


Photo no: dscn6933
Photo direction: W
Location: R65/ FS172/ CN47A GDA94 -33.94228 119.93703

11. Banksia baxteri (Bbax)

Unit area: 52 ha

Sampling: 4 relevés (this project)
3 relevés (Newbey 1987)

Muir classification: Very open mallee, Thicket, Heath, Low scrub and Low sedges

Beard Vegetation System - Unit: Qualup – e_{26}SZc (*Eucalyptus pleurocarpa* mallee-heath)

The following common species were recorded:

Mallees: *Eucalyptus preissiana*

Mid shrubs: *Banksia baxteri, Dryandra quercifolia, Hakea ferruginea, Hakea trifurcata, Hakea victoria, Logania buxifolia, Melaleuca striata*

Low shrubs: *Acrotriche cordata, Adenanthos cuneatus, Allocasuarina humilis, Allocasuarina microstachya, Banksia violacea, Calothamnus gracilis, Dryandra cuneata, Hibbertia mucronata, Isopogon polycephalus, Isopogon trilobus, Leucopogon crassifolius, Lysinema ciliatum, Microcorys barbata, Petrophile teretifolia, Taxandria spathulata*

Dwarf shrubs: *Banksia baueri, Conothamnus aureus*

Sedges/sedge-like: *Anarthria prolifera, Anarthria scabra Caustis dioica, Desmocladus flexuosus, Hypolaena fastigiata, Lyginia barbata, Mesomelaena stygia, Mesomelaena tetragona, Tricostularia neesii var. elatior*

Herbs: *Conostylis vaginata*

Landform: Coastal plain

Notes:

Photo no: dscn6714
Photo direction: SW
Location: R47 GDA94 -33.93449 119.95276

12. Eucalyptus occidentalis (Eocc)

Unit area: 43 ha

Sampling: 3 relevés (this project)
3 relevés (Newbey 1987)

Muir classification: Low woodland, Thicket and Scrub

Beard Vegetation System - Unit: Qualup/ Esperance (widespread) – e_7Mi (Yate)

The following common species were recorded:

Trees: *Eucalyptus occidentalis*

Mallees: *Eucalyptus falcata*

Tall shrubs: *Alyogyne wrayae ms, Melaleuca cuticularis, Melaleuca nesophila, Templetonia retusa*

Mid shrubs: *Acacia myrtifolia, Acacia rostellifera, Calothamnus quadrifidus*

Low shrubs: *Guichenotia ledifolia*

Sedges/sedge-like: *Gahnia decomposita*

Herbs: *Clematis pubescens, Suaeda australis*

Landform: Drainage lines

Notes:

Photo no: dscn6330
Photo direction: W
Location: R13 GDA94 -33.93033 119.98482

13. Melaleuca cuticularis (Mcut)

Unit area: 18 ha **Sampling:** 3 relevés (Newbey 1987)

Muir classification: Thicket, open low scrub, very open mat plants, very open herbs

Beard Vegetation System - Unit: Qualup/ Esperance (widespread) – e_7Mi (Yate)

The following common species were recorded:

Tall shrubs: *Acacia cyclops, Melaleuca brevifolia, Melaleuca cuticularis, Myoporum tetrandrum*

Mid shrubs: *Acacia rostellifera, Rhagodia crassifolia*

Dwarf shrubs: *Atriplex cinerea, Frankenia tetrapetala, Sarcocornia blackiana, Tecticornia lepidosperma, Tecticornia pergranulata*

Herbs: *Disphyma crassifolium, Samolus repens, Suaeda australis, Tetragonia implexicoma, Threlkeldia diffusa*

Landform: Inlet/ coastal lagoon margins

Notes:

Photo no: dscn6940
Photo direction: N
Location: near FS196, east margin of Hamersley Inlet

Appendix 4: Declared Rare, Priority and Significant flora

Species are described in the following order:

Species Name	DEC Code
Adenanthos ellipticus	R
Eucalyptus burdettiana	R
Eucalyptus coronata	R
Kunzea similis subsp. similis	R
Stylidium galioides	R
Verticordia pityrhops	R
Calothamnus macrocarpus	P2
Gonocarpus hispidus	P2
Hibbertia papillata	P2
Leptospermum confertum	P2
Microcorys longiflora	P3
Acacia argutifolia	P4
Anthocercis fasciculata	P4
Corybas limpidus	P4
Dampiera deltoidea	P4
Hakea hookeriana	P4
Jacksonia compressa	P4
Lechenaultia superba	P4
Leucopogon compactus	P4
Melaleuca papillosa	P4
Pimelea physodes	P4
Pleurophascum occidentale	P4
Lepidosperma sp. Fitzgerald River	Significant
Lepidosperma sp. GFC8831	Significant

Adenanthos ellipticus (DRF)

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Alt	Plant Count	Size	Notes	DigiPic
Hamersley Drive upgrade:								
59	-33.9267	120.01115	1-Oct-09	100.6	2			dscn6420-23
60	-33.92672	120.01123	1-Oct-09	98.5	20	<10m		
67	-33.92645	120.01106	1-Oct-09	98.8	1			
10	-33.93104	120.0128	12-Oct-09	90.5	30	patch	1.5 m	
14	-33.93115	120.01327	12-Oct-09	95.4	7			
15	-33.93113	120.01347	12-Oct-09	93.9	80			
16	-33.93108	120.01361	12-Oct-09	92.7	20	+		dscn6439
18	-33.93095	120.01411	12-Oct-09	90.2	20	+		dscn6442-5
26	-33.93072	120.01393	12-Oct-09	92.7	7			
27	-33.93079	120.01358	12-Oct-09	92	100	+ big patch	to wpt 30	
28	-33.93077	120.0133	12-Oct-09	95.7	30			
30	-33.93066	120.01283	12-Oct-09	97.5	10			
52	-33.92694	120.02457	16-Oct-09	101.2	4			
53	-33.92697	120.02443	16-Oct-09	101.2	3			
57	-33.92764	120.02373	16-Oct-09	96.3	4			
58	-33.92767	120.02369	16-Oct-09	91.1	1			
100	-33.9273	120.02446	16-Oct-09	88.4	11			
					350			
East Mt Barren (WAHERB & DEFL):								
17Ae	-33.93194	120.01361	28/02/2008					
18Ae	-33.91833	120.01333	26 11 1931					
19Ae	-33.91833	120.01333	02 11 1929					
20Ae	-33.91833	120.01333	21 04 1962					
21Ae	-33.91833	120.01333	26 11 1931					
22Ae	-33.91833	120.01333	07 05 1993					
23Ae	-33.91833	120.01333	25 10 1964					
24Ae	-33.91833	120.01333	02 11 1929					
25Ae	-33.91833	120.01333	31 01 1960					
26Ae	-33.91833	120.01333	14 04 1974					
27Ae	-33.91833	120.01333	25 10 1964					
28Ae	-33.91666	120.03333	09 11 1983					
29Ae	-33.91833	120.01333	29 12 1984					
30Ae	-33.91666	120.03333	12 01 1979					
31Ae	-33.92986	120.01456	26 04 2004					
32Ae	-33.92486	120.02678	10 04 1994					
33Ae	-33.92986	120.01539	30 11 1993					
34Ae	-33.91833	120.01333	07 09 1993					
35Ae	-33.91666	120.03333	19 11 1985					
36Ae	-33.91833	120.01333	25 05 1983					
37Ae	-33.91666	120	08 09 1992					
38Ae	-33.91666	120.03333	09 09 1971					
39Ae	-33.91666	120.03333	09 09 1971					
40Ae	-33.92861	120.0125	29 09 1999					

Adenanthos ellipticus – cont.

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	350	0.9	0.7
[1] East Mt Barren	40,000+		
[2] Thumb Peak	10,000+		
[2] West Mt Barren	1,000+		

[1] DEC Albany 2008
[2] Robinson & Coates 1995

***Kunzea similis* subsp. *similis* (DRF)**

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	Size	DigiPic
Hamersley Drive upgrade								
11	-33.93104	120.01294	12-Oct-09	92	1			
14	-33.93115	120.01327	12-Oct-09	95.4	70	to wpt 15		dscn6433-8
15	-33.93113	120.01347	12-Oct-09	93.9				
16	-33.93108	120.01361	12-Oct-09	92.7	1			
19	-33.93083	120.01456	12-Oct-09	90.8	5			
21	-33.93043	120.01611	12-Oct-09	82.9	3			
23	-33.92956	120.01743	12-Oct-09	88.4	1			
25	-33.93064	120.01411	12-Oct-09	90.5	5			
26	-33.93072	120.01393	12-Oct-09	92.7	4			
28	-33.93077	120.0133	12-Oct-09	95.7	5			
84	-33.93057	120.0184	16-Oct-09	73.8	5			
					100			
East Mt Barren (WAHERB & DEFL):								
201Ks	-33.93153	120.01347	11/05/2005					
201Ks	- 33.932259	120.01262	07 09 1986					
203Ks	-33.93347	120.01206	04 01 2001				10 ha	

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	100	2.8	2.8
1 East Mt Barren	3,600		

1 DEC Albany 2009

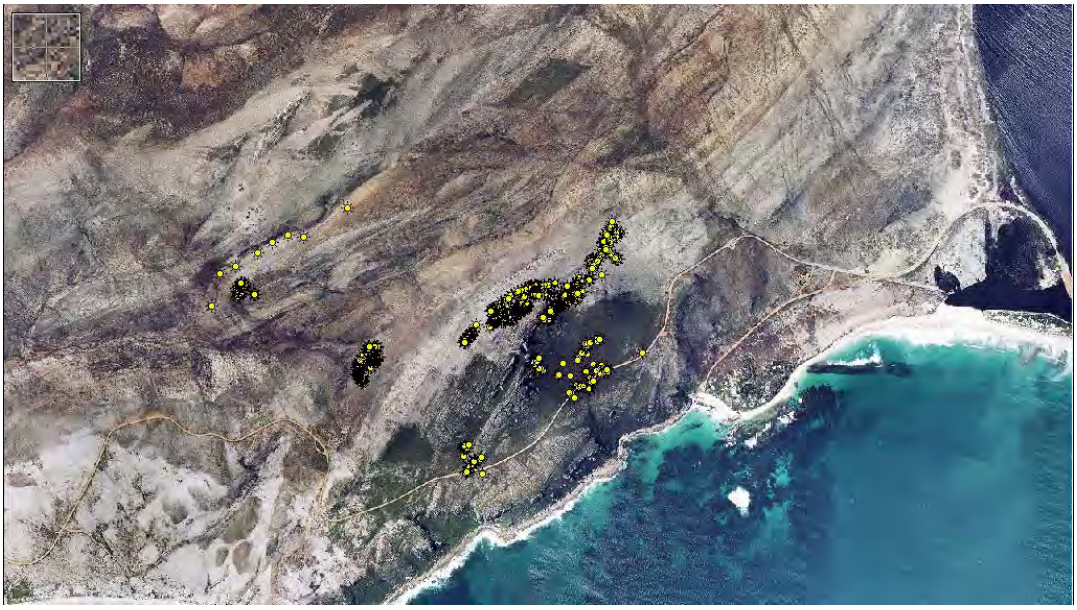
***Eucalyptus burdettiana* (DRF)**

Surveyed by Ellen Hickman- October 2009
[Note – complete list of waypoints for East Mt Barren are provided on DVD at back of report]

Waypoint	Latitude	Longitude	y_proj	x_proj	Date	Altitude	Plant Count
Hamersley Drive upgrade:							
23	-33.9287249	120.0205123	6241747	224574	30-Sep-09	92	1
24	-33.9285661	120.0206604	6241765	224587	30-Sep-09	92	1
25	-33.9285392	120.0206471	6241768	224586	30-Sep-09	93	1
26	-33.9285297	120.0206463	6241769	224586	30-Sep-09	96	1
27	-33.9285016	120.0209229	6241773	224611	30-Sep-09	95	1
28	-33.9284123	120.0209826	6241783	224617	30-Sep-09	94	1
2	-33.9241108	120.0294694	6242283	225387	30-Sep-09	86	1
3	-33.9247515	120.0275988	6242207	225217	30-Sep-09	97	1
4	-33.9245827	120.0273505	6242225	225193	30-Sep-09	90	1
5	-33.924585	120.0273392	6242225	225192	30-Sep-09	91	1
6	-33.9247328	120.0272272	6242208	225182	30-Sep-09	91	1
7	-33.9247898	120.0271298	6242202	225173	30-Sep-09	101	1
8	-33.9247976	120.027071	6242201	225168	30-Sep-09	103	1
9	-33.9251008	120.0266809	6242166	225133	30-Sep-09	98	1
10	-33.9251094	120.0267091	6242165	225135	30-Sep-09	99	1
13	-33.9254482	120.0260613	6242126	225077	30-Sep-09	94	1
14	-33.925424	120.0260233	6242128	225073	30-Sep-09	98	1
15	-33.9257424	120.0256209	6242092	225037	30-Sep-09	97	1
18	-33.9289674	120.0202768	6241720	224553	30-Sep-09	96	1
19	-33.9288234	120.0203926	6241736	224563	30-Sep-09	90	1
20	-33.9287992	120.020383	6241739	224562	30-Sep-09	93	1
21	-33.9288111	120.0203379	6241737	224558	30-Sep-09	92	1
30	-33.9290463	120.0201499	6241711	224542	30-Sep-09	90	1
31	-33.9290353	120.0202277	6241712	224549	30-Sep-09	90	1
33	-33.9291188	120.0210128	6241705	224622	30-Sep-09	91	1
35	-33.9259481	120.0258895	6242070	225062	30-Sep-09	99	1
36	-33.9254957	120.0261001	6242121	225080	30-Sep-09	95	1
37	-33.9255242	120.026105	6242118	225081	30-Sep-09	96	1
39	-33.9254707	120.0262328	6242124	225093	30-Sep-09	100	1
40	-33.9254684	120.0263565	6242124	225104	30-Sep-09	100	1
41	-33.9254716	120.0266466	6242125	225131	30-Sep-09	97	1
42	-33.9255715	120.0266922	6242114	225135	30-Sep-09	96	1
43	-33.9255661	120.0266395	6242114	225130	30-Sep-09	95	1
44	-33.9253376	120.0267516	6242140	225140	30-Sep-09	96	1
45	-33.9253099	120.0267647	6242143	225141	30-Sep-09	96	1
46	-33.9253151	120.0267883	6242143	225143	30-Sep-09	93	1
47	-33.9252779	120.0268573	6242147	225150	30-Sep-09	91	1
48	-33.9249459	120.027257	6242185	225186	30-Sep-09	90	1
49	-33.9248718	120.0274608	6242194	225204	30-Sep-09	88	1
50	-33.9248717	120.0274753	6242194	225206	30-Sep-09	88	1
51	-33.9248518	120.0276342	6242196	225220	30-Sep-09	85	1
52	-33.9247981	120.0276199	6242202	225219	30-Sep-09	79	1
							42

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	42	1.2	1.2
East Mt Barren	3580		

Eucalyptus burdettiana – cont.

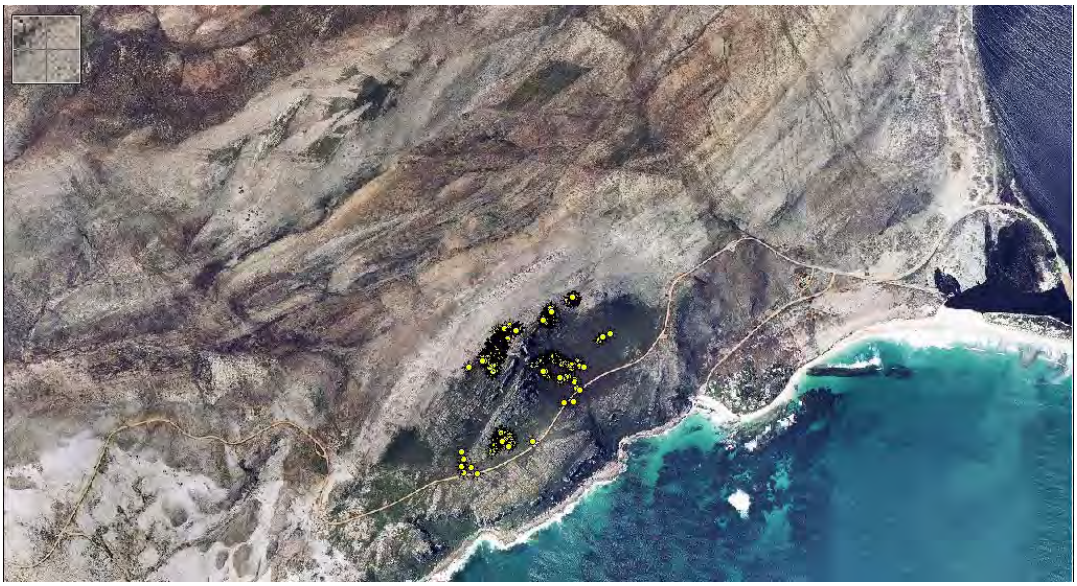


***Eucalyptus coronata* (DRF)**

Surveyed by Ellen Hickman- October 2009
[Note – complete list of waypoints for East Mt Barren are provided on DVD at back of report]

Waypoint	Latitude	Longitude	y_proj	x_proj	Date	Altitude	Plant Count
Hamersley Drive upgrade:							
*	-33.925439	120.02603	6242127	225073	30-Sep-09	96	1
*	-33.925437	120.02603	6242127	225073	30-Sep-09	96	1
*	-33.926044	120.02534	6242058	225012	30-Sep-09	100	1
*	-33.927679	120.02368	6241872	224863	30-Sep-09	94	1
*	-33.928714	120.02045	6241749	224568	30-Sep-09	97	1
*	-33.928932	120.02004	6241723	224531	30-Sep-09	93	1
*	-33.92898	120.02077	6241720	224599	30-Sep-09	92	1
*	-33.92602	120.02585	6242062	225058	30-Sep-09	97	1
*	-33.925522	120.02616	6242118	225086	30-Sep-09	97	1
							9

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	9	0.45%	0.45%
East Mt Barren	2,000		
Annie Peak	unknown		
Whoogerup Range	unknown		
Mid Mt Barren	unknown		



Eucalyptus burdettiana – cont.

Surveyed by Ellen Hickman- October 2009

Pop No.	Location	No. of plants prior 2009	No. of plants 2009 survey	Comments
1A	W lower slopes of East Mt Barren above valley 3-400m N of Hammersley Drive extending N along E side of valley	200 (1/9/88 NMQ) ?(22/9/92 CJR) 50 (20/5/02 NMQ) 52 (15/1/02 JAC) ? (4/10/06 SAB)	267 + 10	This population was assessed 1/10/09. 267 plants tagged. Plants regenerating from fire, old burnt fruits only no new buds/flowers/fruits. Ran out of tags. More plants to the NE and SW of tagged population estimated additional 10 plants. (6/10/09)
1B	Both sides of Hammersley Drive on E side of East Mt Barren	? (22/10/83 RLS) 20 (7/5/93 NMQ) 150 (30/6/98 DNI) 150 (28/4/00 SAB) 50 (3/4/02 SAB) ? (16/1/07 SAB)	92 + 200	This population was visited on 30/9/09 & 2/10/09. 50 plants tagged, another 42 plants marked with blue flagging tape along roadside within 25m proposed disturbance area. These plants are assumed to be potentially under threat during road works. This population is a mixture of *E.burdettiana* & *E.coronata*. Lots more plants seen and yet to be tagged. Vegetation very thick, last burnt 1989. (6/10/09) This population was not revisited during this survey as it was concluded that to visit and mark every plant was not effective. Estimates of additional plants made using aerial photography is 200
1C	On ridge running NE, N of Hammersley Drive where it turns cnr from running N-S to E-W	1 (22/4/95 NMQ) ? (4/10/06 SAB)	42 188 + 300 316 + 1500	This population was initially visited on 1/10/09. 42 plants tagged, ran out of light. Population extends further up ridge from tagged plants (6/10/09). This population was revisited 21/10/09 and found to extend upslope and into gully/plateau below sheer cliff of the summit. Nearer the top this species begins to mix with *E.coronata*. The vegetation was last burnt in 1989 and was too thick to do a thorough survey so plants counted is 188 but estimated number of plants is 300 (30/10/09). This population also extended from where the plants were recorded on the 1/10/09 to the west along the NW face of East Mt Barren and extends from just below summit downslope almost to bottom. The extent and no. of plants was assessed on 24/10/09, 316 plants were marked but a lot more were seen (too many to count individually). The estimated number of plants is 1200

1D	Near summit of East Mt Barren	? (18/10/64 CAG) ? (4/10/66 PAW) 1 (15/3/00 MAT) ? (4/10/06 SAB)	0	No plants found near summit. Large population seen below SE cliff face but not easily accessible from summit, probable access from extention of W valley before summit beyond *E.coronata* Pop No. 1 or from E ridgeline of East Mt Barren. These plants are assumed to be *E.burdettiana* but may be *E.coronata*, or a mixture of both species (6/10/09). *E.burdettiana* were found to extend upslope as noted in comments of population 1C. As the old path to the summit originally traversed the east face of the mountain prior to 1989 fire, this population was probably initially recorded as one of the plants from population 1C. (30/10/09)
1E	2.5km N of Hammersley Drive 500m off Culham Inlet	35 (2/9/90 SDH) ? (4/10/06 SAB)	0	Not surveyed yet. (6/10/09) This population site was visited on 22/10/09, however no plants were located. The terrain was not quite right. On reading the notes on file pertaining to this population it is now assumed that this is actually population 1C and that there was a miss communication with the distances. From File Note: "Steve Hopper advised that he saw the population of *E.burdettiana* on the NE running ridge, mentioned by Nathan McQuoid (f125), on 2/9/90. It was 500m W of Culham Inlet and 2.5km N of Hammersley Dr. There were 30 mature plants and a few seedlings. Regenerating from coppice after fire, 1m tall. Quartzite. *E.burdettiana* was also seen scattered between this location and East Mt Barren. This was the most NE location of E.burdettiana that Steve saw. Brenda Moran 18/5/95". It is probably 2.5km up Hammersley Drive from Culham Inet and 500m N of Hammersley Drive making it population 1C. (30/10/09)
2	Creekline ca. 1.5km NW of East Mt Barren	100 (28/6/08 SAB)	666	Not surveyed yet (6/10/09). This population was visited 23/10/09, There were two sub-populations – 2A consists of 620 plants approximately (plants were not individually counted) in a gully 750m N of Hammersley Drive. The plants extend for 800-900m along the gully and up the SE facing slope or N side of gully. 2B consists of 46 plants on the end of a ridge S of 2A on the S & SE facing slope of this ridge. (30/10/09)
		TOTAL	1571 + 2010	

Eucalyptus coronata – cont.

Surveyed by Ellen Hickman- October 2009

Pop No.	Location	No. of plants prior 2009	No. of plants 2009 survey	Comments
1A	Both sides of Hammersley Drive at base of East Mt Barren on E side	2 (22/10/83 RLS) 1 (31/10/86 RLS) ? (5/6/91 LA) 50 (9/8/92 NMQ) 150 (9/9/92 CJR) 30 (7/5/93 NMQ) 20 (20/5/95 NMQ) 50 (21/1/96 DN) 150 (22/4/00 SAB) 2 (1A only 3/4/02 SAB) 50 (1B only 11/5/05 SAB) ? (1A only 27/2/08 SAB) 50 (1B only 27/2/08 SAB)	132 64 + 300	This population was visited 30/9/09 & 2/10/09. 123 tagged, remaining 9 marked with blue flagging tape along roadside within 25m proposed disturbance area. These plants are assumed to be potentially under threat during road works. This population is a mixture of *E.burdettiana* & *E.coronata.* Lots more plants seen and yet to be tagged. Vegetation very thick, last burnt in 1989. (6/10/09 EJH) Because the vegetation was to thick to traverse when entering from the south side of the mountain, upslope into unburnt vegetation decided to try and access it from the N side across the burnt vegetation which is not as thick. 64 plants were marked until the vegetation was again too thick to traverse. The population is again a mixture of *E.coronata* & *E.burdettiana*. The population of *E.coronata* is estimate to have an additional 300 plants. (30/10/09 EJH)
1B	Summit of East Mt Barren		222 43 + 1200	This population was visited 29/9/09. 222 were tagged. Population extends both N & S. Most plants tagged so far were burnt in recent fire and regenerating, old burnt fruits, no new buds/flowers/fruit. Some plants tagged in unburnt area to S. Vegetation very thick. (6/10/09 EJH) I had intended to assess the rest of this population to the S, to tag the plants and to see if the population continues around to the E to join up with 1A. However because other areas of unburnt vegetation were found to be too thick to traverse it was decided to abandon this plan and to assess the population to the N. On the 24/10/09 43 plants were marked, 18 were the N extension of 1B and the remaining 25 were mixed in with *E.burdettiana* population 1C. There were more seen, not marked but number are estimated at 1200. (30/10/09 EJH)
2	Eyre Range in a gully running E of Annie Peak	? (16/9/86 ES) 50 (26/9/88 AN)		Not survey yet (6/10/09 EJH)
3	Whoogarup Range	? (23/9/23 CAG) 15 (26/9/96 FO)		Not survey yet (6/10/09 EJH)
4	Mid Mt Barren	? (23/9/23 CAG) 0 (28/11/02 SAB)		Not survey yet (6/10/09 EJH)
		TOTAL	461 + 1500	

***Stylidium galioides* (DRF)**

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	Size	DigiPic
Hamersley Drive upgrade:								
33	-33.92735	120.00877	1-Oct-09	88.7	12	?burnt 2006		dscn6414
34	-33.92741	120.00874	1-Oct-09	89	60			
35	-33.92741	120.00861	1-Oct-09	88.7	7			
36	-33.92742	120.00854	1-Oct-09	87.5	4			
37	-33.92746	120.0085	1-Oct-09	86.3	7			
38	-33.9274	120.00879	1-Oct-09	87.5	16	BLUE TAPE (S limit)		
40	-33.92744	120.00855	1-Oct-09	87.5	4	BLUE TAPE (W limit)		
53	-33.92712	120.0095	1-Oct-09	88.1	11	BLUE TAPE		dscn6415-8
55	-33.92678	120.0102	1-Oct-09	92.7	24	+ BLUE TAPE (W limit)		
56	-33.9267	120.01029	1-Oct-09	92.7	2			
58	-33.92665	120.01048	1-Oct-09	96	50	BLUE TAPE (E limit)		
67	-33.92645	120.01106	1-Oct-09	98.8	5			
69	-33.92651	120.01032	1-Oct-09	93.3	20	BLUE TAPE (E limit)		
70	-33.92664	120.00997	1-Oct-09	90.5	50	BLUE TAPE (W limit)		
4	-33.9297	120.01238	12-Oct-09	90.8	17			
5	-33.9298	120.01244	12-Oct-09	89	30	+ seedlings; burnt 2006		
39	-33.92458	120.02813	16-Oct-09	94.5	10			dscn6456-7
48	-33.92603	120.02538	16-Oct-09	102.4	5	+		
49	-33.92617	120.02524	16-Oct-09	99.1	20	+		
60	-33.92807	120.02291	16-Oct-09	93.3	15			
71	-33.92884	120.02014	16-Oct-09	95.1	1			
75	-33.92894	120.01934	16-Oct-09	93.3	10			
76	-33.92901	120.01899	16-Oct-09	91.7	50	+		
78	-33.92919	120.01858	16-Oct-09	88.7	10	+		
80	-33.92937	120.01811	16-Oct-09	82.9	50	+		
85	-33.92982	120.01844	16-Oct-09	79.6	5			
86	-33.92942	120.01874	16-Oct-09	84.1	5			
95	-33.92834	120.02282	16-Oct-09	89.9	1			
111	-33.92439	120.02912	16-Oct-09	84.4	1			
					502			
East Mt Barren (WAHERB & DEFL):								
271Sg	-33.92361	120.02033	22/04/2000					
290Sg	-33.91833	120.01333	12 1971					
283Sg	-33.91833	120.01333	04 10 1966					
288Sg	-33.91833	120.01333	04 11 1967					
285Sg	-33.91833	120.01333	11 10 1974					
293Sg	-33.92666	120.01694	15 01 2002					
280Sg	-33.91833	120.01333	16 10 1961					
294Sg	-33.92013	120.03289	16 11 2003					
275Sg	-33.91833	120.01333	18 10 1964					
279Sg	-33.91666	120.01667	20 10 1987					
272Sg	-33.91833	120.01333	20 11 1989					
273Sg	-33.91833	120.01333	22 10 1961					
289Sg	-33.91833	120.01333	24 09 1967					
282Sg	-33.91833	120.01333	25 10 1964					
277Sg	-33.91666	120.01667	25 10 1982					
278Sg	-33.91833	120.01333	26 11 1931					
292Sg	-33.92736	120.02095	27 09 1997					
291Sg	-33.91833	120.01333	28 10 1963					
274Sg	-33.91833	120.01333	31 10 1962					

Stylidium galioides – cont.

		% EMB population	% all populations
Hamersley Drive upgrade	500+	<16%	unknown
1 East Mt Barren	3,000+		
2 Fortification Hill	scattered		
2 Annie Peak	common		

1 E.Hickman pers.comm.
2 Robinson & Coates 1995

Verticordia pityrhops (DRF)

Surveyed by Gillian Craig – December 2009

Species	Cons Code	Wpt	Latitude	Longitude	Date	Altitude	PlantCount
Verticordia pityrhops	R	72	-33.931126	120.01329	22 12 2009	29.6	1
Verticordia pityrhops	R	73	-33.931108	120.01344	22 12 2009	29.6	1
Verticordia pityrhops	R	74	-33.931089	120.01353	22 12 2009	29.6	1
Verticordia pityrhops	R	87	-33.930794	120.013	22 12 2009	30.5	1
Verticordia pityrhops	R	88	-33.93077	120.01306	22 12 2009	30.5	1
Verticordia pityrhops	R	89	-33.930785	120.01305	22 12 2009	30.5	1
Verticordia pityrhops	R	90	-33.93076	120.01305	22 12 2009	30.5	1
Verticordia pityrhops	R	91	-33.930789	120.01304	22 12 2009	30.5	1
Verticordia pityrhops	R	92	-33.930992	120.01293	22 12 2009	29.9	1
Verticordia pityrhops	R	93	-33.931012	120.01294	22 12 2009	29.9	1
Verticordia pityrhops	R	94	-33.931017	120.01288	22 12 2009	29.9	1
Verticordia pityrhops	R	95	-33.931044	120.01292	22 12 2009	29.9	1
Verticordia pityrhops	R	96	-33.931022	120.01284	22 12 2009	29.9	1
Verticordia pityrhops	R	98	-33.931105	120.01278	22 12 2009	29.6	1
Verticordia pityrhops	R	99	-33.931114	120.01278	22 12 2009	29.6	1
Verticordia pityrhops	R	100	-33.931103	120.01281	22 12 2009	29.9	1
Verticordia pityrhops	R	101	-33.931106	120.01281	22 12 2009	29.9	1
Verticordia pityrhops	R	104	-33.931049	120.01304	22 12 2009	29.9	1
Verticordia pityrhops	R	105	-33.931119	120.01304	22 12 2009	29.6	1
Verticordia pityrhops	R	106	-33.931146	120.01329	22 12 2009	29.6	1
Verticordia pityrhops	R	107	-33.931149	120.01329	22 12 2009	29.6	1
Verticordia pityrhops	R	108	-33.931146	120.0133	22 12 2009	29.6	1
Verticordia pityrhops	R	109	-33.930994	120.01348	22 12 2009	29.9	1
Verticordia pityrhops	R	110	-33.930993	120.01346	22 12 2009	29.9	1
Verticordia pityrhops	R	111	-33.931123	120.01333	22 12 2009	29.6	1
							38
		East Mt Barren (WAHERB & DEFL):					
Verticordia pityrhops	R	302Vp	-33.92931	120.01484	6/05/1999		
Verticordia pityrhops	R	303Vp	-33.92931	120.01484	6/05/1999		
Verticordia pityrhops	R	304Vp	-33.93083	120.01278	3/04/2002		
Verticordia pityrhops	R	305Vp	-33.91833	120.01333	23 01 1969		
Verticordia pityrhops	R	306Vp	-33.93333	120.03333	04 10 1966		
Verticordia pityrhops	R	307Vp	-33.91833	120.01333	31 01 1960		
Verticordia pityrhops	R	308Vp	-33.91833	120.01333	24 01 1969		
Verticordia pityrhops	R	309Vp	-33.91833	120.01333	31 01 1960		
Verticordia pityrhops	R	310Vp	-33.91666	120.01667	25 10 1982		
Verticordia pityrhops	R	311Vp	-33.93194	120.0125	07 09 1986		
Verticordia pityrhops	R	312Vp	-33.91833	120.01333	25 05 1968		
Verticordia pityrhops	R	313Vp	-33.91833	120.01333	24 10 1984		
Verticordia pityrhops	R	314Vp	-33.93125	120.01706	24 05 1999		
Verticordia pityrhops	R	315Vp	-33.91666	120.03333	17 03 1972		
Verticordia pityrhops	R	316Vp	-33.91833	120.01333	05 1970		
Verticordia pityrhops	R	317Vp	-33.91833	120.01333	08 04 1988		

		% EMB population	% all populations
Hamersley Road upgrade	38	2%	2%
[1] East Mt Barren	+/- 2000		

[1] DEC Albany 2009

***Verticordia pityrhops* (DRF) – cont.**

Calothamnus macrocarpus (Priority 2)

Surveyed by Gillian Craig – October 2009 to July 2010

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	Size	DigiPic
FRNP Improvement Project								
A. Mylies Creek								
11	-33.93149	119.99441	29-Sep-09	6.7	3			
12	-33.93154	119.99447	29-Sep-09	5.8	1			
13	-33.93163	119.99449	29-Sep-09	6.7	1			
14	-33.93167	119.99446	29-Sep-09	7.3	4			
20	-33.93164	119.99494	29-Sep-09	8.8	1	2 m tall		
21	-33.93175	119.99485	29-Sep-09	6.7	5			dscn6362-4
22	-33.93189	119.99491	29-Sep-09	7.6	100	+ (S of upgrade area)		
23	-33.93189	119.9953	29-Sep-09	8.5	20			
24	-33.93195	119.9954	29-Sep-09	8.8	20			
25	-33.9317	119.99543	29-Sep-09	11.9	12			
27	-33.93211	119.99585	29-Sep-09	13.7	12			
28	-33.93216	119.99598	29-Sep-09	14.9	9			
29	-33.93222	119.99607	29-Sep-09	14	12			
30	-33.93233	119.99588	29-Sep-09	10.4	10			
33	-33.93255	119.99731	29-Sep-09	21.3	1			
34	-33.93248	119.99787	29-Sep-09	15.8	5			
35	-33.93237	119.99812	29-Sep-09	13.4	5			
37	-33.93221	119.99826	29-Sep-09	19.8	6			
38	-33.93212	119.99837	29-Sep-09	17.1	30	+		
39	-33.93194	119.9985	29-Sep-09	21.9	5	E limit		
47	-33.93193	119.99828	29-Sep-09	20.4	1			
49	-33.93214	119.99754	29-Sep-09	22.9	1			
50	-33.93221	119.99743	29-Sep-09	22.9	4			
51	-33.93226	119.99716	29-Sep-09	22.3	40	dense patch		
52	-33.93232	119.99709	29-Sep-09	21	1	old road		
53	-33.9322	119.99665	29-Sep-09	18.6	20	scattered		
55	-33.93206	119.99611	29-Sep-09	17.7	4	scattered		
18	-33.93186	120.00101	10-Mar-09	12.8	30	+		
19	-33.93179	120.00111	10-Mar-09	12.2	20			
21	-33.93205	120.00108	10-Mar-09	12.5	10			
23	-33.93227	120.00138	10-Mar-09	11.3	4			
					297			
B. Wave-cut bench								
11	-33.93104	120.01294	12-Oct-09	92	5			
13	-33.93125	120.0131	12-Oct-09	94.8	3			
17	-33.93103	120.01367	12-Oct-09	92.7	2			
29	-33.9308	120.01316	12-Oct-09	97.2	4			
36	-33.92423	120.02927	16-Oct-09	86.9	5			
41	-33.92496	120.02694	16-Oct-09	87.2	2			
43	-33.9254	120.02614	16-Oct-09	96.6	1			
44	-33.92563	120.02581	16-Oct-09	99.4	5			
45	-33.92568	120.0257	16-Oct-09	100	5			
46	-33.92584	120.02555	16-Oct-09	100	1			
47	-33.92599	120.02542	16-Oct-09	98.8	3			
50	-33.92643	120.02499	16-Oct-09	99.7	3			
52	-33.92694	120.02457	16-Oct-09	101.2	3			
57	-33.92764	120.02373	16-Oct-09	96.3	2			
58	-33.92767	120.02369	16-Oct-09	91.1	1			
59	-33.92803	120.0232	16-Oct-09	86.9	10	+		
61	-33.92821	120.02257	16-Oct-09	89.3	5			
65	-33.92863	120.02131	16-Oct-09	93	4			
68	-33.9288	120.02075	16-Oct-09	94.5	2			
69	-33.92884	120.02049	16-Oct-09	97.8	3			

70	-33.92886	120.0203	16-Oct-09	96.3	2	
72	-33.92889	120.01995	16-Oct-09	93	3	
88	-33.92911	120.02006	16-Oct-09	90.8	5	
91	-33.92898	120.02074	16-Oct-09	93	2	
97	-33.9281	120.0233	16-Oct-09	87.5	5	
98	-33.92768	120.02399	16-Oct-09	93.3	2	
99	-33.9274	120.02434	16-Oct-09	96.6	3	
104	-33.9254	120.02636	16-Oct-09	94.5	2	
106	-33.9252	120.02674	16-Oct-09	96.3	3	
107	-33.92507	120.02699	16-Oct-09	95.1	10	+
110	-33.92449	120.0289	16-Oct-09	88.4	3	
114	-33.92342	120.03073	16-Oct-09	83.8	3	
9	-33.92079	120.04127	23-Oct-09	7.9	1	
11	-33.92075	120.04054	23-Oct-09	4.6	10	
23	-33.9208	120.03899	23-Oct-09	11.6	2	
26	-33.92095	120.03989	23-Oct-09	9.8	2	
29	-33.92097	120.04031	23-Oct-09	9.1	3	
31	-33.92102	120.04055	23-Oct-09	7.9	1	
34	-33.91957	120.0341	23-Oct-09	52.4	1	
62	-33.91923	120.03458	23-Oct-09	57.9	12	
76	-33.92121	120.03117	23-Oct-09	88.7	2	
80	-33.92048	120.03223	23-Oct-09	82.9	10	
					156	

B. Four Mile Beach - Culham Inlet

48	-33.92033	120.03732	23-Oct-09	25.3	1	
4	-33.92238	120.03906	22-Feb-10	11.3	20	
5	-33.92226	120.03889	22-Feb-10	10.4	10	
6	-33.92224	120.03872	22-Feb-10	9.8	1	
7	-33.92206	120.03863	22-Feb-10	11.9	3	
16	-33.92273	120.03648	22-Feb-10	4	100	+
25	-33.9235	120.03485	22-Feb-10	7	1	
26	-33.92336	120.03516	22-Feb-10	6.7	20	+
27	-33.92299	120.03511	22-Feb-10	10.1	5	scattered
29	-33.92322	120.03496	22-Feb-10	10.4	5	+
31	-33.92343	120.03474	22-Feb-10	9.1	3	
38	-33.92109	120.03928	22-Feb-10	4.6	6	+
39	-33.92152	120.03886	22-Feb-10	9.4	4	
40	-33.9216	120.03865	22-Feb-10	12.2	10	+
41	-33.92192	120.03806	22-Feb-10	11	10	+
42	-33.9218	120.03829	22-Feb-10	12.2	1	
43	-33.92179	120.03853	22-Feb-10	11.3	10	+
44	-33.92174	120.03871	22-Feb-10	12.5	10	+
45	-33.92154	120.03903	22-Feb-10	12.5	5	
46	-33.9214	120.0392	22-Feb-10	13.7	2	
47	-33.92132	120.03933	22-Feb-10	14.6	2	
48	-33.92125	120.03941	22-Feb-10	15.5	4	
49	-33.92113	120.03945	22-Feb-10	15.5	2	
53	-33.92122	120.03813	8-Jul-09	13.1	5	frequent to E
54	-33.92132	120.03804	8-Jul-09	12.2	5	
59	-33.92104	120.03836	8-Jul-09	13.4	5	frequent to E
					250	

East Mt Barren (WAHERB & DEFL):

-

64Cm	33.931759	120.01222	27/02/2008
65Cm	-33.93167	119.99556	28/09/2004
66Cm	-33.93167	119.99556	28/09/2004
67Cm	-33.91833	120.01333	25 08 1964
68Cm	-33.91805	120.04667	22 09 1970
69Cm	-33.91833	120.01333	25 08 1964
70Cm	-33.91833	120.01333	11 10 1967
71Cm	-33.91833	120.01333	04 10 1966
72Cm	-33.93333	120	09 11 1983

73Cm	-33.91833	120.01333	29 08 1962
74Cm	-33.91833	120.01333	10 01 1969
75Cm	-33.91833	120.01333	31 10 1962
76Cm	-33.91833	120.01333	
77Cm	-33.91833	120.01333	11 10 1967
78Cm	-33.925	120.025	16 09 2000
79Cm	-33.92138	120.04139	08 09 1992
80Cm	-33.91666	120.03333	19 11 1985
81Cm	-33.92319	120.03067	04 01 2001
82Cm	-33.91833	120.01333	21 04 1962
83Cm	-33.93166	119.99556	28 09 2004
84Cm	-33.92138	120.04139	08 09 1992

		% EMB population	% all populations
FRNP Improvement Project:			
A. Mylies Beach	297	unknown	unknown
B. Wave-cut bench	156	15%	unknown
C. Four Mile Beach	250	unknown	unknown
1 East Mt Barren	200+		
2 Wave-cut bench	est. 1,000		

1 Robinson & Coates 1995

2 S.Barrett DEC Albany 2008

Gonocarpus hispidus **(Priority 2)**

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
Hamersley Drive upgrade:								
71	-33.92016	120.03231	23-Oct-09	81.1	50	+ abundant	GFC 8660	dscn6557-9
East Mt Barren (WAHERB & DEFL):								
165Gh	-33.9255	120.01989	9/09/1992					
166Gh	-33.91833	120.01333	14 09 1974					
167Gh	-33.92611	120.00722	09 09 1992					

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	50	0.05	0.05
1 East Mt Barren	100,000+		

1 Robinson & Coates 1995

Hibbertia papillata (Priority 2)

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
Hamersley Drive upgrade:								
14	-33.92694	120.00157	1-Oct-09	58.5	30		GFC8614	dscn6403-6
33	-33.92735	120.00877	1-Oct-09	88.7	+			
42	-33.92703	120.00759	1-Oct-09	90.8	+			
53	-33.92712	120.0095	1-Oct-09	88.1	+			
59	-33.9267	120.01115	1-Oct-09	100.6	+			
9	-33.93071	120.01239	12-Oct-09	88.7	+			
25	-33.93064	120.01411	12-Oct-09	90.5	+			
33	-33.92338	120.03006	16-Oct-09	86.3	+			
35	-33.92415	120.0293	16-Oct-09	87.8	+			
67	-33.92877	120.02099	16-Oct-09	92.4	+		GFC8638	
83	-33.9301	120.01842	16-Oct-09	77.7	+			
109	-33.92452	120.02873	16-Oct-09	89.6	+			dscn6509
117	-33.92188	120.03108	16-Oct-09	83.8	+			
79	-33.92074	120.0317	23-Oct-09	85	2			
85	-33.93106	120.01345	23-Oct-09	92	100	+	GFC8661	
					est. 500 +			
East Mt Barren (WAHERB & DEFL):								
170Hp	-33.92706	120.01633	8/09/2001					
171Hp	-33.93333	120.03333	04 10 1966					
172Hp	-33.92861	120.0125	29 09 1999					
173Hp	-33.91666	120.01667	01 10 1970					
174Hp	-33.91666	120.01667	01 10 1970					
175Hp	-33.91666	120.01667	04 10 1966					
176Hp	-33.927189	120.01617	08 09 2001					
177Hp	-33.931864	120.01269	03 09 1986					
178Hp	-33.91833	120.01333	23 09 1986					
179Hp	-33.93333	120.05	07 10 1971					
180Hp	-33.91833	120.01333	22 09 1986					
Eyre Range:								
			2-Nov-65				AS George 7262	

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	est. 500+	unknown	unknown
East Mt Barren	not surveyed		

Leptospermum confertum **(Priority 2)**

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	Size	DigiPic
Hamersley Drive upgrade:								
47	-33.92599	120.02542	16-Oct-09	98.8	ca. 10	dense thicket	10m x 10m	dscn6467-71
East Mt Barren (WAHERB & DEFL):								
2Lepc	-33.91833	120.01333	12 1931					
3Lepc	-33.91833	120.01333	13 12 1964					
4Lepc	-33.91833	120.01333	12 1926					
5Lepc	-33.91833	120.01333	03 1966					
6Lepc	-33.91833	120.01333	31 01 1960					
7Lepc	-33.93333	120.03333	04 10 1966					
8Lepc	-33.91833	120.01333	18 10 1964					
11Lepc	-33.91833	120.01333	12 1966					
13Lepc	-33.92472	120.01889	09 08 2003					
14Lepc	-33.92291	120.02234	04 01 2001					

		% EMB population	% all populations
Hamersley Drive upgrade	10	?10%	unknown
1 East Mt Barren	+/-100		
2 Thumb Peak	500+		

1 S.Barret, DEC Albany, 2005
2 Robinson & Coates 1995

Micorcorys longiflora **(Priority 3)**

Surveyed by Gillian Craig – April to July 2010

Wpt	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
FRNP Improvement Project:								
39	-33.94339	119.9738	16-Apr-10	75	+			
35	-33.94366	119.97429	8-Jul-10	76.8	20	+		
36	-33.94376	119.97442	8-Jul-10	73.8	30	+	GFC8867	dscn7114-20
37	-33.9438	119.97479	8-Jul-10	70.7	+	few		
					50			

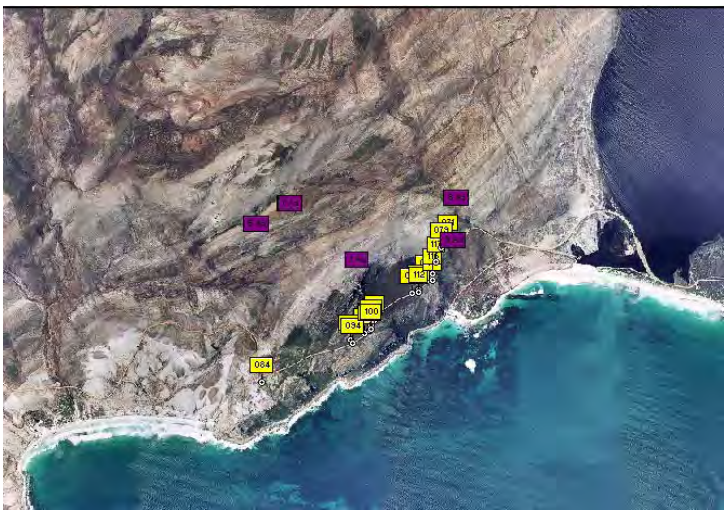
Acacia argutifolia (Priority 4)

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo
Hamersley Drive upgrade:							
32	-33.92337	120.03024	16-Oct-09	91.1	20	+	
35	-33.92415	120.0293	16-Oct-09	87.8	10		
38	-33.92443	120.02866	16-Oct-09	90.8	+	occasional	
51	-33.92659	120.02482	16-Oct-09	102.4	13	+	
53	-33.92697	120.02443	16-Oct-09	101.2	5	+ frequent	
57	-33.92764	120.02373	16-Oct-09	96.3	+	frequent	
62	-33.92821	120.02234	16-Oct-09	89.9	+	few	
94	-33.92847	120.02256	16-Oct-09	87.2	3		GFC8641
99	-33.9274	120.02434	16-Oct-09	96.6	20	+	
100	-33.9273	120.02446	16-Oct-09	95.4	+		
112	-33.92434	120.02927	16-Oct-09	84.1	+		
114	-33.92342	120.03073	16-Oct-09	83.8	+		
116	-33.92285	120.03073	16-Oct-09	81.7	+		
117	-33.92188	120.03108	16-Oct-09	83.8	+		
71	-33.92016	120.03231	23-Oct-09	81.1	2		
79	-33.92074	120.0317	23-Oct-09	85	2		
84	-33.93148	120.01341	23-Oct-09	93	1		
					84+		
East Mt Barren (WAHERB & DEFL):							
1Aa	-33.92153	120.02317	25/10/1982				
2Aa	-33.91666	120.01667	25 10 1982				
3Aa	-33.91666	120.01667	02 12 1980				
4Aa	-33.91666	120.01667	01 10 1970				
5Aa	-33.91666	120.01667	13 12 1964				
6Aa	-33.91833	120.01333	28 10 1968				
7Aa	-33.91666	120.01667	11 1931				
8Aa	-33.91666	120.03333	18 11 1985				
9Aa	-33.92013	120.03289	16 11 2003				

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	est. 100	est. <5%	est. <3%
1 East Mt Barren	2,000+		
1 FRNP	830+		
1 Kundip	3+		

1 Robinson & Coates 1995



Anthocercis fasiculata **(Priority 4)**

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
Hamersley Drive upgrade:								
6	-33.93141	119.99496	29-Sep-09	12.6	20		GFC8600	dscn6355-60
7	-33.93142	119.9951	29-Sep-09	11.3	20			
16	-33.93166	119.99464	29-Sep-09	6.1	2			
18	-33.93154	119.99472	29-Sep-09	8.8	+	W limit		
19	-33.93156	119.99484	29-Sep-09	9.8	+	E limit		
45	-33.92697	120.00646	1-Oct-09	84.7	1			
13	-33.92067	120.0401	23-Oct-09	10.1	1			
15	-33.92061	120.03979	23-Oct-09	7.3	13			
16	-33.92048	120.03958	23-Oct-09	11.9	5			
17	-33.92051	120.0393	23-Oct-09	14.3	7			
19	-33.92034	120.03876	23-Oct-09	17.4	3			
25	-33.9209	120.03957	23-Oct-09	11.9	2			
32	-33.92107	120.0407	23-Oct-09	7.6	1			
33	-33.92117	120.04071	23-Oct-09	7.6	12			
38	-33.91926	120.03498	23-Oct-09	47.9	5			
39	-33.91925	120.03508	23-Oct-09	48.8	4			
40	-33.91948	120.03553	23-Oct-09	46.6	200	+ large patch extends upslope		
55	-33.91939	120.0361	23-Oct-09	37.5	2			
59	-33.91891	120.03484	23-Oct-09	52.4	10			
65	-33.91961	120.03368	23-Oct-09	65.5	70			
66	-33.91979	120.03329	23-Oct-09	68.3	+			
67	-33.91998	120.03293	23-Oct-09	71.6	20			
81	-33.92008	120.03293	23-Oct-09	75	2			
					200			
East Mt Barren (WAHERB & DEFL):								
43Af	-33.91666	120.03333	05 08 1974					
44Af	-33.91833	120.01333	22 10 1961					
45Af	-33.91833	120.01333	25 10 1964					
46Af	-33.93305	119.98333	05 05 1991					
47Af	-33.91666	120.01667	13 04 1974					
48Af	-33.91833	120.01333	28 10 1963					
49Af	-33.91833	120.01333	26 11 1931					
50Af	-33.91833	120.01333	26 11 1931					
51Af	-33.91833	120.01333	26 11 1931					
52Af	-33.91833	120.01333	28 10 1963					
53Af	-33.925	120.05	14 09 1974					
54Af	-33.91666	120.01667	08 09 1992					

Anthocercis fasciculata

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	100	est. <2%	est. <1%
1 East Mt Barren	1,000+		
1 West Mt Barren	500+		

1 Robinson & Coates 1995

Corybas limpidus (Priority 4)

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes
Hamersley Inlet (WAHERB & DEFL):						
88 Cl	-33.95459	119.91567	09/22/2009			
89 Cl	-33.96042	119.91456	09/22/2009			
90 Cl	-33.96666	119.9	09/22/2009			

	No. of plants
1 Hamersley Inlet	-

1 Robinson & Coates 1995

Dampiera deltoidea **(Priority 4)**

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	DigiPic
Hamersley Drive upgrade:							
37	-33.91939	120.0348	23-Oct-09	56.7	25	+	dscn6547-9
41	-33.91945	120.03558	23-Oct-09	40.5	1		
54	-33.91954	120.03648	23-Oct-09	37.8	1		
71	-33.92016	120.03231	23-Oct-09	81.1	50	+	
East Mt Barren (WAHERB & DEFL):							
91Dd	-33.91986	120.03484	1/10/1998				
92Dd	-33.93333	120.03333	04 10 1966				

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	80	unknown	<0.7%
1 FRNP	6,000		
1 Bandalup Hill	6,000		

1 Cockerton and Craig 2000

***Hakea hookeriana* (Priority 4)**

Not found in 2009 surveys.

Waypoint	Latitude	Longitude	Date	Altitude
East Mt Barren (WAHERB & DEFL):				
168Hh	-33.91666	120.01667	31 01 1960	
169Hh	-33.92013	120.03289	16 11 2003	

	No. Plants	% EMB population	% all populations
Hamersley Drive upgrade	nil found	-	-
East Mt Barren	?		
1 Thumb Peak	100+		
1 Two Bump Hill	50+		

1 Robinson & Coates 1995

Jacksonia compressa (Priority 4)

Surveyed by Gillian Craig – October 2009 to July 2010

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
FRNP Improvement Project:								
9	-33.93489	119.96026	22-Sep-09	57.6	11			
10	-33.93519	119.9605	22-Sep-09	58.2	10			
12	-33.93541	119.96062	22-Sep-09	61	10			dscn6238-41
13	-33.93558	119.96038	22-Sep-09	62.2	30			
42	-33.93557	119.96094	22-Sep-09	61.9	45	50+ on E-W ridge		
43	-33.93516	119.96055	22-Sep-09	62.2	+			
44	-33.93504	119.96047	22-Sep-09	61.3	5			
42	-33.93653	119.97734	23-Sep-09	55.8	13			
43	-33.93705	119.97565	23-Sep-09	64	50	W limit		
44	-33.93709	119.97579	23-Sep-09	61.6	20	abundant on N verge		
45	-33.93665	119.97654	23-Sep-09	59.7	30			
46	-33.93672	119.97706	23-Sep-09	57.6	1			
47	-33.93593	119.97932	23-Sep-09	52.4	200			
48	-33.93576	119.97964	23-Sep-09	50	5	E limit		
52	-33.93576	119.97949	23-Sep-09	50	500			
53	-33.93655	119.97724	23-Sep-09	57.6	20			
1	-33.9026	119.9476	25-Sep-09	171	+			
10	-33.92643	120.00271	1-Oct-09	66.8	2			
11	-33.92658	120.00213	1-Oct-09	63.4	20	+		
12	-33.92668	120.00186	1-Oct-09	61.3	50			
13	-33.92682	120.00166	1-Oct-09	60.4	10	+		
15	-33.92698	120.00156	1-Oct-09	58.2	+			
18	-33.9271	120.00181	1-Oct-09	56.1	8			
19	-33.92667	120.00221	1-Oct-09	62.2	6			
20	-33.92649	120.00297	1-Oct-09	69.2	4			
22	-33.92637	120.00482	1-Oct-09	75	1			
23	-33.92688	120.00558	1-Oct-09	78.3	50			
26	-33.92724	120.00646	1-Oct-09	84.1	10			
28	-33.92715	120.00718	1-Oct-09	89.9	5			
29	-33.92715	120.0072	1-Oct-09	86	5			
30	-33.92739	120.00781	1-Oct-09	87.2	10	+		
37	-33.92746	120.0085	1-Oct-09	86.3	+			
39	-33.92745	120.00866	1-Oct-09	86.3	+			
41	-33.9272	120.00838	1-Oct-09	89.3	20	+		
43	-33.927	120.00736	1-Oct-09	89.3	+			
46	-33.92692	120.00617	1-Oct-09	82.9	+	common		
47	-33.92636	120.00497	1-Oct-09	79.9	+			
50	-33.92694	120.00878	1-Oct-09	88.4	+	frequent		
54	-33.92681	120.01008	1-Oct-09	89.9	+			
56	-33.9267	120.01029	1-Oct-09	92.7	+			
59	-33.9267	120.01115	1-Oct-09	100.6	+			
61	-33.92681	120.01149	1-Oct-09	100.3	50			
67	-33.92645	120.01106	1-Oct-09	98.8	+	E limit		
68	-33.92644	120.01069	1-Oct-09	95.4	10	+		
14	-33.93115	120.01327	12-Oct-09	95.4	3			
27	-33.93079	120.01358	12-Oct-09	92	3			
32	-33.92337	120.03024	16-Oct-09	91.1	50	+		
35	-33.92415	120.0293	16-Oct-09	87.8	+			
36	-33.92423	120.02927	16-Oct-09	86.9	+	frequent		
42	-33.92526	120.02648	16-Oct-09	94.2	+	frequent		
45	-33.92568	120.0257	16-Oct-09	100	+			
50	-33.92643	120.02499	16-Oct-09	99.7	+			
52	-33.92694	120.02457	16-Oct-09	101.2	+			
58	-33.92767	120.02369	16-Oct-09	91.1	+	occasional		

61	-33.92821	120.02257	16-Oct-09	89.3	+	
62	-33.92821	120.02234	16-Oct-09	89.9	+	
70	-33.92886	120.0203	16-Oct-09	96.3	+	frequent
72	-33.92889	120.01995	16-Oct-09	93	+	
96	-33.92821	120.02323	16-Oct-09	89.9	+	
97	-33.9281	120.0233	16-Oct-09	87.5	+	frequent
98	-33.92768	120.02399	16-Oct-09	93.3	+	
99	-33.9274	120.02434	16-Oct-09	96.6	+	
100	-33.9273	120.02446	16-Oct-09	95.4	+	
101	-33.9268	120.0248	16-Oct-09	96.3	+	
107	-33.92507	120.02699	16-Oct-09	95.1	10	+
110	-33.92449	120.0289	16-Oct-09	88.4	+	
112	-33.92434	120.02927	16-Oct-09	84.1	+	
114	-33.92342	120.03073	16-Oct-09	83.8	+	
117	-33.92188	120.03108	16-Oct-09	83.8	+	
119	-33.92153	120.0311	16-Oct-09	86.3	+	
120	-33.92123	120.03093	16-Oct-09	87.8	+	
122	-33.92216	120.03075	16-Oct-09	87.2	+	
18	-33.93732	119.94923	19-Oct-09	59.4	+	
34	-33.91957	120.0341	23-Oct-09	52.4	20	+
44	-33.91959	120.03598	23-Oct-09	38.4	5	+
45	-33.91994	120.03668	23-Oct-09	32.9	5	+
49	-33.92045	120.03804	23-Oct-09	19.2	8	
58	-33.91904	120.03484	23-Oct-09	53.3	5	
64	-33.91942	120.0338	23-Oct-09	68	+	
65	-33.91961	120.03368	23-Oct-09	65.5	+	
66	-33.91979	120.03329	23-Oct-09	68.3	+	
67	-33.91998	120.03293	23-Oct-09	71.6	+	
69	-33.92015	120.03262	23-Oct-09	76.2	+	
72	-33.92024	120.03219	23-Oct-09	85.3	+	
73	-33.92038	120.0321	23-Oct-09	79.6	+	
74	-33.92103	120.03108	23-Oct-09	87.5	+	
76	-33.92121	120.03117	23-Oct-09	88.7	+	
78	-33.92097	120.03143	23-Oct-09	87.5	+	
79	-33.92074	120.0317	23-Oct-09	85	+	
80	-33.92048	120.03223	23-Oct-09	82.9	+	
81	-33.92008	120.03293	23-Oct-09	75	+	
82	-33.91966	120.03378	23-Oct-09	66.8	+	
29	-33.93418	119.98693	10-Mar-10	11	32	
38	-33.93483	119.98936	10-Mar-10	2.4	200	s
39	-33.93474	119.98939	10-Mar-10	3	200	narrow strip to base of dune
3	-33.94923	119.98158	16-Apr-10	36.9	70	
52	-33.92919	120.01342	8-Jul-10	100.9	4	
					1876	

East Mt Barren (WAHERB & DEFL):

181Jc	-33.91666	120.01667	22 10 1985
182Jc	-33.91666	120.01667	10 01 1969
183Jc	-33.91666	120.01667	17 09 1965
184Jc	-33.91666	120.01667	01 10 1970
185Jc	-33.91666	120.01667	21 04 1962
186Jc	-33.91666	120.01667	31 01 1960
187Jc	-33.91666	120.01667	13 12 1964
188Jc	-33.93333	120.01667	02 01 1983
189Jc	-33.92472	120.01778	15 01 2002
190Jc	-33.91666	120.01667	14 07 1971
191Jc	-33.93333	120.03333	07 02 1986
192Jc	-33.91666	120.01667	25 05 1983
193Jc	-33.91055	119.9575	26 12 2006
194Jc	-33.93333	120.03333	28 11 1992
196Jc	-33.93333	120.03333	28 11 1991

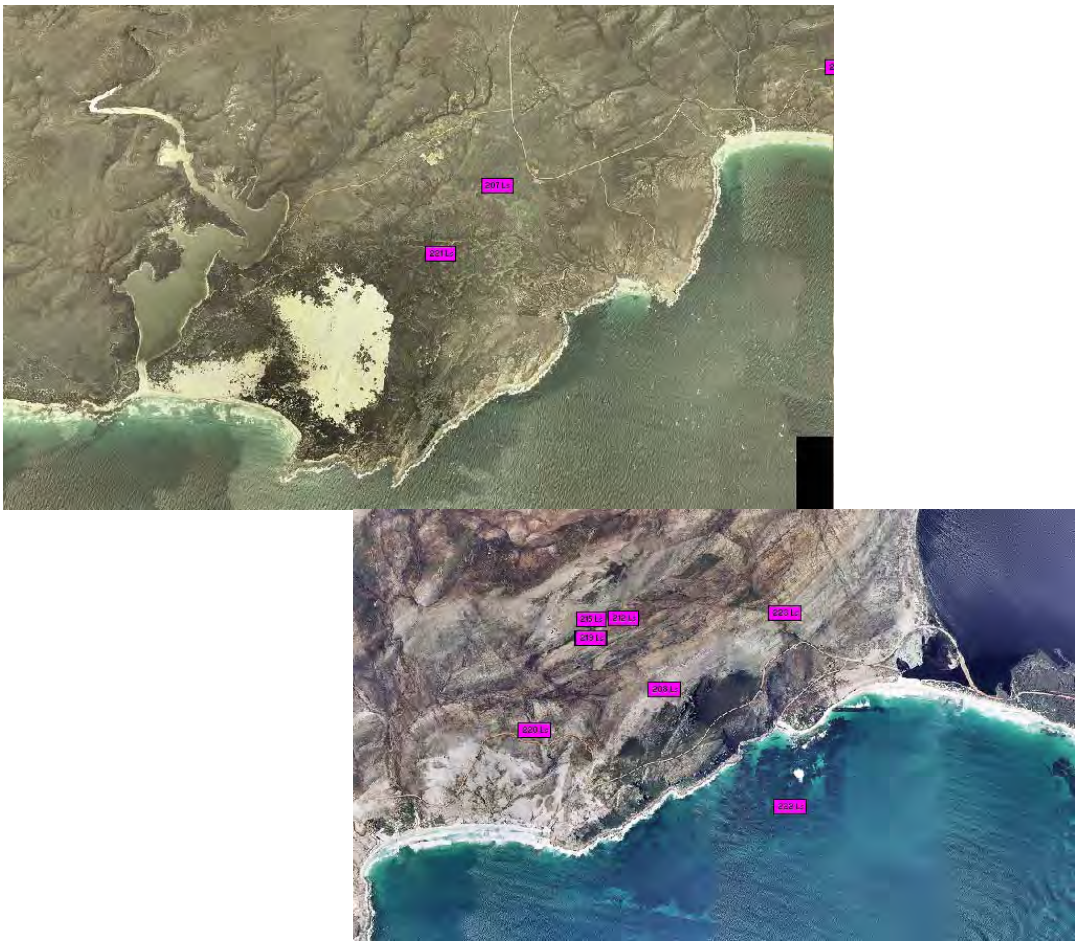
197Jc	-33.93333	119.96667	29 11 1992
199Jc	-33.93333	120	28 11 1992
200Jc	-33.93833	119.97806	19 09 2005

	No. Plants	% population
FRNP Improvement Project	1,900	est. < 2%
Hamersley Inlet to Culham Inlet	est. 10,000+	

Lechenaultia superba(Priority 4)

Not found in 2009-2010 surveys

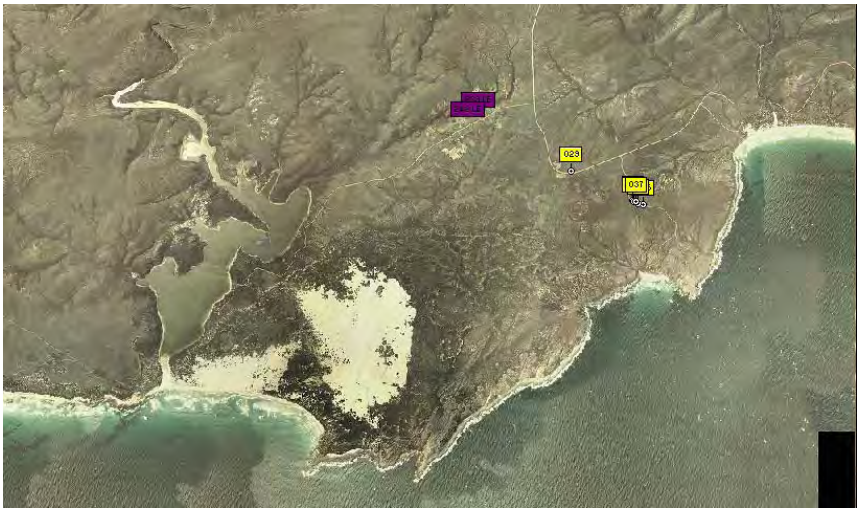
Waypoint	Latitude	Longitude	Date
East Mt Barren (WAHERB & DEFL):			
206 Ls	-33.86069	120.07983	09/22/2009
207 Ls	-33.94153	119.95789	09/22/2009
208 Ls	-33.92292	120.02067	09/22/2009
209 Ls	-33.91833	120.01333	09/22/2009
210 Ls	-33.91833	120.01333	09/22/2009
211 Ls	-33.91833	120.01333	09/22/2009
212 Ls	-33.91666	120.01667	09/22/2009
213 Ls	-33.91833	120.01333	09/22/2009
214 Ls	-33.91833	120.01333	09/22/2009
215 Ls	-33.91666	120.01333	09/22/2009
216 Ls	-33.91833	120.01333	09/22/2009
217 Ls	-33.91833	120.01333	09/22/2009
218 Ls	-33.91833	120.01333	09/22/2009
219 Ls	-33.91833	120.01333	09/22/2009
220 Ls	-33.92611	120.00722	09/22/2009
221 Ls	-33.95	119.95	09/22/2009
222 Ls	-33.93333	120.03333	09/22/2009
223 Ls	-33.91666	120.03333	09/22/2009



Leucopogon compactus (Priority 4)

Surveyed by Gillian Craig – October 2009 to July 2010

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
FRNP Improvement Project:								
29	-33.9404	119.96534	22-Sep-09	57.9	+		GFC8559-2	
36	-33.94411	119.97581	16-Apr-10	67.1	5			
37	-33.94401	119.9751	16-Apr-10	70.1	+			
35	-33.94366	119.97429	8-Jul-10	76.8	20	+		
36	-33.94376	119.97442	8-Jul-10	73.8	+			
37	-33.9438	119.97479	8-Jul-10	70.7	+			
East Mt Barren (WAHERB & DEFL):								
239Le	-33.93208	119.9515	14/07/1992					
242Le	-33.89875	119.93484	14/07/1982					
225Le	-33.91666	120.01667	03 09 1986					
226Le	-33.93333	119.95	14 07 1982					
227Le	-33.91833	120.01333	23 10 1985					
228Le	-33.91666	120.01667	03 09 1986					
229Le	-33.90833	119.93472	11 09 1986					
230Le	-33.89472	119.945	21 08 1991					
231Le	-33.9	119.93333	14 07 1982					



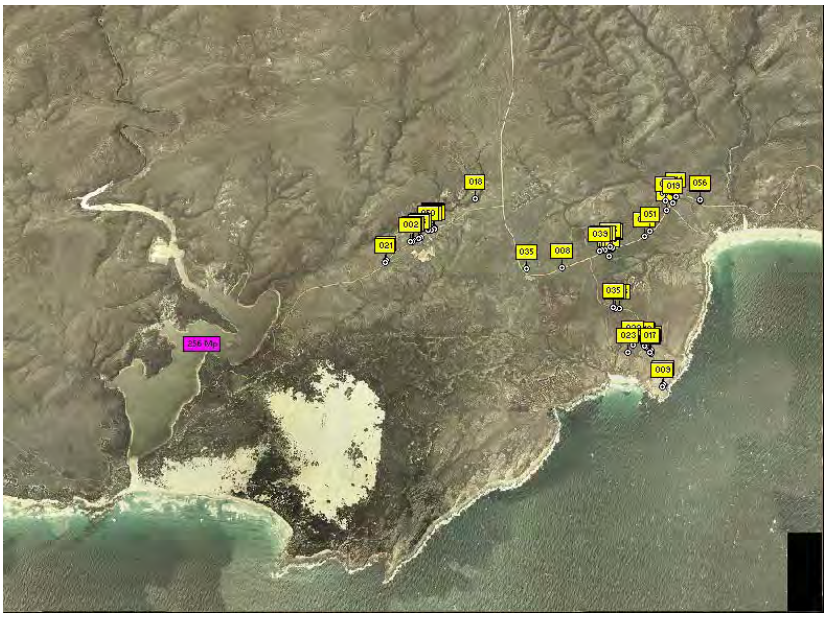
Melaleuca papillosa (Priority 4)

Surveyed by Gillian Craig – October 2009 to July 2010

Wpt	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
FRNP Improvement Project:								
35	-33.93974	119.96333	22-Sep-09	57.6	10	gravel pit regen	GFC8562	dscn6256-63
8	-33.93951	119.96844	23-Sep-09	59.7	1			
29	-33.93803	119.97523	23-Sep-09	58.2	200+	burnt 1989; nil in 2006 burn		
33	-33.93706	119.97556	23-Sep-09	63.4	2			
34	-33.93698	119.97555	23-Sep-09	62.2	2			
35	-33.93688	119.97534	23-Sep-09	61.9	1,000	+ N&S side		
37	-33.93727	119.97462	23-Sep-09	63.4	+	W limit at verge		
38	-33.93728	119.97416	23-Sep-09	64.9	+			
39	-33.93738	119.97384	23-Sep-09	65.8	+	SW limit - lge pop extends to N		
49	-33.93545	119.98023	23-Sep-09	44.5	20	unburnt		
					1,000	+ seedlings burnt 2006; extends S		
51	-33.93482	119.98101	23-Sep-09	38.1	+	extends N & E; burn mosaic		
54	-33.93221	119.98331	23-Sep-09	22.6	+	E limit on verge		
14	-33.93054	119.98457	25-Sep-09	9.1	1			
18	-33.93115	119.98309	25-Sep-09	12.2	6	patch; creekline (extends upslope to NW)		
19	-33.93136	119.9842	25-Sep-09	13.1	+			
55	-33.93093	119.98816	25-Sep-09	22.9	+	seedlings 30 cm tall		
56	-33.93084	119.98806	25-Sep-09	18	+	+		dscn6356 (N)
18	-33.93153	119.95557	20-Jan-10	54.6	30	+		
43	-33.93507	119.94971	21-Jan-10	59.1	30			
44	-33.93521	119.94982	21-Jan-10	62.5	150			
45	-33.93532	119.94974	21-Jan-10	62.5	100	+		
49	-33.93551	119.94931	21-Jan-10	62.5	1,000	breakaway/quarry		
50	-33.93541	119.94893	21-Jan-10	58.5	+			
56	-33.93642	119.94781	21-Jan-10	61	2			
58	-33.93646	119.94756	21-Jan-10	59.7	300	+		
60	-33.93681	119.9468	21-Jan-10	61.3	1,000	+		
1	-33.93689	119.94674	11-Feb-10	64.3	+			
2	-33.93694	119.94639	11-Feb-10	62.5	+			
19	-33.93925	119.94291	12-Feb-10	45.1	1			
21	-33.93947	119.94277	12-Feb-10	43.3	1			
3	-33.94923	119.98158	16-Apr-10	36.9	70			
8	-33.95331	119.9836	16-Apr-10	50.6	+			
9	-33.95357	119.98351	16-Apr-10	46.6	+			
16	-33.94952	119.98161	16-Apr-10	35.4	100	+		
17	-33.94939	119.98152	16-Apr-10	34.7	+			
18	-33.94886	119.98083	16-Apr-10	37.5	+			
19	-33.94864	119.98067	16-Apr-10	37.8	+			
22	-33.94858	119.97905	16-Apr-10	35.4	+			
23	-33.94948	119.97836	16-Apr-10	31.1	+			
33	-33.94425	119.97686	16-Apr-10	62.8	+			
34	-33.94421	119.97632	16-Apr-10	64.9	+			
35	-33.94413	119.97593	16-Apr-10	66.4	+			
					4826			
East Mt Barren (WAHERB & DEFL):								
255Mp	-33.91666	120.03333	19 11 1985					
256Mp	-33.95	119.91667	30 09 1972					

Melaleuca papillosa – cont.

	No. Plants	% FRNP population
FRNP Improvement Project	5,000+	est. <5%
FRNP	100,000+	



Pimelea physodes (Priority 4)

Surveyed by Gillian Craig – October 2009

Waypoint	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
Hamersley Drive upgrade:								
54	-33.93219	119.99658	29-Sep-09	19.5	1	old track		
57	-33.93047	119.99976	29-Sep-09	23.8	1			
58	-33.9304	119.99983	29-Sep-09	23.2	12			dscn6375-83
61	-33.92988	120.00023	29-Sep-09	31.7	1			
72	-33.92893	120.0004	29-Sep-09	36.3	3			
74	-33.92957	119.9999	29-Sep-09	32.9	3			
75	-33.92966	119.99982	29-Sep-09	32.9	6			
32	-33.92337	120.03024	16-Oct-09	91.1	1			
115	-33.9231	120.03055	16-Oct-09	71.6	2			
121	-33.92186	120.03068	16-Oct-09	89.3	+			
72	-33.92024	120.03219	23-Oct-09	85.3	3			
75	-33.92092	120.03103	23-Oct-09	88.4	5			
77	-33.9211	120.03132	23-Oct-09	87.8	+			
78	-33.92097	120.03143	23-Oct-09	87.5	+			
79	-33.92074	120.0317	23-Oct-09	85	+			
					ca. 50			
East Mt Barren (WAHERB & DEFL):								
260Pp	-33.91833	120.01333	29 08 1962					
261Pp	-33.91833	120.01333	22 10 1961					
262Pp	-33.91833	120.01333	17 09 1965					
263Pp	-33.93333	119.93333	12 09 1983					
264Pp	-33.86858	119.89684	29 05 2000					
265Pp	-33.92861	120.0125	29 09 1999					

	No. Plants	% all population
Hamersley Drive upgrade	50	est. <0.2%
FRNP	common	
Ravensthorpe Range	occasional	

Pleurophascum occidentale (Priority 4)

Wpt	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
East Mt Barren (WAHERB & DEFL):								
266 Po	-33.95125	119.98234	6/08/2001					

Lepidosperma sp. Fitzgerald River (AS George 9935) (P2 recommended)

Wpt	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
FRNP Improvement Project:								
56	-33.91902	120.03521	23-Oct-09	47.9	+	abundant in drainage line	GFC8656	

Lepidosperma sp. GFC8831 (Significant)

Wpt	Latitude	Longitude	Date	Altitude	Plant Count	Notes	CollNo	DigiPic
FRNP Improvement Project:								
13	-33.95111	119.9821	16-Apr-10	33.8	+	few	GFC8831	
1	-33.95113	119.98209	8-Jul_10	31.1	+	few	GFC8858	dscn7090-3
6	-33.95106	119.98181	8-Jul_10	36.3	+	few	GFC8860	

Appendix 5: Plant species list

List of plant taxa found between Culham Inlet and Hamersley Inlet.

Cons Code – DEC's conservation code (see Appendix 1)
* - indicates recommended by R. Barrett (2009)
Sign – significant, poorly known but not listed
GFC – noted by author during 2009 - 2010 surveys
KRN – included in releves by Ken Newbey (Chapman and Newbey 1987)
Fire – response of species to fire 'RS' = resuckering; 'OS' = obligate seeder
FLS – some plants observed flowering post- October 2006 fire
FRTS – some plants observed to have fruits post- October 2006 fire
PERTH – collections to be vouchered in the WA Herbarium.

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Aizoaceae						
	Carpobrotus rossii		1				
	Carpobrotus virescens	1	1				
	Disphyma crassifolium	1	1				
	*Mesembryanthemum crystallinum	1	1				
	Tetragonia implexicoma	1	1				
	Amaranthaceae						
	Ptilotus stirlingii var. laxus		1				
	Anarthriaceae						
	Anarthria humilis	1					
	Anarthria laevis	1	1				
	Anarthria prolifera	1	1	RS		Y	
	Anarthria scabra	1	1	RS	Y	Y	
	Lyginia barbata	1	1	RS			
	Apiaceae						
	Apium annuum		1				
	Apium prostratum		1				
	Daucus glochidiatus		1				
	Platysace compressa	1	1	RS			
	Platysace deflexa		1				
	Platysace effusa		1				
	Xanthosia huegelii	1	1	OS			
	Araliaceae						
	Hydrocotyle rugulosa		1				
	Trachymene cyanopetala		1				
	Asparagaceae						
	Laxmannia sessiliflora		1				
	Lomandra collina		1				
	Lomandra hastilis	1	1				
	Lomandra micrantha subsp. micrantha		1				
	Lomandra micrantha subsp. teretifolia		1				
	Lomandra mucronata	1					
	Lomandra nigricans		1				
	Lomandra rupestris		1				

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Thysanotus dichotomus	1	1				
	Thysanotus patersonii		1				
	Asphodelaceae						
	*Trachyandra divaricata	1					
	Asteraceae						
	Brachyscome ciliaris		1				
	Brachyscome goniocarpa		1				
	Brachyscome perpusilla		1				
	Calotis hispidula		1				
	*Conyza bonariensis		1				
	*Dittrichia graveolens		1				
	Euchiton collinus		1				
	Gnaphalium indutum		1				
	Helichrysum luteoalbum		1				
	*Hypochaeris glabra		1				
	Lagenophora huegelii		1				
	Millotia tenuifolia		1				
	Olearia axillaris	1	1				
	Olearia ciliata		1				
	Olearia dampieri subps. eremicola	1					
	Olearia revoluta		1				
	Podotheca angustifolia		1				
	Rhodanthe citrina	1	1				
	Senecio glomeratus		1				
	Senecio quadridentatus		1				
	Senecio spanomerus		1				
	*Sonchus oleraceus		1				
	Vittadinia australasica		1				
	Vittadinia cuneata		1				
	Vittadinia gracilis		1				
	Boraginaceae						
	Halgania cyanea	1		RS			GFC8579-1
	Heliotropium argyreum	1		RS		Y	
	Brassicaceae						
	*Brassica tournefortii		1				
	*Hornungia procumbens		1				
	Menkea australis		1				
	Stenopetalum lineare		1				
	Campanulaceae						
	Lobelia gibbosa		1				
	Wahlenbergia gracilenta		1				
	Caryophyllaceae						
	*Cerastium glomeratum		1				
	*Polycarpon tetraphyllum		1				
	*Silene gallica		1				
	*Stellaria media		1				
	Stellaria multiflora		1				
	Casuarinaceae						
	Allocasuarina acuaria	1	1				
	Allocasuarina corniculata	1					

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Allocasuarina humilis	1	1	RS	Y		
	Allocasuarina microstachya	1					
	Allocasuarina thuyoides	1	1				
	Allocasuarina trichodon	1	1				
	Celastraceae						
	Stackhousia monogyna	1	1	OS		Y	
	Stackhousia scoparia		1				
	Tripterococcus brunonis	1	1	RS			
	Chenopodiaceae						
	Atriplex cinerea	1	1				
	Enchylaena tomentosa	1	1				
	Rhagodia baccata	1	1				
	Rhagodia crassifolia	1	1				
	Rhagodia preissii	1	1				
	Sarcocornia blackiana	1	1				
	Sarcocornia quinqueflora	1					
	Suaeda australis	1	1				
	Tecticornia halocnemoides		1				
	Tecticornia lepidosperma		1				
	Tecticornia pergranulata		1				
	Threlkeldia diffusa	1	1				
	Crassulaceae						
	Crassula colorata var. acuminata		1				
	Crassula exserta		1				
	Cyperaceae						
	Baumea juncea	1					
	Caustis dioica	1	1	RS			
	Cyathochaeta equitans	1	1	RS			
	Ficinia nodosa	1	1				
	Gahnia ancistrophylla	1	1	RS			
	Gahnia aristata	1					
	Gahnia decomposita		1				
	Gahnia deusta	1		OS		Y	
	Gahnia lanigera	1	1	RS	Y		
	Gahnia trifida	1					
	Isolepis congrua		1				
	*Isolepis marginata		1				
	Lepidosperma carphoides	1	1	RS		Y	
	Lepidosperma resinosum		1				
	Lepidosperma sp. A2 Inland Flat (G.J. Keighery 7000)		1				
	Lepidosperma sp. Clathrate (RL Barrett & GF Craig RLB 3570)	1		RS			
	Lepidosperma sp. Dale River (R Davis 1051)	1	1				
	Lepidosperma sp. Dunns Swamp (R Davis 724)	1					
2*	Lepidosperma sp. Fitzgerald River (AS George 9935)	1					
	Lepidosperma sp. Mt Burdett (M.A. Burgman & C. Layman MAB 3287)	1	1	RS	Y	Y	
Sign	Lepidosperma sp. GFC8831	1					GFC8831

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)	1		RS			GFC8583-1
	Lepidosperma sp. U1 big heads (A.S. George 11294)	1		RS			
	Lepidosperma ustulatum	1					
	Mesomelaena stygia	1	1	RS	Y	Y	
	Mesomelaena tetragona	1	1				
	Schoenus breviculmis	1					
	Schoenus brevisetis	1	1				GFC8554-2
	Schoenus caespititius	1		RS	Y	Y	
	Schoenus curvifolius		1				
	Schoenus grandiflorus	1					
	Schoenus lanatus		1				
	Schoenus obtusifolius		1				
	Schoenus pleiostemoneus	1	1	RS			
	Schoenus subflavus	1	1				
	Schoenus sublaxus	1	1	RS			GFC8564
	Tetraria capillaris		1				
	Tetraria sp. Jarrah Forest (R. Davis 7391)	1					
	Tricostularia neesii var. elatior	1	1	RS			
	Dasypogonaceae						
	Calectasia cyanea		1				
	Dilleniaceae						
	Hibbertia cunninghamii		1				
	Hibbertia gracilipes	1	1	RS		Y	
	Hibbertia mucronata	1	1	RS			GFC8590
2	Hibbertia papillata	1	1				GFC8614
	Hibbertia pungens		1				
	Hibbertia racemosa	1	1	RS		Y	
	Hibbertia recurvifolia	1					
	Hibbertia rupicola	1		RS			
	Droseraceae						
	Drosera glanduligera		1				
	Drosera huegelii		1				
	Drosera macrantha		1				
	Drosera menziesii		1				
	Drosera paleacea subsp. trichocaulis	1	1				GFC8560
	Drosera scorpioides		1				
	Drosera zonaria		1				
	Ericaceae						
	Acrotriche cordata	1	1	RS	Y	Y	
	Acrotriche ramiflora		1				
Sign	?Acrotriche sp. Israelite Bay (M Hislop & F Hort MH2630)	1					GFC8823-1
	Andersonia parvifolia	1					
	Astroloma drummondii		1				
	Astroloma prostratum	1		OS			
	Astroloma tectum	1	1				GFC8550
	Brachyloma geissoloma subsp. collinum ms		1				
	Conostephium roei	1					

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Leucopogon assimilis		1				
	Leucopogon carinatus	1	1				GFC8551
4	Leucopogon compactus	1	1			Y	GFC8559-2
	Leucopogon conostephioides	1	1	OS		Y	GFC8596
	Leucopogon crassifolius	1	1				
	Leucopogon fimbriatus	1	1	RS			
	Leucopogon flavescens var. brevifolius	1	1				
	Leucopogon obovatus		1				
	Leucopogon revolutus	1		RS		Y	
	Leucopogon sp. Twertup (K.R. Newbey 10859)	1					
	Lissanthe pleurandroides	1					
	Lysinema ciliatum	1	1	RS		Y	
	Oligarrhena micrantha	1	1			Y	
	Sphenotoma dracophylloides	1		RS			
	Sphenotoma gracilis	1					
	Sphenotoma squarrosa	1	1				
	Styphelia melaleucoides	1					GFC8548
	Styphelia tenuiflora		1				
	Euphorbiaceae						
	Adriana quadripartita	1					
	Amperea ericoides	1					GFC8862
	*Euphorbia paralias	1	1				
	Monotaxis paxii		1				
	Stachystemon polyandrus	1	1				GFC8557
	Stachystemon virgatus		1				
	Fabaceae						
4	Acacia argutifolia	1	1				GFC8630
	Acacia biflora		1				
	Acacia cedroides	1	1				
	Acacia cochlearis	1	1	RS			
	Acacia crassiuscula	1	1				
	Acacia cyclops	1	1				
	Acacia empelioclada		1				
	Acacia glaucoptera		1				
	Acacia gonophylla	1		RS			
	Acacia harveyi		1				
	Acacia moirii subsp. dasycarpa	1	1	OS	Y		
	Acacia myrtifolia	1	1				GFC8585
	Acacia octonervia	1					
	Acacia phlebopetala	1		OS		Y	
	Acacia rostellifera	1	1	RS			
	Acacia saligna		1				
	Acacia subcaerulea	1	1	RS			
	Bossiaea dentata	1	1				
	Callistachys lanceolata	1					
	Chorizema cytisoides	1	1				
	Chorizema glycinifolium	1	1				GFC8546
	Chorizema spathulatum	1		RS			
	Chorizema trigonum	1	1				

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Chorizema uncinatum	1		OS			GFC8582
	Daviesia decurrens		1				
	Daviesia elongata		1				
	Daviesia emarginata	1		OS			
	Daviesia incrassata subsp. reversifolia	1	1	RS	Y	Y	
	Daviesia mollis	1					
	Daviesia striata	1	1				
	Dillwynia pungens	1	1				
	Eutaxia neurocalyx ms	1	1	OS			GFC8554-1
	Gastrolobium congestum	1					
	Gastrolobium spinosum		1				
	Gompholobium aristatum		1				
	Gompholobium baxteri		1				
	Gompholobium knightianum	1	1	OS		Y	
	Gompholobium polymorphum	1	1				GFC8576
	Gompholobium scabrum	1	1	OS			
	Gompholobium tomentosum	1					GFC8586
	Gompholobium venustum	1	1				
	Gompholobium viscidulum		1				
	Hovea pungens		1				
4	Jacksonia compressa	1	1	OS			
	Jacksonia furcellata	1					
	Jacksonia viscosa	1	1	RS			
	Kennedia coccinea	1					
	Kennedia nigricans	1	1	OS			
	Labichea lanceolata subsp. brevifolia	1	1				
	Pultenaea adunca		1				
	Pultenaea heterochila	1	1				
	Pultenaea neurocalyx		1				
	Pultenaea vestita		1				
	Sphaerolobium daviesioides	1	1	RS			GFC8570
	Sphaerolobium racemulosum	1	1				GFC8559-1
	Templetonia neglecta	1					
	Templetonia retusa	1	1	OS			
	Frankeniaceae						
	Frankenia tetrapetala		1				
	Geraniaceae						
	Pelargonium littorale		1				
	Goodeniaceae						
	Dampiera angulata	1					
4	Dampiera deltoidea	1					
	Dampiera fasciculata	1		RS			
	Dampiera juncea	1	1	RS			GFC8549
	Dampiera lavandulacea		1				
	Dampiera loranthifolia	1	1	OS		Y	
	Goodenia coerulea	1					
	Goodenia concinna		1				
	Goodenia scapigera	1	1	OS/RS		Y	
	Lechenaultia formosa	1					
	Lechenaultia heteromera	1	1	RS	Y	Y	

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Lechenaultia superba		1				
	Scaevola aemula	1					GFC8589
	Scaevola crassifolia	1	1				
	Scaevola thesioides subsp. filifolia	1					GFC8584
	Velleia trinervis	1	1				
	Gyrostemonaceae						
	Gyrostemon sheathii		1				
	Gyrostemon subnudus	1		OS			GFC8581
	Haemodoraceae						
	Anigozanthos humilis		1				
	Conostylis bealiana		1				
	Conostylis seorsiflora		1				
	Conostylis vaginata	1	1	RS			
	Haloragaceae						
	Glischrocaryon angustifolium		1				
	Glischrocaryon aureum	1		OS			
2	Gonocarpus hispidus	1					
	Gonocarpus nodulosus		1				
	Hemerocallidaceae						
	Agrostocrinum scabrum	1	1				
	Caesia micrantha		1				
	Corynotheca micrantha	1	1				
	Dianella revoluta		1				
	Johnsonia acaulis	1	1			Y	
	Tricoryne elatior		1				
	Iridaceae						
	Patersonia lanata	1	1	RS	Y	Y	
	Patersonia occidentalis	1	1	RS			
	Patersonia umbrosa		1				
	Juncaginaceae						
	Triglochin calcitrapa		1				
	Lamiaceae						
	Microcorys barbata		1				
	Microcorys glabra	1					
3	Microcorys longiflora	1	1				GFC8838
	Microcorys virgata		1				
	Pityrodia exserta	1	1				
	Lauraceae						
	Cassytha glabella	1	1				
	Cassytha melantha		1				
	Cassytha micrantha		1				
	Cassytha racemosa		1				
	Loganiaceae						
	Logania buxifolia	1	1	OS/RS	Y		
	Logania micrantha	1	1	RS			
	Logania serpyllifolia	1					
	Loranthaceae						
	Nuytsia floribunda	1	1	RS			
	Malvaceae						
	Alyogyne hakeifolia		1				

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Alyogyne wrayae ms	1	1	OS			GFC8583-2
	Guichenotia ledifolia	1	1				
	Lasiopetalum compactum	1	1	OS			
	Lasiopetalum discolor		1				
	Lasiopetalum quinquenervium	1	1				GFC8605
	Lysiosepalum involucratum		1				
	Thomasia angustifolia		1				
	Menyanthaceae						
	Villarsia parnassiifolia	1					
	Myrtaceae						
	Agonis baxteri	1	1	RS	Y	Y	
	Astartea ambigua		1				
	Astartea fascicularis		1				
	Astartea sp. Hopetoun area (A.S. George 10594)	1					
	Baeckea corynophylla		1				
	Baeckea ovalifolia	1	1				
	Beaufortia anisandra	1	1				
	Beaufortia micrantha	1	1				
	Beaufortia schaueri	1	1				
	Calothamnus gracilis	1	1	RS			
2	Calothamnus macrocarpus	1	1	RS	Y	Y	
	Calothamnus pinifolius	1	1	OS			
	Calothamnus quadrifidus	1	1	OS			
	Calothamnus validus	1	1	OS			GFC8598
	Calothamnus villosus		1				
	Calytrix leschenaultii	1		OS			
	Calytrix simplex		1				
	Calytrix grandiflora subsp. wheatbelt	1					GFC8706
	Chamelaucium axillare	1					
	Chamelaucium ciliatum		1				
	Chamelaucium megalopetalum		1				
	Conothamnus aureus	1	1	RS	Y		
	Darwinia diosmoides	1	1				
	Darwinia sp. Ravensthorpe (G.J. Keighery 8030)	1	1				
	Darwinia vestita	1	1				
	Eucalyptus angulosa	1	1	RS			
	Eucalyptus astringens		1				
R	Eucalyptus burdettiana	1	1				
	Eucalyptus conglobata subsp. perata	1	1				
R	Eucalyptus coronata	1	1				
	Eucalyptus decurva	1	1				
	Eucalyptus falcata	1	1	RS	Y		
	Eucalyptus gardneri		1				
	Eucalyptus leptocalyx	1					
	Eucalyptus occidentalis	1	1	RS			
	Eucalyptus phenax		1				
	Eucalyptus pleurocarpa	1	1	RS			
	Eucalyptus preissiana	1	1	RS			

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Eucalyptus redunca		1				
	Eucalyptus tetraptera	1					
	Eucalyptus uncinata	1	1				
	Eucalyptus utilis	1	1				
	Hypocalymma strictum	1	1				
R	Kunzea similis	1					
2	Leptospermum confertum	1	1				
	Leptospermum oligandrum	1	1				
	Leptospermum sp. Bandalup Hill (G. Cockerton 11001)	1		RS			
	Leptospermum spinescens	1	1	RS	Y	Y	
	Melaleuca brevifolia		1				
	Melaleuca citrina	1	1				
	Melaleuca cuticularis	1	1				
	Melaleuca lanceolata	1	1				
	Melaleuca nesophila	1	1	OS			
4	Melaleuca papillosa	1	1	OS			GFC8562
	Melaleuca pauperiflora		1				
	Melaleuca pentagona	1	1	OS			GFC8592
	Melaleuca pulchella	1	1	RS	Y		
	Melaleuca rigidifolia	1					
	Melaleuca striata	1	1	RS	Y	Y	
	Melaleuca suberosa	1	1	RS		Y	
	Melaleuca subtrigona	1	1	RS	Y	Y	
	Melaleuca thymoides		1				
	Regelia velutina	1	1				
	Taxandria conspicua subsp. abrupta	1	1				
	Taxandria spathulata	1	1	RS		Y	
	Verticordia densiflora		1				
	Verticordia pholidophylla		1				
R	Verticordia pityrhops	1					
	Verticordia tumida subsp. therogana	1					
	Olacaceae						
	Olax benthamiana	1	1				
	Olax phyllanthi		1				
	Orchidaceae						
	Caladenia brownii		1				
	Caladenia denticulata		1				
	Caladenia graminifolia		1				
	Caladenia longicauda		1				
	Caladenia longifimbriata		1				
	Caladenia microchila		1				
	Caladenia roei		1				
	Corunastylis tepperi		1				
	Cyanicula aperta		1				
	Cyrtostylis robusta		1				
	Diuris longifolia		1				
	Elythranthera brunonis		1				
	Ericksonella saccharata		1				
	Eriochilus dilatatus		1				

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Glycorchis saccharata		1				
	Leporella fimbriata		1				
	Microtis media		1				
	Paracaleana nigrita		1				
	Prasophyllum gibbosum		1				
	Prasophyllum parvifolium		1				
	Pterostylis barbata		1				
	Pterostylis mutica		1				
	Pterostylis plumosa		1				
	Pterostylis pyramidalis		1				
	Pterostylis recurva		1				
	Pterostylis spathulata		1				
	Pterostylis vittata		1				
	Pyrorchis nigricans		1				
	Thelymitra campanulata		1				
	Thelymitra fuscolutea		1				
	Thelymitra macrophylla		1				
	Oxalidaceae						
	*Oxalis corniculata		1				
	Phyllanthaceae						
	Phyllanthus calycinus	1	1	RS		Y	
	Phyllanthus scaber		1				
	Pittosporaceae						
	Billardiera coriacea	1	1				
	Billardiera fusiformis	1	1				
	Billardiera speciosa		1				
	Billardiera venusta		1				
	Plantaginaceae						
	Plantago debilis		1				
	Plantago hispida		1				
	Poaceae						
	*Aira cupaniana		1				
	Amphipogon amphipogonoides	1		RS			
	Amphipogon turbinatus	1	1	RS		Y	
	Austrodanthonia caespitosa		1				
	Austrostipa elegantissima		1				
	Austrostipa mollis		1				
	Austrostipa puberula		1				
	*Avena barbata		1				
	*Ehrharta brevifolia		1				
	*Ehrharta longiflora	1	1				
	Neurachne alopecuroidea	1	1	RS			
	*Poa annua		1				
	*Poa bulbosa		1				
	Poa poiformis		1				
	Spinifex hirsutus	1	1				
	Sporobolus virginicus		1				
	*Vulpia myuros		1				
	Polygalaceae						
	Comesperma flavum	1					

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Comesperma polygaloides		1				
	Comesperma spinosum		1				
	Polygonaceae						
	Muehlenbeckia adpressa	1	1				
	Portulacaceae						
	Calandrinia calyptrata		1				
	Calandrinia granulifera		1				
	Primulaceae						
	*Anagallis arvensis		1				
	Samolus repens		1				
	Proteaceae						
	Adenanthos cuneatus	1	1	RS			
R	Adenanthos ellipticus	1	1				
	Adenanthos labillardierei	1					
	Adenanthos oreophilus	1	1				
	Adenanthos venosus	1	1	RS		Y	
	Banksia baueri	1	1	OS			
	Banksia baxteri	1	1	OS			
	Banksia coccinea	1	1				
	Banksia lemanniana	1	1	OS			
	Banksia media	1	1	OS			
	Banksia nutans	1	1				
	Banksia oreophila	1	1	OS			
	Banksia pulchella	1					
	Banksia repens	1	1	RS	2%		
	Banksia speciosa	1	1	OS			
	Banksia violacea	1	1	OS	Y	Y	
	Conospermum distichum	1		RS		Y	
	Conospermum floribundum	1	1	RS			
	Conospermum teretifolium	1	1	RS		Y	
	Dryandra cuneata	1	1	OS	Y	Y	
	Dryandra falcata	1	1	OS			
	Dryandra nivea	1	1	OS			
	Dryandra obtusa	1	1	RS	10%	Y	
	Dryandra plumosa	1	1	OS			
	Dryandra quercifolia	1	1	OS			
	Dryandra tenuifolia	1					GFC8678
	Franklandia fucifolia	1	1				
	Grevillea coccinea	1	1	OS/RS		Y	
	Grevillea nudiflora	1	1	OS/RS	Y	Y	
	Grevillea tripartita	1	1	OS			
2	Hakea acuminata		1				
	Hakea corymbosa	1	1				
	Hakea denticulata	1					
	Hakea ferruginea	1	1				GFC8547
	Hakea florida	1	1				
	Hakea laurina	1	1				
	Hakea nitida	1	1				
	Hakea obtusa	1	1				
	Hakea pandanicarpa subsp. crassifolia	1	1	OS			

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Hakea prostrata	1	1	RS			
	Hakea trifurcata	1	1				
	Hakea varia		1				
	Hakea verrucosa		1				
	Hakea victoria	1	1	OS			GFC8599
	Isopogon formosus	1	1	RS			
	Isopogon polycephalus	1	1	RS		Y	
	Isopogon sp. Fitzgerald River (D.B. Foreman 813)	1		OS			
	Isopogon teretifolius		1				
	Isopogon trilobus	1	1	OS			
	Lambertia inermis	1					
	Persoonia striata	1	1	RS			
	Persoonia teretifolia	1	1	OS			
	Petrophile divaricata		1				
	Petrophile fastigiata	1					
	Petrophile phylicoides	1	1				
	Petrophile seminuda	1	1	RS		Y	
	Petrophile squamata subsp. northern (J. Monks 40)	1	1				GFC8561
	Petrophile teretifolia	1	1	OS			
	Stirlingia anethifolia	1	1	RS	Y		
	Synaphea favosa		1				
	Synaphea oligantha		1				
	Synaphea petiolaris	1		OS			
	Synaphea spinulosa	1		OS/RS			
	Pteridaceae						
	Cheilanthes austrotenuifolia		1				
	Ranunculaceae						
	Clematis pubescens	1	1				
	Ranunculus sessiliflorus		1				
	Restionaceae						
	Anarthria humilis	1					
	Anarthria laevis	1	1				
	Anarthria prolifera	1	1				GFC8563
	Anarthria scabra	1	1				
	Chordifex crispatus	1	1				
	Chordifex sphacelatus	1		RS	Y	Y	
	Desmocladus fasciculatus	1		RS			
	Desmocladus flexuosus	1	1	RS			GFC8566
	Harperia lateriflora		1				
	Hypolaena exsulca	1	1				
	Hypolaena fastigiata		1				
	Lepidobolus chaetocephalus	1	1				
	Loxocarya cinerea		1				
	Lyginia barbata	1					
	Rhamnaceae						
	Cryptandra myriantha	1					GFC8587
	Cryptandra pungens		1				
	Pomaderris myrtilloides	1	1	OS		Y	

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Spyridium globulosum	1	1				
	Spyridium majoranifolium		1				
	Stenanthemum intricatum	1					
	Stenanthemum tridentatum	1					
	Trymalium elachophyllum		1				
	Rubiaceae						
	*Galium murale		1				
	Opercularia hispidula		1				
	Opercularia spermacocea	1	1	OS			
	Opercularia vaginata	1	1				
	Rutaceae						
	Boronia albiflora	1	1				
	Boronia crassifolia	1	1	RS	Y		
	Boronia crenulata		1				
	Boronia ramosa subsp. anethifolia	1					
	Boronia spathulata	1	1				GFC8553-2
	Boronia tetrandra	1	1				
	Rhadinothamnus rudis	1	1				
	Santalaceae						
	Choretrum glomeratum		1				
	Exocarpos sparteus	1	1				
	Leptomeria axillaris	1					
	Leptomeria pauciflora		1				
	Santalum murrayanum		1				
	Sapindaceae						
	Dodonaea amblyophylla	1	1				
	Dodonaea bursariifolia	1					
	Dodonaea ceratocarpa		1				
	Dodonaea trifida		1				
	Scrophulariaceae						
	Myoporum tetrandrum	1	1	RS			
	Solanaceae						
4	Anthocercis fasciculata	1					GFC8600
	Anthocercis littorea	1	1				
	Nicotiana rotundifolia		1				
	Solanum capsiciforme		1				
	*Solanum nigrum	1	1				
	Stylidiaceae						
	Levenhookia stipitata		1				
	Stylidium albomontis	1	1	OS/RS			GFC8597
	Stylidium breviscapum	1					GFC8588
	Stylidium falcatum		1				
R	Stylidium galioides	1	1				
	Stylidium piliferum		1				
	Stylidium schoenoides	1	1	RS			
	Stylidium spinulosum		1				
	Thymelaeaceae						
	Pimelea angustifolia		1				
	Pimelea argentea		1				
	Pimelea brevifolia		1				

Cons Code		GFC	KRN	FIRE	FLS	FRTS	PERTH
	Pimelea drummondii	1					GFC8591
	Pimelea erecta	1					
	Pimelea ferruginea	1					
	Pimelea lehmanniana	1					GFC8555
4	Pimelea physodes	1	1				
	Pimelea spectabilis	1	1				
	Urticaceae						
	Parietaria debilis		1				
	Xanthorrhoeaceae						
	Xanthorrhoea platyphylla	1	1	RS			
	Zygophyllaceae						
	Zygophyllum billardierei		1				
	Zygophyllum glaucum		1				
	Zygophyllum simile		1				
	TOTAL	340	466				

Appendix 6: Location of relevés and monitoring quadrats

Appendix 6.1 Location of author's releves and Ken Newbey vegetation sites (Chapman and Newbey 1987) included in the PRIMER analysis.

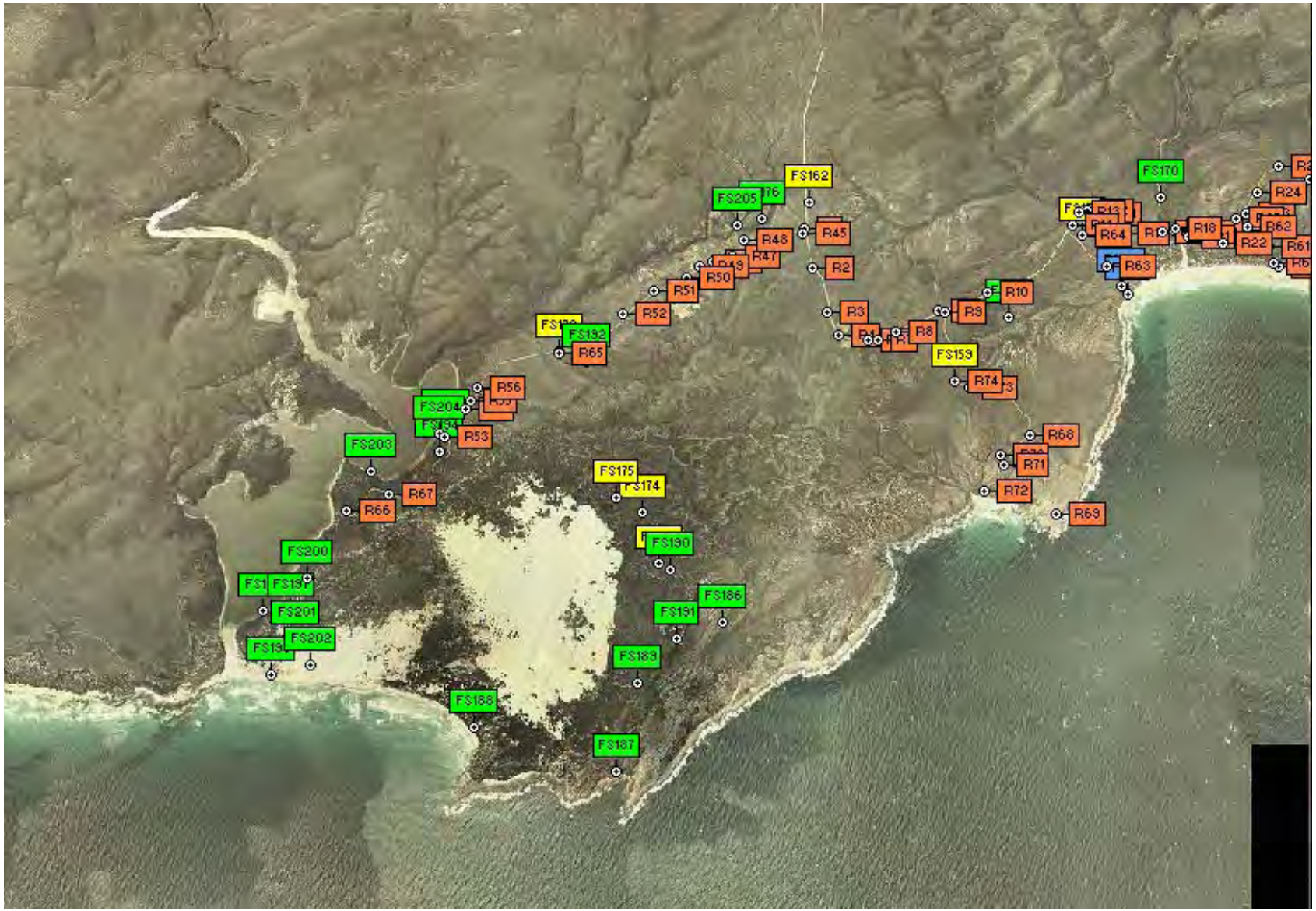
GFC RELEVE	KRN SITE	VEG UNIT	GDA94 Latitude	Longitude	DATE	PHOTO NO	DIRECTION	Report photo
near FS196		Mcut			8/04/2010	6940	N	1
R1		Dque	-33.93216	119.95931	22/09/2009	6224	NE	
R1		Dque	-33.93216	119.95931	22/09/2009	6225	NE	
R2		Eple/Brep	-33.93517	119.96021	22/09/2009	6236	S	
R2		Eple/Brep	-33.93517	119.96021	22/09/2009	6237	S	
R3		Eple/Brep	-33.93859	119.96173	22/09/2009	6242	N	
R3		Eple/Brep	-33.93859	119.96173	22/09/2009	6243	S	
R4		Eang/Efal	-33.94035	119.96289	22/09/2009	6249	SW	
R5		Dque	-33.94063	119.96561	22/09/2009	6253	SE	
R6		Dque	-33.93823	119.97194	23/09/2009	6266	N	
R7		Eang/Efal	-33.94061	119.96643	23/09/2009	6281	SE	
R8		Mpul	-33.93988	119.9682	23/09/2009	6288	E	1
R9		Dque	-33.93828	119.97257	23/09/2009	6290	W	1
R9		Dque	-33.93828	119.97257	23/09/2009	6289	SW	
R10		Dque	-33.93665	119.97654	23/09/2009	6316	E	
R11		Eple/Brep	-33.93042	119.9866	25/09/2009	6320	E	
R11		Eple/Brep	-33.93042	119.9866	25/09/2009	6321	E	
R12		Eple/Brep	-33.93021	119.98546	25/09/2009	6329	W	
R13		Eocc	-33.93033	119.98482	25/09/2009	6330	W	1
R14		Eple/Brep	-33.93136	119.9842	25/09/2009	6334	SSW	
R14		Eple/Brep	-33.93136	119.9842	25/09/2009	6335	SSW	
R15		Eple/Brep	-33.93181	119.98904	25/09/2009	6339	E	
R16		Eple/Brep	-33.93157	119.99257	25/09/2009	6344	W	
R17		Eocc	-33.93151	119.99359	25/09/2009	6345	SE	
R18		Eocc	-33.93141	119.99367	25/09/2009	6346	S	
R18		Eocc	-33.93141	119.99367	25/09/2009	6347	E	
R18		Eocc	-33.93141	119.99367	25/09/2009	6348	N	
R19		Eple/Brep	-33.93192	119.99605	29/09/2009	6352	NE	
R20		Dque	-33.93155	119.99535	29/09/2009	6353	W	
R20		Dque	-33.93155	119.99535	29/09/2009	6354	NW	
R21		Eang/Cmac	-33.93189	119.99491	29/09/2009	6365	E	
R21		Eang/Cmac	-33.93189	119.99491	29/09/2009	6366	NE	
R22		Eang/Cmac	-33.93237	119.99812	29/09/2009	6369	SE	1
R22		Eang/Cmac	-33.93237	119.99812	29/09/2009	6370	SE	
R23		Eple/Brep	-33.93003	120.00015	29/09/2009	6384	S	
R24		Bbax	-33.92836	120.00121	29/09/2009	6389	NE	
R25		Eple/Brep	-33.93047	119.99924	29/09/2009	6400	E	
R26		Dque	-33.9263	120.00306	1/10/2009	6401	W	
R26		Dque	-33.9263	120.00306	1/10/2009	6402	NE	
R27		Adven	-33.92728	120.00604	1/10/2009	6407	E	
R28		Adven	-33.9267	120.01115	1/10/2009	6419	SW	
R29		Dque	-33.92802	120.01257	1/10/2009	6424	S	
R30		Bspe	-33.93025	120.01225	12/10/2009	6429	S	
R31		Bspe	-33.93066	120.0152	12/10/2009	6446	E	1
R31		Bspe	-33.93066	120.0152	12/10/2009	6447	SE	
R32		Adven	-33.92338	120.03006	16/10/2009	6451	SW	
R33		Adven	-33.92415	120.0293	16/10/2009	6452	SW	
R34		Adven	-33.92568	120.0257	16/10/2009	6463	SW	
R34		Adven	-33.92568	120.0257	16/10/2009	6464	SW	
R34		Adven	-33.92568	120.0257	16/10/2009	6465	SW	

GFC RELEVE	KRN SITE	VEG UNIT	GDA94 Latitude	Longitude	DATE	PHOTO NO	DIRECTION	Report photo
R34		Adven	-33.92568	120.0257	16/10/2009	6466	SW	
R35		Adven	-33.92714	120.02425	16/10/2009	6479	NE	1
R35		Adven	-33.92714	120.02425	16/10/2009	6478	SW	
R36		Bspe	-33.9287	120.0211	16/10/2009	6484	W	
R37		Adven	-33.92886	120.01961	16/10/2009	6485	W	
R38		Adven	-33.92821	120.02323	16/10/2009	6500	SE	
R39		Adven	-33.92188	120.03108	16/10/2009	6515	E	
R40		Eang/Cmac	-33.92085	120.04204	23/10/2009	6536	NW	
R41		Eang/Cmac	-33.92037	120.03884	23/10/2009	6546	NW	
R42		Dque	-33.91953	120.0358	23/10/2009	6554	S	
R43		Dque	-33.92009	120.03768	23/10/2009	6555	NW	
R44		Adven	-33.92016	120.03231	23/10/2009	6556	NE	
R45		Dque	-33.93258	119.95918	20/01/2010	6683		
R46		Epre/Dque	-33.93488	119.95101	21/01/2010	6704	W	1
R47		Bbax	-33.93449	119.95276	21/01/2010	6714	SW	1
R47		Bbax	-33.93449	119.95276	21/01/2010	6713	SW	
R48		Bbax	-33.93324	119.95374	21/01/2010	6715	SW	
R49		Epre/Dque	-33.93532	119.94974	21/01/2010	6716		
R50		Bbax	-33.9362	119.94863	21/01/2010	6721	E	
R51		Epre/Dque	-33.93728	119.94566	11/02/2010	6741	W	
R52		Eple/Brep	-33.9391	119.94288	12/02/2010	6748	NW	
R53		Euti	-33.94902	119.92659	12/02/2010	6754	N	1
R54		Eang/Efal	-33.94686	119.92858	12/02/2010	6755	NW	
R55		Eple/Brep	-33.94617	119.92894	12/02/2010	6756	E	
R55		Eple/Brep	-33.94617	119.92894	12/02/2010	6757	ESE	
R56		Eang/Efal	-33.94508	119.92959	12/02/2010	6762	NW	1
R57		Eang/Cmac	-33.92206	120.03863	22/02/2010	6774	ESE	
R58		Eang/Efal	-33.92414	120.03431	22/02/2010	6778	SW	
R59		Mlan	-33.93404	120.00339	10/03/2010	6834	E	
R60		Mlan	-33.93371	120.00292	10/03/2010	6835	W	
R61		Eang/Efal	-33.93253	120.00238	10/03/2010	6836	E	
R62		Eple/Brep	-33.931	120.00035	10/03/2010	6837	E	
R63		Eple/Brep	-33.93441	119.9875	10/03/2010	6838	N	
R64	FS158/CN40A	Eple/Brep	-33.93212	119.98507	10/03/2010	6839	S	1
R65	FS172/CN47A	Eple/Brep	-33.94228	119.93703	8/04/2010	6933	W	1
R65	FS172/CN47A	Eple/Brep	-33.94228	119.93703	8/04/2010	6930	E	
R65	FS172/CN47A	Eple/Brep	-33.94228	119.93703	8/04/2010	6931	N	
R65	FS172/CN47A	Eple/Brep	-33.94228	119.93703	8/04/2010	6932	W	
R65	FS172/CN47A	Eple/Brep	-33.94228	119.93703	8/04/2010	6934	S	
R66		Euti	-33.95492	119.91775	8/04/2010	6952	E	
R67		Euti	-33.95349	119.92165	8/04/2010	6957		
R68		Eple/Brep	-33.94753	119.98077	16/04/2010	6975	SE	
R69		Mpap	-33.95357	119.98351	16/04/2010	6980	SW	1
R69		Mpap	-33.95357	119.98351	16/04/2010	6979	W	
R70		Mpap	-33.94916	119.97812	16/04/2010	6991	NE	
R71		Eang/Efal	-33.94983	119.9785	16/04/2010	6992	SW	
R72		Mlan	-33.95201	119.97675	16/04/2010	6994	E	1
R72		Mlan	-33.95201	119.97675	16/04/2010	6993	E	
R73		Dque	-33.94401	119.9751	16/04/2010	7000	SW	
R74	FS159/CN44A	Dque	-33.94354	119.97372	16/04/2010	7002	S	1
	FS158		-33.9321	119.9851				
	FS159		-33.94352	119.97375				
	FS160		-33.935935	119.9889				
	FS161		-33.936491	119.98951				
	FS162		-33.93018	119.95969				
	FS163		-33.922161	120.05061				
	FS164		-33.922151	120.05007				
	FS165		-33.92453	120.0352				

GFC RELEVE	KRN SITE	VEG UNIT	GDA94 Latitude	Longitude	DATE	PHOTO NO	DIRECTION	Report photo
	FS166		-33.92264	120.03707				
	FS167		-33.923195	120.04763				
	FS168		-33.924307	120.02957				
	FS169		-33.929307	120.01874				
	FS170		-33.929029	119.99235				
	FS171		-33.932973	120.01233				
	FS172		-33.94221	119.93694				
	FS173		-33.958197	119.94679				
	FS174		-33.954308	119.94513				
	FS175		-33.9533	119.94267				
	FS176		-33.93153	119.9554				
	FS177		-33.899308	119.92513				
	FS178		-33.879308	119.91401				
	FS179		-33.910141	119.93763				
	FS180		-33.911252	119.93874				
	FS181		-33.906808	119.93652				
	FS182		-33.898752	119.92152				
	FS185		-33.938474	119.97846				
	FS186		-33.962641	119.9529				
	FS187		-33.974308	119.94346				
	FS188		-33.971253	119.93013				
	FS189		-33.967534	119.94515				
	FS190		-33.958752	119.9479				
	FS191		-33.96403	119.94874				
	FS192		-33.942919	119.93957				
	FS193		-33.948197	119.92679				
	FS194		-33.950141	119.92624				
	FS195		-33.92444	120.02194				
	FS196		-33.962797	119.91033				
	FS197		-33.962642	119.91291				
	FS198		-33.967642	119.91124				
	FS200		-33.960142	119.91429				
	FS201		-33.964864	119.91346				
	FS202		-33.966808	119.91485				
	FS203		-33.951793	119.91991				
	FS204		-33.948753	119.92624				
	FS205		-33.932085	119.95318				
	FS238		-33.786441	119.95476				
	FS239		-33.785511	119.9558				
	FS240		-33.785821	119.94286				
	FS245		-33.848083	119.82506				
	FS255		-33.878302	119.88226				
	FS256		-33.885873	119.86685				
	FS257		-33.887263	119.86528				
	FS258		-33.85061	119.91478				
	FS259		-33.84576	119.91588				
	FS260		-33.823121	119.92847				
	FS261		-33.824041	119.92797				
	FS262		-33.830511	119.92117				
	FS263		-33.735871	119.86292				
	FS264		-33.737591	119.86622				

Appendix 6.2 GPS locations of Chapman and Newbey (1995) permanent monitoring quadrats between Culham Inlet and Hamersely Inlet, and Moir Track.

SITE NO.	ZONE	EASTING	NORTHING	(GDA94 datum)	
40 A	50H	775941	6241362	burnt Dec 89, Sept 06	Mylies Beach
43A (2)	50H	225919	6242252	burnt Dec 89, Sept 06	Four Mile Beach
44A	50H	774850	6240122	burnt Dec 89	West Beach Rd
47A	50H	771449	6240365	burnt Dec 89	Hamersley Inlet Rd
46B	50H	773590	6241635	?burnt Dec 89	Hamersley Drive
62B	50H	769688	6250585	burnt Dec 89	Moir Track- east side
63B	50H	769804	6251120	burnt Dec 89	Moir Track - east side


FS162
FS205
FS170
R45
R48
R2
R51
R50
R52
R10
R3
R8
FS153
R74
R65
FS192
R56
FS204
R53
FS203
R68
R71
R72
R63
R67
R66
FS175
FS174
FS190
FS200
FS201
FS202
FS186
FS191
FS189
FS188
FS187
R64
R18
R22
R62
R24
R63

Location of relevés: Hamersley Inlet to Mylies Beach

Location of relevés: Mylies Beach to Culham Inlet

Appendix 6.3 Two-way table of relevé data used for PRIMER® analysis

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
*Euphorbia paralias													1			**1**
Acacia argutifolia		6														**6**
Acacia cedroides		2														**2**
Acacia cochlearis	2	1				4	1		3		1					**12**
Acacia crassiuscula						1		1								**2**
Acacia cyclops						1		1				2				**4**
Acacia empelioclada								1								**1**
Acacia glaucoptera								1								**1**
Acacia gonophylla														1		**1**
Acacia harveyi								1								**1**
Acacia moirii subsp. dasycarpa			1		10		1		4					1		**17**
Acacia myrtifolia								2								**2**
Acacia phlebopetala		1			3	1	3							2		**10**
Acacia rostellifera						4	1	3	2		4	2	7			**23**
Acacia subcaerulea									1							**1**
Acrotriche cordata			2				3		2	1			1			**9**
Adenanthos cuneatus		2	5	3	1				16	1						**28**
Adenanthos ellipticus		2														**2**
Adenanthos oreophilus					1					1					1	**3**
Adenanthos venosus		9			1											**10**
Adriana quadripartita							1									**1**
Agonis baxteri		5		1	6	3	1		10	1				1		**28**
Agrostocrinum scabrum					1											**1**
Allocasuarina acuaria									3							**3**
Allocasuarina corniculata					1											**1**
Allocasuarina humilis			5	2	12				11	2						**32**
Allocasuarina microstachya			2													**2**
Allocasuarina thuyoides			1						2							**3**
Allocasuarina trichodon								1		1						**2**
Alyogyne wrayae ms								2								**2**
Amphipogon amphipogonoides					1				1							**2**
Amphipogon turbinatus						1	1		3					1		**6**
Anarthria humilis			1													**1**
Anarthria laevis		3				2										**5**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Anarthria prolifera		2	2	1	1				6	1						**13**
Anarthria scabra		4	5	3	2				12	2						**28**
Andersonia parvifolia					3										1	**4**
Anthocercis littorea													1			**1**
Astartea sp. Hopetoun area (A.S. George 10594)		1														**1**
Astroloma prostratum					1		1		3							**5**
Astroloma tectum									1							**1**
Atriplex cinerea								1				3	1			**5**
Baeckea ovalifolia		7	1	2												**10**
Banksia baueri		7	2	1												**10**
Banksia baxteri		1	3	2												**6**
Banksia lemanniana		1			10	2	2		6	2				1		**24**
Banksia media						1			2							**3**
Banksia nutans			1		1				2	1						**5**
Banksia oreophila		11		1												**12**
Banksia repens		1	1		3				16							**21**
Banksia speciosa			1	3												**4**
Banksia violacea		2	2		3				4	1						**12**
Beaufortia anisandra			1		1											**2**
Beaufortia micrantha			1		4				2	3				1		**11**
Beaufortia schaueri					1					2						**3**
Billardiera coriacea					1											**1**
Billardiera fusiformis						1		1								**2**
Boronia albiflora		2												1		**3**
Boronia crassifolia					9		1		11	1				1		**23**
Boronia crenulata	2															**2**
Boronia ramosa subsp. anethifolia					1											**1**
Boronia spathulata					1											**1**
Boronia tetrandra											1		1			**2**
Calothamnus gracilis		2	2	1	3				16	1				1		**26**
Calothamnus macrocarpus		4				2										**6**
Calothamnus pinifolius		4	1		1									2		**8**
Calothamnus quadrifidus		1				3		3								**7**
Calothamnus validus		4			1											**5**
Calothamnus villosus		1														**1**
Calytrix grandiflora subsp. wheatbelt		2														**2**
Calytrix leschenaultii		2														**2**
Calytrix simplex		2														**2**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Carpobrotus rossii											1		2			**3**
Carpobrotus virescens								1					6			**7**
Cassytha glabella			1							1						**2**
Cassytha melantha								1								**1**
Cassytha racemosa			1													**1**
Caustis dioica			6	1	4				5	2						**18**
Chamelaucium axillare											1					**1**
Chamelaucium megalopetalum									1							**1**
Chordifex crispatus			1						2							**3**
Chordifex sphacelatus		1		1	3				8							**13**
Chorizema cytisoides									1							**1**
Chorizema glycinifolium					1											**1**
Chorizema spathulatum									1	1						**2**
Chorizema trigonum					1		3									**4**
Chorizema uncinatum		1	1													**2**
Clematis pubescens								3								**3**
Comesperma spinosum							1									**1**
Conospermum distichum					1				1							**2**
Conospermum floribundum									3							**3**
Conospermum teretifolium		1		1					4							**6**
Conostephium roei							1									**1**
Conostylis vaginata			5	1	3	1			8	2					1	**21**
Conothamnus aureus			3						11							**14**
Corynotheca micrantha						2										**2**
Cyathochaeta equitans						2			2							**4**
Dampiera angulata					2											**2**
Dampiera fasciculata									1							**1**
Dampiera juncea					3				3							**6**
Dampiera loranthifolia						1	1									**2**
Darwinia diosmoides					1				1							**2**
Darwinia vestita					1											**1**
Daviesia decurrens							1									**1**
Daviesia emarginata					6					1						**7**
Daviesia incrassata subsp. reversifolia			1		1	1			14	1				1		**19**
Daviesia mollis					1											**1**
Daviesia striata					4				1							**5**
Desmocladus fasciculatus				2					1							**3**
Desmocladus flexuosus	2	1	3		3	2		1	8					1		**21**
Dillwynia pungens		2														**2**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Disphyma crassifolium								1				2	1			**4**
Dodonaea bursariifolia					1						1					**2**
Dodonaea trifida								1								**1**
Dryandra cuneata			2						3	1				1		**7**
Dryandra falcata					7		1		1	1						**10**
Dryandra nivea					1									1		**2**
Dryandra obtusa					1				16							**17**
Dryandra plumosa					7				1	3						**11**
Dryandra quercifolia		6	2		13	1			2	3						**27**
Enchylaena tomentosa													1			**1**
Eucalyptus angulosa						2	3	1			2		1			**9**
Eucalyptus astringens								1					1			**2**
Eucalyptus burdettiana		2														**2**
Eucalyptus conglobata subsp. perata							2									**2**
Eucalyptus decurva		1			1				2							**4**
Eucalyptus falcata						2	7	2		1			1			**13**
Eucalyptus gardneri								1								**1**
Eucalyptus occidentalis								3								**3**
Eucalyptus phenax													1			**1**
Eucalyptus pleurocarpa		1			12	4	1		15	2						**35**
Eucalyptus preissiana			2		5		2		1	2						**12**
Eucalyptus tetraptera										1						**1**
Eucalyptus uncinata					1		2		1						1	**5**
Eucalyptus utilis											5		1			**6**
Eutaxia neurocalyx ms		3	1	1					1							**6**
Exocarpos sparteus					1											**1**
Ficinia nodosa								1					1			**2**
Frankenia tetrapetala												2				**2**
Franklandia fucifolia									1							**1**
Gahnia ancistrophylla						1	1		1							**3**
Gahnia aristata					1					1						**2**
Gahnia decomposita								2								**2**
Gahnia deusta							1									**1**
Gahnia lanigera	2		1				3		2	1				1		**10**
Gahnia trifida								1								**1**
Gastrolobium congestum					1											**1**
Glischrocaryon aureum									1							**1**
Gompholobium knightianum			1		5				6					1		**13**
Gompholobium scabrum		1							3							**4**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Gompholobium tomentosum						2										**2**
Gompholobium venustum										1						**1**
Gonocarpus hispidus		1														**1**
Goodenia coerulea		1														**1**
Goodenia scapigera					8	2	3									**13**
Grevillea coccinea			1		7	1			6	1					1	**17**
Grevillea nudiflora					5	4	3		3					2		**17**
Grevillea tripartita								1	3							**4**
Guichenotia ledifolia						2	1	2					1			**6**
Gyrostemon subnudus					2	1			1							**4**
Hakea corymbosa									3	1						**4**
Hakea denticulata					1					1						**2**
Hakea ferruginea			2		4					1						**7**
Hakea florida								1								**1**
Hakea laurina								1								**1**
Hakea nitida	1					1			1							**3**
Hakea obtusa					1											**1**
Hakea pandanicarpa subsp. crassifolia					10	1	1		3	2						**17**
Hakea prostrata	1								1							**2**
Hakea trifurcata			2		2	1				1						**6**
Hakea victoria		4	3	2	8	2			6	1						**26**
Halgania cyanea								1								**1**
Heliotropium argyreum									1							**1**
Hibbertia gracilipes			1	1	6	3			14					1		**26**
Hibbertia mucronata			5	1		1			2	1	1					**11**
Hibbertia papillata		7														**7**
Hibbertia racemosa		1			1	3		1								**6**
Hibbertia recurvifolia										1						**1**
Hibbertia rupicola								1								**1**
Hypocalymma strictum		5														**5**
Hypolaena exsulca		4		1												**5**
Hypolaena fastigiata			2		1				2							**5**
Isopogon formosus					6					1						**7**
Isopogon polycephalus			5		5				14	1						**25**
Isopogon sp. Fitzgerald River (D.B. Foreman 813)					2		1		1							**4**
Isopogon trilobus		1	5	2	6	1	1		8	1						**25**
Jacksonia compressa		10														**10**
Jacksonia furcellata				2												**2**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Jacksonia viscosa					6				3	1						**10**
Johnsonia acaulis				1												**1**
Kennedia nigricans						1		1								**2**
Labichea lanceolata subsp. brevifolia						2							1			**3**
Lambertia inermis										1						**1**
Lasiopetalum compactum														1		**1**
Lasiopetalum discolor													1			**1**
Lasiopetalum quinquenervium						1	2		1							**4**
Lechenaultia heteromera		1	1	1	1				6							**10**
Lepidobolus chaetocephalus										1						**1**
Lepidosperma carphoides					2	1			3	1						**7**
Lepidosperma sp. A2 Inland Flat (G.J. Keighery 7000)	1	1					1	1		1						**5**
Lepidosperma sp. Clathrate (RL Barrett & GF Craig RLB 3570)					4											**4**
Lepidosperma sp. Dale River (R Davis 1051)					4				1	1						**6**
Lepidosperma sp. Dunns Swamp (R Davis 724)			1													**1**
Lepidosperma sp. Mt Burdett (M.A. Burgman & C. Layman MAB 3287)		1				1	3		5							**10**
Lepidosperma sp. Ravensthorpe (G.F. Craig 5188)									1							**1**
Lepidosperma sp. U1 big heads (A.S. George 11294)		8		1												**9**
Lepidosperma ustulatum										1						**1**
Leptospermum oligandrum				1		2	1		2							**6**
Leptospermum sp. Bandalup Hill (G. Cockerton 11001)					4				5							**9**
Leptospermum spinescens			1		6	1			8	1						**17**
Leucopogon assimilis		1														**1**
Leucopogon carinatus					3				1						1	**5**
Leucopogon compactus					1											**1**
Leucopogon conostephioides		4		2	2	1			3					2		**14**
Leucopogon crassifolius			6		4				3	2						**15**
Leucopogon fimbriatus									3							**3**
Leucopogon flavescens var. brevifolius		7		2												**9**
Leucopogon obovatus													1			**1**
Leucopogon revolutus					1	1		1								**3**
Leucopogon sp. Twertup (K.R. Newbey 10859)					1					1						**2**
Logania buxifolia			2				2		1	1						**6**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Logania micrantha									2	1						**3**
Logania serpyllifolia					1											**1**
Lomandra hastilis									1							**1**
Lomandra micrantha						1										**1**
Lomandra mucronata		1				1										**2**
Loxocarya cinerea									1							**1**
Lyginia barbata			3			1			4							**8**
Lysinema ciliatum		3	5	3	7				11	2						**31**
Melaleuca brevifolia												1				**1**
Melaleuca citrina		7														**7**
Melaleuca cuticularis								2				3				**5**
Melaleuca lanceolata											3		9			**12**
Melaleuca nesophila		1			1			2			1		2	1		**8**
Melaleuca papillosa					1			1		1				2		**5**
Melaleuca pauperiflora								1								**1**
Melaleuca pentagona						2	4		2		1					**9**
Melaleuca pulchella						1	1		1						1	**4**
Melaleuca rigidifolia					2		1								1	**4**
Melaleuca striata		6	5	3	8				19	3						**44**
Melaleuca suberosa									1							**1**
Melaleuca subtrigona		2			6		1		9					1		**19**
Mesomelaena stygia			2	1	12				14	4				1	1	**35**
Mesomelaena tetragona			2							1						**3**
Microcorys barbata			2						1							**3**
Microcorys glabra									1							**1**
Muehlenbeckia adpressa					1	1										**2**
Myoporum tetrandrum								1				1				**2**
Neurachne alopecuroidea						2			2							**4**
Nuytsia floribunda			1	2												**3**
Olax benthamiana					1	1										**2**
Olearia axillaris													4			**4**
Oligarrhena micrantha			1	2					1							**4**
Opercularia hispidula		1						1								**2**
Opercularia spermacocea	2						1									**3**
Opercularia vaginata		1														**1**
Patersonia lanata			1		2				4							**7**
Patersonia occidentalis								1								**1**
Persoonia striata					2											**2**
Persoonia teretifolia							1		1							**2**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Petrophile fastigiata					1											**1**
Petrophile phylicoides										1						**1**
Petrophile seminuda					6				1						1	**8**
Petrophile squamata subsp. northern (J. Monks 40)						1										**1**
Petrophile teretifolia			5	1	1				6	1				1		**15**
Phyllanthus calycinus					1	2		1								**4**
Pimelea drummondii						1			1							**2**
Pimelea erecta							1									**1**
Pimelea ferruginea													1			**1**
Platysace compressa		1			2	2	1	1						1		**8**
Poa poiformis													2			**2**
Pomaderris myrtilloides							5		1		1					**7**
Pultenaea heterochila							1				2		1			**4**
Regelia velutina		5														**5**
Rhadinothamnus rudis									1	1						**2**
Rhagodia baccata								1			1		4			**6**
Rhagodia crassifolia								1			3	1	4			**9**
Rhagodia preissii													1			**1**
Samolus repens												1				**1**
Sarcocornia blackiana												1				**1**
Sarcocornia quinqueflora								1								**1**
Scaevola crassifolia													6			**6**
Schoenus breviculmis															1	**1**
Schoenus brevisetis									4							**4**
Schoenus caespititius		1		1	1				4							**7**
Schoenus pleiostemoneus		2														**2**
Schoenus sublaxus		3	1		4				5	2						**15**
Sphaerolobium daviesioides									1							**1**
Sphenotoma dracophylloides					1											**1**
Sphenotoma squarrosa		3														**3**
Spinifex hirsutus													1			**1**
Spyridium globulosum						3							1			**4**
Spyridium majoranifolium								1								**1**
Stachystemon polyandrus					2											**2**
Stachystemon virgatus		1														**1**
Stackhousia monogyna						1		1	1							**3**
Stirlingia anethifolia			1		2				7					1		**11**
Stylidium albomontis		3	1		3	4	3		3					1		**18**

Taxon Name	Accoc	Adven	Bbax	Bspe	Dque	Eang/Cmac	Eang/Efal	Eocc	Eple/Brep	Epre/Dque	Euti	Mcut	Mlan	Mpap	Mpul	**Grand Total**
Stylidium galeoides		2	1													**3**
Stylidium schoenoides		1							1							**2**
Suaeda australis								2			1	3	4			**10**
Synaphea favosa									1							**1**
Synaphea oligantha									1							**1**
Synaphea petiolaris									2	1						**3**
Synaphea spinulosa									2							**2**
Taxandria conspicua subsp. abrupta		11						1								**12**
Taxandria spathulata			4		4				7	2						**17**
Tecticornia lepidosperma								1				3				**4**
Tecticornia pergranulata												2				**2**
Templetonia neglecta							1									**1**
Templetonia retusa			1			1	3	2	3	1						**11**
Tetragonia implexicoma											1	2	6			**9**
Tetraria capillaris	2															**2**
Tetraria sp. Jarrah Forest (R. Davis 7391)					1											**1**
Thomasia angustifolia								1								**1**
Threlkeldia diffusa												1	1			**2**
Tricoryne elatior						1										**1**
Tricostularia neesii var. elatior			5		1				6					1		**13**
Tripterococcus brunonis									3							**3**
Trymalium elachophyllum											1					**1**
Velleia trinervis						1										**1**
Verticordia densiflora						1										**1**
Verticordia pholidophylla		1														**1**
Verticordia tumida subsp. therogana		1														**1**
Xanthorrhoea platyphylla		6			9			1	4	3						**23**
Xanthosia huegelii		2														**2**
Zygophyllum billardierei													2			**2**
Zygophyllum glaucum											1					**1**
Grand Total	15	234	149	57	373	109	89	73	527	95	33	30	81	35	11	**1911**

RELEVE - Total No	**2**	**14**	**6**	**3**	**14**	**5**	**8**	**6**	**20**	**4**	**7**	**3**	**11**	**2**	**1**	**106**
GF Craig	0	11	4	3	13	4	7	3	17	3	3	0	3	2	1	**74**
KR Newbey	2	3	2	0	1	1	1	3	3	1	4	3	8	0	0	**32**

Appendix 7: Location of weeds

Species	Common Name	Waypoint	Latitude	Longitude	Date	Altitude	Location	Area
Trachyandra divaricata	dune onion weed	63	-33.92567	120.03247	08-Jul-10	2.1	Barrens Beach carpark	few plants
Trachyandra divaricata	dune onion weed	64	-33.92563	120.03232	08-Jul-10	3.4	Barrens Beach carpark	few plants
Trachyandra divaricata	dune onion weed	34	-33.92538	120.03264	22-Feb-10	5.2	Barrens Beach carpark	few plants
Mesembryanthemum crystallinum	common ice plant	36	-33.92551	120.03226	22-Feb-10	5.8	Barrens Beach carpark	few plants
Mesembryanthemum crystallinum	common ice plant	37	-33.92569	120.03236	22-Feb-10	6.7	Barrens Beach carpark	few plants
Ehrharta longiflora	annual veldt grass	60	-33.92459	120.03754	08-Jul-10	6.1	Four Mile Beach carpark	patches c. 5 m x 2 m
Mesembryanthemum crystallinum	common ice plant	19	-33.92442	120.03748	22-Feb-10	4	Four Mile Beach carpark	few plants
Mesembryanthemum crystallinum	common ice plant	14	-33.922605	120.03838	22-Feb-10		*Four Mile campsite (ex toilet)	c. 10 m x 5 m
Asparagus asparagoides	bridal creeper	55	-33.92131	120.0379	08-Jul-10	12.5	Ranger station	c. 1 m x 1 m
Asparagus asparagoides	bridal creeper	56	-33.92124	120.03796	08-Jul-10	9.8	Ranger station	c. 1 m x 1 m
Asparagus asparagoides	bridal creeper	58	-33.92084	120.03786	08-Jul-10	13.7	Ranger station	c. 1 m x 1 m
Conyza/ Hypochaeris	fleabane/ flatweed & other annuals	57	-33.92095	120.03784	08-Jul-10	14	Ranger station	widespread
Ehrharta longiflora/ Solanum nigum/ Sonchus	annual veldt grass/ blackberry nightshade/ sowthistle	49	-33.93355	120.00271	08-Jul-10	2.4	East Mylies Beach - sump W of walk path	c. 15 m x 5 m
Ehrharta longiflora/ Solanum nigum/ Sonchus	annual veldt grass/ blackberry nightshade/ sowthistle	50	-33.9337	120.00276	08-Jul-10	-0.3	East Mylies Beach - sump W of walk path	
Ehrharta longiflora	annual veldt grass	48	-33.93344	120.00264	08-Jul-10	2.7	East Mylies Beach - walk path	c. 20 m x 1 m
Mesembryanthemum crystallinum	common ice plant	55	-33.94786	119.92687	12-Feb-10	3	*Hamersley Inlet - Shire campsite	scattered patches

* NB Surveys of Hamersley Inlet and Four Mile Beach campsites were carried out in summer. More annual weeds are expected to occur at these sites


058
14
015
037
050