FLORA AND VEGETATION
RESERVE 2145 and PERCY CULLEN OVAL
GIDGEGANNUP

Prepared for:
City of Swan

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STATEMENT OF LIMITATIONS

Scope of Services

This report ("the report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Eleanor Bennett ("the Author"). In some circumstances a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services.

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i. SUMMARY

Bennett Environmental Consulting Pty Ltd undertook a vegetation and flora survey of the City of Swan Reserve 2145 and Percy Cullen Oval, Gidgegannup on 14th September 2006. This is an excellent remnant bushland reserve, which has managed to include formal recreation and bushland conservation in the one area.

The following illustrate the environmental significance of the Reserve.

- Mattiske and Havel (1998) mapped the pre-European vegetation complexes as part of the Regional Forest Agreement. The vegetation complexes recorded for the site are Dwellingup 2 and Yarragil 1.

- One Priority 3 Flora, *Tetratheca pilifera* and two Priority 4 Flora, *Templetonia drummondii* and *Hibbertia montana* were recorded.

- The site consists of low ground including a very narrow ephemeral creek with higher ground to the south. The creek is on the northern side of the property, nearly parallel to Toodyay Road.

- A total of 5 vegetation units, 2 from the higher ground and 3 from the sumpland of the lower ground were recorded. This level of vegetation variety is very significant and worthy of conservation.

- 42 vascular plant families, 110 genera and 174 taxa (subspecies and varieties) of which 8 taxa were weeds.

- Using the vegetation condition table in Keighery (1994), the vegetation at the site ranged from excellent to good.

- Dieback has been recorded for the area, but the understorey is still healthy.

- Very few weeds were recorded, with most occurring along tracks.

- There are two wetland areas at the site, one is a floodplain the other a creek. Both are considered as significant as applying the wetland criteria (Environmental Protection Authority, 2004).

- The remnant vegetation is approximately square in outline. This is the preferred shape as there is less potential for weed invasion.

- There is minimal linkage with adjacent bushland as the adjoining properties are cleared.

The remnant bushland, and the site as a whole, is therefore environmentally very important. It is essential that the City of Swan maintain the area as a bushland Reserve and continue to undertaken maintenance.

1. INTRODUCTION

1.1 Background

The City of Swan contracted Bennett Environmental Consulting Pty Ltd to undertake a vegetation, and flora survey of Reserve 2145 and Percy Cullen Oval in Gidgegannup. The site includes an oval, tennis courts and associated club houses. On the north east boundary there is a shed used by the Gidgegannup Volunteer Bush Fire Brigade. The whole area is fenced and general public access is via a locked gate.

1.2 Scope of Works

The requirements for this project were to:

i. Record the vegetation units and associated species in the remnant bushland.
ii. Search for and record all significant species at the site.

2. REGIONAL METHODOLOGY

2.1 Geology and Landform

The site is included in the Northern Jarrah Forest, occupying the northern portion of the Darling Plateau to the east of the Darling Scarp (Beard, 1990). It overlies Archaean granite and metamorphic rocks. The plateau is an ancient erosion surface capped by an extensive lateritic duricrust, which has been dissected by later drainage.

The dominant soils are lateritic gravels consisting of up to 5m or more depth of ironstone gravels in a yellow sandy matrix, and related lateritic podosolic soils with ironstone gravels in a sandy surface horizon overlying mottled yellow-brown clay subsoil. Massive ironstone pavements are common on the ridge tops and some slopes.

The major catena in the northern subregion comprise (Beard, 1990):

- Open vegetation associated with granite outcrops;
- Jarrah Forest on the lateritic plateau and scree descending from its edges;
- Marri-Wandoo Woodland on the younger red soils of the scarp; and
- River gums and Paperbarks along the watercourses.

2.2 Vegetation

The Interim Biogeographical Regionalisation for Australia (IBRA) (Thackway and Cresswell, 1995) recognises 85 bioregions. The IBRA is used as the common unit to compare biological and biophysical attributes. Bioregions represent a landscape-based approach to classifying the land surface and each region is defined by a set of major environmental influences, which shape the occurrence of flora and fauna and their interaction with the physical environment. The survey area occurs in the Northern Jarrah Forest (Williams and Mitchell, 2002), which occurs east of the Darling Scarp, overlying Archaean granite and metamorphic rocks with an average elevation of 300m. Rainfall varies from 1300mm on the scarp to approximately 700mm in the east and north. The vegetation comprises Jarrah – Marri Forest in the west grading to Wandoo and Marri Woodlands in the east with Powder bark wandoo on the breakaways. Extensive but localized Banksia Low Woodlands occur on sand sheets with heaths on shallow soils over granite rocks and as a common understorey in the Forest and Woodlands to the north and east.

Special values related to the Northern Jarrah Forest include:

- Riparian habitat for restricted fauna;
- Freshwater wetlands of *Baumea* reed beds in forest areas;
- Granite outcrops with associated flora/fauna;

- Wandoo and Wandoo/Powder bark wandoo over *Dryandra* Scrub supporting restricted fauna; and
- other refugia identified by the RFA process.

The Northern Jarrah Forest has moderate species richness, 400-600 species/km^2, especially for the mosaic of forests, woodlands and heaths on the eastern and northeastern fringes. This species richness results from the rapid changes in communities on the lower slopes and on the variable soil types.

There are no wetlands of significance except for riparian vegetation along rivers, none of which occur in the survey area.

Ecosystems affected by Jarrah dieback (*Phytophthora cinnamomi*) are considered by CALM (Williams and Mitchell, 2002) to be ecosystems at risk. Dieback eliminates several species of structurally and floristically dominant plant families including Proteaceae and Myrtaceae from ecosystems.

Prior to the above classification, Beard (1981) classified the vegetation of Western Australia. Western Australia was divided into three main Botanical Provinces, Southwest, Eremaean and Northern. Gidgegannup occurs within the Dale Botanical Subdistrict of the Darling Botanical District within the Southwest Botanical Province Beard (1990). Beard (1981) described the vegetation of the site as Jarrah/Marri Forest (abbreviated e2,3Mc). Shepherd *et al.* (2002) have determined the pre-European and current extent of the vegetation associations described by Beard. In addition they have assessed the percentage of each association remaining, the amount in IUCN reserves and the percentage in other reserves. This develops an excellent picture of the extent of these remnants. The following data is taken from Shepherd *et. al*. (2002):

- Pre-European extent of e2,3Mc = 3,046,385ha
- Current extent remaining vegetated = 2,197,837ha
- Percentage remaining vegetated = 72.1%
- Percentage of remaining vegetated area in reserves = 78%

About 68% of e2,3Mc conserved occurs in Timber Reserves. Most of the Jarrah Forest has been logged resulting in larger trees replaced by younger stems. The virgin Jarrah Forest would have contained many large mature trees but the Jarrah forest now contains many immature trees.

The National Objectives and Targets for Biodiversity Conservation 2001-2005 (Commonwealth of Australia, 2001) are to conserve at least 30% of each vegetation unit. This legislation recognises that at least 30% of the original pre-clearing extent must be retained to protect Australia's biodiversity. The area of E2,3Mc remaining vegetated exceeds this extent.

There have been numerous studies undertaken within the Jarrah Forest, both by researchers and consultants. Havel (1975) described 26 site vegetation types for the Jarrah Forest. The species that should be present, or could be present and were always absent, were listed together with the soil and aspect. It was a combination of all these aspects that determined the site vegetation types. However he concluded that it is possible to use plant indicators (55 were chosen) to define sites within the northern Jarrah Forest. This was the first major work where the different vegetation complexes within the Jarrah Forest were defined.

Heddle *et al.* (1980) described the vegetation complexes of the Darling system at a scale of 1: 250 000. There was found to be a distinct pattern of plant distribution linked to landforms, soils and climate. The most obvious trend was associated with increasing aridity from west to east on the Darling Plateau. The vegetation changes observed were a decrease in height and percentage cover of the tallest stratum and a distinct change in floristics. The surveyed site covers two vegetation complexes:

- Dwellingup Complex in Medium to High Rainfall. This is described as an Open Forest of *Eucalyptus marginata* and *Corymbia calophylla;*

- Murray and Bindoon Complex in Low to Medium rainfall. This is described as ranging from Open Forest of *Eucalyptus marginata* and *Corymbia calophylla* to Woodland of *Eucalyptus wandoo* with *Eucalyptus rudis* and *Eucalyptus patens* on the valley floors.

The Regional Forest Agreement (RFA) (Mattiske and Havel, 1998) mapped the vegetation complexes of the forest areas of Western Australia. This included the Jarrah forest. The survey site is included in the RFA vegetation complexes:

- Dwellingup 2 - Open Forest of *Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* on lateritic uplands in subhumid and semiarid zones.
- Yarragil 1 – Open Forest of *Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* on slopes with mixtures of *Eucalyptus patens* and *Eucalyptus megacarpa* on the valley floors in the humid and subhumid zones.

3. METHODS

The remnant vegetation within the lots was surveyed using the methods set out in the Environmental Protection Authority Guidance No 51 (2004). All access tracks were driven and transects walked through the remnant bushland. Each vegetation unit identified was recorded using a 10m x 10m quadrat, which was set up using a compass and placed due N,S,E,W. All quadrats were permanently marked with 4 metal droppers. The site selected for each quadrat was chosen to be the most representative of that vegetation and in the best condition.

The vegetation, flora and weed surveys were conducted concurrently. For each quadrat the following were recorded in the field:

- GPS reading (WGS84, equivalent to Geocentric Datum of Australia 1994 (GDA94)) at NW corner.
- Digital photograph taken from the NW corner.
- Soil type.
- Presence, size and type of any outcropping rocks.
- Topography – eg. ridge, upper slope, middle slope, lower slope, drainage line, minor creek, major creek, wetland.
- Aspect where this is applicable.
- Vegetation condition using the scale set out by Keighery (1994).
- Presence of any Declared Rare or Priority Flora or other significant flora.
- Additional information including dieback, age since fire, predators, erosion, weeds, grazing, tracks etc.
- All species were listed together with their percentage cover within the quadrat and average height.

The area outside of the quadrat was also surveyed to record additional (opportunistic) species for that vegetation unit. All species unknown in the field were collected, pressed and identified later using appropriate keys and by comparison with collections housed at the Western Australian Herbarium. A collection of each Rare or Priority Flora seen was made and forms will be completed and sent to the Rare Flora section of the Department of Conservation and Land Management. The pressed and dried specimens will be sent to the Western Australian Herbarium for inclusion in their collection.

4. RESULTS

Field work was undertaken on 14th September 2006.

4.1 Number of Taxa

A total of 42 vascular plant families, 110 genera and 174 taxa (species, subspecies and varieties) were recorded during the survey (Appendix A). The dominant plant families were:

Papilionaceae with 23 taxa and 12 genera;
Proteaceae with 16 taxa and 9 genera;
Cyperaceae with 11 taxa and 6 genera
Myrtaceae with 9 taxa and 8 genera; and
Iridaceae with 9 taxa, of which 3 are weeds and 5 genera .

These five families represent 39% of the total number of taxa, 36.4% of the genera and 11.9% of the families.

4.2 Significant Taxa

Species of flora are defined as rare or priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Conservation and Land Management recognises these threats of extinction and consequently applies regulations towards population and species protection. Rare Flora are gazetted under subsection 2 of section 23F of the Wildlife Conservation Act (1950) and therefore it is an offence to "take" or damage rare flora without approval from the Minister for the Environment.

Table 1. Code and description of Rare and Priority Flora

Code	Code Declared Rare and Priority Flora Categories
R	DRF (Declared Rare Flora) -Extant Taxa. Taxa, which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection.
X	DRF (Declared Rare Flora) -Presumed Extinct Taxa. Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently.
1	Priority One -Poorly Known Taxa. Taxa, which are known from one or a few (generally <5) populations, which are under threat.
2	Priority Two -Poorly Known Taxa. Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat.
3	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.
4	Priority Four -Rare Taxa. Taxa which are considered to have been adequately surveyed and which whilst being rare, are not currently threatened by any identifiable factors.

Table 1 presents the definitions of Declared Rare and the four Priority Flora ratings under the Wildlife Conservation Act (1950) as extracted from Department of Conservation and Land Management (2006a). Table 2 presents the definitions of the threatened species under the Environmental Protection and Biodiversity Conservation Act, 1999 (Environment Australia, 2006).

Table 2. Categories of Threatened Flora Species (Environmental Protection and Biodiversity Conservation Act, 1999)

Code	Code Declared Rare and Priority Flora Categories
Ex	Extinct Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of this species has died.
ExW	Extinct in the Wild Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

Code	Code Declared Rare and Priority Flora Categories
CE	Critically Endangered Taxa which at any particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	Endangered Taxa, which is not critically endangered, and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	Conservation Dependent Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Prior to undertaking the field work a search of the Department of Conservation and Land Management Rare Flora database was undertaken for the co-ordinates 31^0 45' - 31^0 50' S and 116^0 05' - 116^0 15' E. The results of this search are listed below in Table 3.

Table 3. Possible Significant Taxa

Cons.Code	Taxon	Description
R	*Grevillea flexuosa*	Irregular, few-branched, non-lignotuberous shrub, to 2 m high. Fl. creamy, yellow, Jul–Oct. Red-brown sand with laterite & gravel, sand over granite. Ridgetop plateau & associated breakaways.
R	*Thelymitra manginiorum*	Herb, 0.2–0.3 m high. Fl. orange, brown, Sep–Oct. Dry brown sand, sandy clay, gravel, granite. On face of the escarpment, slopes.
P2	*Verticordia citrella*	Erect, slender shrub, 0.3–1 m high. Fl. yellow, Oct–Nov. Gravelly loam or sand. Low-lying damp areas, swamps.
P3	*Aotus cordifolia*	Erect or straggling shrub, 0.3–1.5 m high. Fl. yellow, Aug–Jan. Peaty soils. Swamps.
P3	*Halgania corymbosa*	Erect shrub, 0.35–1 m high. Fl. blue, purple, Aug–Nov. Gravelly soils, soils over granite.
P3	*Templetonia drummondii*	Prostrate or ascending shrub, 0.1–0.4(–0.6) m high. Fl. yellow, brown, purple, Aug–Sep. Lateritic soils.
P3	*Tetratheca pilifera*	Spreading shrub, 0.1–0.3 m high. Fl. purple, Aug–Oct. Gravelly soils.
P3	*Tetratheca similis*	Spreading shrub, to 0.3 m high. Fl. pink, Aug–Sep. Sandy clay with lateritic boulders.
P4	*Calothamnus rupestris*	Erect, compact or spreading shrub or tree (occasionally), 0.9–4 m high. Fl. pink, red, Jul–Dec. Gravelly skeletal soils. Granite outcrops & rocks, hillsides.
P4	*Darwinia pimelioides*	Erect shrub, 0.25–0.5(–1) m high. Fl. red, pink, green, Sep–Oct. Loam, sandy loam. Granite outcrops.
P4	*Grevillea pimeleoides*	Non-lignotuberous shrub, 0.4–2.4 m high. Fl. yellow, orange, May–Nov. Gravelly soils over granite. Rocky hillsides.
P4	*Verticordia lindleyi* subsp. *lindleyi*	Erect shrub, 0.2–0.75 m high. Fl. pink, May/Nov–Jan. Sand, sandy clay. Winter-wet depressions.

During the survey, three Priority Flora were recorded. These were:

- *Tetratheca pilifera*, a Priority 3 taxon, which was recorded in the gravelly soils just above the damp area associated with the creek. Plants were recorded from:

15 plants at 423408E; 6481696N
10 plants at 423014E; 6481645N

Flowering shrub of *Tetratheca pilifera*

- *Templetonia drummondii*, a Priority 4 taxon, was recorded from Quadrat GI04. Only one plant was recorded but this taxon is very low making it difficult to see when amongst dense litter. The plant observed in the field was not in flower. Below is a flowering plant photographed at another site. It has pale yellow, pea shaped flowers.

Templetonia drummondii

- *Hibbertia montana*, a Priority 4 taxon was recorded from Quadrat GI05. 10 plants were recorded and as they were in full flower they were very obvious.

Hibbertia montana

4.3 Weeds

A total of 8 weeds were recorded from the remnant bushland at the site. All have been determined as weeds by the Western Australian Herbarium (2006a) and Department of Conservation and Land Management (1999). The rating allocated to each weed by CALM is based on three criteria:

Invasiveness – ability to invade natural bushland in good to excellent condition or ability to invade waterways.

Distribution – wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world.

Environmental impacts – Ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

Ratings indicate the following:

High indicates this weed is prioritised for control and/or research ie prioritising funding to it.

Moderate indicates control or research effort should be directed to it if funds are available, however it should be monitored (possibly a reasonably high level of monitoring).

Mild indicates monitoring of the weed and control where appropriate.

Low indicates that this species would require a low level of monitoring.

Table 4. Weeds recorded during the survey classified according to CALM (1999)

SCIENTIFIC NAME	COMMON NAME	CALM RATING	INVASIVENESS	IMPACTS
**Moraea flaccida*	One-leaf Cape tulip	High	✓	✓
**Romulea rosea*	Guildford grass	High	✓	✓
**Sparaxis bulbifera*	Harlequin flower	High	✓	✓
**Typha orientalis*	Bulrush	High	✓	✓
**Arctotheca calendula*	Cape weed	Moderate	✓	
**Hypochaeris glabra*	Flat weed	Moderate	✓	
**Lotus subbiflorus*	Lotus	Low		
**Oxalis purpurea*	Four o'clock	Low		

Four of the weeds were rated as High, indicating that these are the weeds which should be targeted for removal. Two of the weeds, One-leaf Cape tulip and Four o'clock were only recorded along the track to the west of the fire shed. In addition several annual weeds were also recorded along this track. This degraded track and surrounding area should be targeted immediately for weed control.

4.4 Vegetation Units

The field information obtained for each quadrat is provided in Appendix B. The field data was run through the PATN database for the presence/absence of species in each of the 9 quadrats recorded to produce the following dendrogram.

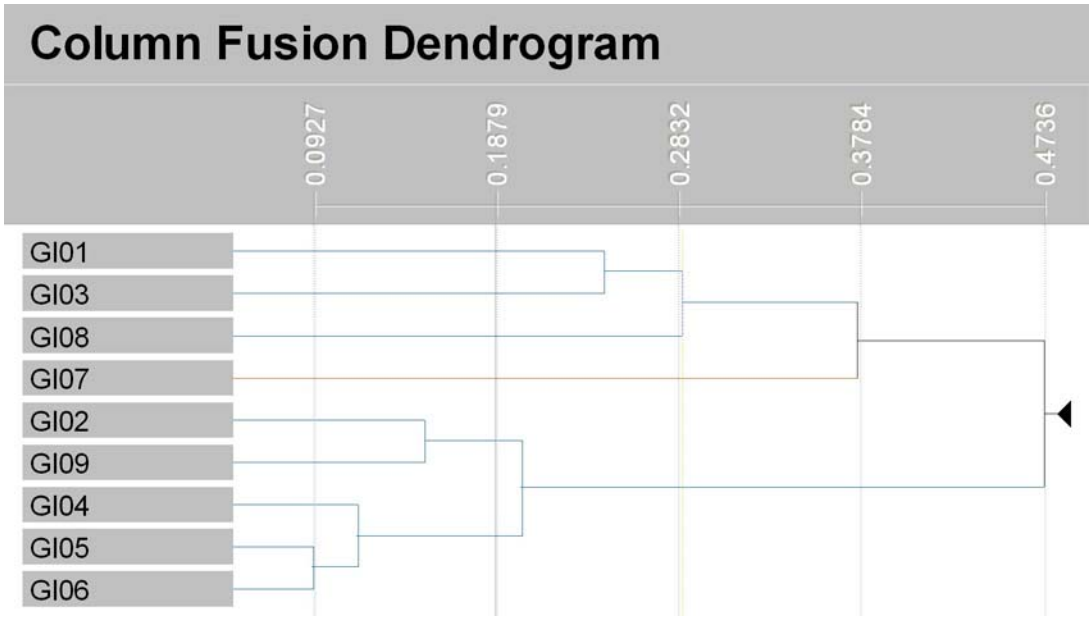

Diagram 1. Resulting diagram from PATN analysis

The dendrogram indicates there are three different vegetation groups at the site. Quadrats GI01, GI03, GI08 and GI07 represent one unit, GI02 and GI09 the second unit and GI04, GI05 and GI06 the third unit.

The vegetation units recorded from the Reserve are described below using the vegetation classification of Muir as provided in Table 5. The abbreviation that follows is used in the mapping.

Table 5. Vegetation Classification (from Muir, 1977)

LIFE FORM / HEIGHT CLASS	Canopy Cover			
	DENSE 70 % - 100%	**MID DENSE 30% - 70%**	**SPARSE 10% - 30%**	**VERY SPARSE 2% - 10%**
Trees > 30 m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
Trees 15 – 30 m	Dense Forest	Forest	Woodland	Open Woodland
Trees 5 – 15 m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
Trees < 5 m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs > 2 m	Dense Thicket	Thicket	Scrub	Open Scrub
Shrubs 1.5 – 2 m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
Shrubs 1 - 1.5 m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
Shrubs 0.5 – 1 m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
Shrubs 0 - 0.5 m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
Hummock grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
Bunch grass > 0.5 m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
Bunch grass < 0.5 m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
Herbaceous species	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
Sedges > 0.5 m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
Sedges < 0.5 m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverworts	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

High Ground

Open Low Woodland A of *Eucalyptus marginata* subsp. *thalassica* over Thicket of *Dryandra sessilis* var. *sessilis* and *Dryandra squarrosa* or Low Scrub A of *Xanthorrhoea preissii* over Low Heath D dominated by *Hibbertia hypericoides* over Open Low Sedges dominated by *Tetraria capillaris.* (Em)

It was represented by Quadrats GI02, GI04, GI05 and GI06.

There were only occasional areas where *Dryandra sessilis* var. *sessilis* was a dominant but typically it was present in low numbers. *Hibbertia hypericoides* was common throughout this entire vegetation unit.

Low Woodland A *of Corymbia calophylla* over Open Low Scrub B of *Xanthorrhoea brunonis* over Herbs of *Phlebocarya ciliata* over Dense Low Sedges dominated by *Hypolaena exsulca.* (Pc)

It was represented by Quadrat GI09. This vegetation unit was combined with the vegetation unit above by the software when run through PATN, but in the field it appeared distinct.

Low Ground

Low Woodland B of *Corymbia calophylla* over Scrub of *Xanthorrhoea preissii* over Dense Tall Sedges of *Mesomelaena tetragona.* (Xp)

It was represented by GI03 and although combined with quadrat GI01 by the software in the PATN analysis was slightly higher on the landscape.

Dense Low Forest A of *Melaleuca preissiana* over Scrub of *Taxandria linearifolia* over Low Sedges of ?*Tetraria capillaris.* (Mp)

This was represented by GI08, which in the PATN analysis did separate at a higher level so therefore is different to GI01, GI03 and G07. The dominant sedge at the quadrat was sterile and could not be positively identified. It is thought to be *Tetraria capillaris* although it is an unusual habitat for this taxon to occur.

Low Woodland A of *Melaleuca preissiana* over Open Scrub of *Hakea varia* over Open Low Sedges dominated by *Lepidosperma drummondii* and *Chorizandra enodis* over Very Open Herbs. (Hv)

This was represented by GI01 and GI07. Quadrat GI01 included more trees of *Melaleuca preissiana.*

4.5 Vegetation Condition

Using the vegetation condition of Keighery (Table 6) the vegetation condition recorded for each quadrat is listed in Table 7.

Table 6. Vegetation Condition Classification (Keighery, 1994)

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

The vegetation condition recorded for each quadrat is provided in Table 7.

Table 7. Vegetation condition of the remnant bushland.

Rating	Quadrats
2	GI01, GI03, GI08, GI09
3	GI02, GI05
3-4	GI07
4	GI04, GI06

As Jarrah had previously been logged the best rating that could be applied to the higher ground was very good (vegetation condition 3). The wetland associated with the creek recorded a vegetation condition varying between very good and excellent.

4.6 Wetland

Wetlands are defined as "*areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline, eg waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries*" (Wetlands Advisory Committee, 1977).

Wetland types and consanguineous suites have been mapped over a large portion of the Swan Coastal Plain north of Bunbury by Hill *et al*. (1996). Those within the southern Swan Coastal plain have been mapped and classified by the Semeniuk Research Group (1997). The global geomorphic classification system developed and used in this review is shown in Table 8 below.

Table 8: Wetland Classification System (from Semeniuk, 1987)

WATER LONGEVITY	LANDFORM				
	BASIN	CHANNEL	FLAT	SLOPE	HIGHLAND
permanent inundation	lake	river	-	-	-
seasonal inundation	sumpland	creek	floodplain	-	-

WATER LONGEVITY	LANDFORM				
	BASIN	CHANNEL	FLAT	SLOPE	HIGHLAND
seasonal waterlogging	dampland	trough	palusplain	paluslope	palusmont

The wetlands at the site are:
Floodplain – Quadrats GI01, GI03 and GI07
Creek – Quadrat GI08

The Environmental Protection Authority (2004) has prepared a policy to determine the environmental value of wetlands. A wetland meets the environmental quality criteria if:

- the wetland is recognised internationally, nationally or regionally as provided in regulation 5 of the regulations – not applicable to this site;
- the wetland has one of the significant natural attributes referred to in regulation 6 of the regulations; or
- the wetland has at least 2 of the environmental values listed in regulation 7 of the regulations – none of which are applicable to this site.

If the wetland has one or more of the listed significant natural attributes (Regulation 6) it is considered a significant wetland. These attributes are summarized below:

a) supports flora being declared to be protected flora for the purposes of the Wildlife Conservation Act 1950;
b) supports fauna specified in a notice in operation under section 14(2)(ba) of the Wildlife Conservation Act 1950 as fauna likely to become extinct, or is rare, or otherwise in need of special protection;
c) supports vegetation in good, very good, excellent or pristine condition B.J. Keighery in *Bushland Plant Survey. A Guide to Plant Community Survey for the Community*, Wildflower Society of WA (Inc.), Nedlands, Western Australia, 1994;
d) supports an ecological community listed as 'threatened' in Category 1, 2, 3, or 4, as described by V.J. English and J. Blyth (1997);
e) is a wetland that is part of a natural wetland group of which fewer than 30% of wetlands of that type in that group are represented in the conservation estate on the Swan Coastal Plain, according to the wetland type and geomorphic classification system in Hill, A.L., Semeniuk, C.A., Semeniuk V and Del Marco, A. (1996);
f) it is a significant habitat or refuge for native or migratory fauna.

The wetland units are both in good to excellent condition (Keighery 1994). In addition the Priority 3 Flora, *Tetratheca pilifera,* was recorded from both wetlands.

Therefore the wetland areas at the site are significant.

5. DISCUSSION

Bennett Environmental Consulting Pty Ltd undertook a vegetation and flora survey of Reserve 2145 and Percy Cullen Oval, Gidgegannup in September 2006. This is an excellent remnant bushland reserve, which has managed to include formal recreation and bushland conservation in the one area.

Guidance Statement 10 prepared by the Environmental Protection Authority (2003) is used to assess the environmental potential of an area in the Perth Metropolitan area. The site is assessed below using this publication.

1. Vegetation Complexes
Mattiske and Havel (1998) mapped the pre-European vegetation complexes as part of the Regional Forest Agreement. The vegetation complexes recorded for the Reserve are Dwellingup 2 and Yarragil 1. Havel (2002) discussed the poorly represented vegetation complexes of the RFA study area, neither of these complexes are listed as poorly represented.

The vegetation complexes are not considered to be poorly represented.

2. Threatened Flora
One Priority 3 Flora, *Tetratheca pilifera* and two Priority 4 Flora, *Templetonia drummondii* and *Hibbertia montana* were recorded from the site. Priority 3 taxa are known from several populations, at least some of which are not believed to be under immediate threat. Priority 4 taxa are considered to have been adequately surveyed, and which whilst being rare, are not currently threatened by any identifiable factors.

One Priority 3 Flora and two Priority 4 Flora were recorded.

3. Vegetation Diversity
The site consists of low ground including an ephemeral creek with higher ground to the south. The creek runs on the northern side of the property, nearly parallel to Toodyay Road. A total of 5 vegetation units, 2 from the higher ground and 3 from the floodplain of the lower ground were recorded from the site. This level of vegetation variety is very significant and worthy of conservation.

A total of 5 vegetation units were recorded from the site indicating it is worthy of conservation.

4. Number of taxa
42 vascular plant families, 110 genera and 174 taxa (subspecies and varieties) of which 8 taxa were weeds were recorded during the survey. The five dominant vascular plant families were Papilionaceae, Myrtaceae, Proteaceae, Cyperaceae and Iridaceae. These five families represent 11.9% of the total number of families, 36.4% of the number of genera and 40.8% of the number of taxa.

5. Vegetation Condition
Using the vegetation condition set out in Keighery (1994), the vegetation at the site ranged from excellent to good. Dieback has been recorded for the area, but mostly the understorey is still healthy. Very few weeds were recorded; most were along tracks and had not penetrated into the bushland.

Most of the remnant vegetation is in good to excellent condition.

6. Wetland
There are two wetland areas at the site, one is a floodplain the other a narrow creek. Both are considered as significant after applying the wetland criteria (Environmental Protection Authority, 2004).

The floodplain and creek at the site are significant wetlands.

7. Shape of Remnant Vegetation
The remnant vegetation is approximately square in outline. This is the preferred shape as there is less potential for weed invasion into the remnant bushland. The residents who use the facilities for sport activities should be made aware of the environmental significance of the area and should be involved in the conservation of the bushland.

The compact shape of the remnant vegetation is important as it reduces the potential for weed invasion.

8. Linkage with Adjoining Vegetation

There is minimal linkage with adjacent bushland as the properties to the east and west are cleared for farmland, as is most of the vegetation to the south. Toodyay Road is on the northern boundary and the properties to the north of this are also nearly cleared of all natural vegetation. This indicates the importance of this Reserve and why the bushland should continue to be conserved.

There is no linkage between the survey site and adjoining properties.

This indicates that the remnant bushland, and the site as a whole, is environmentally very important. It is essential that the City of Swan maintain the area as a Bushland Reserve and continue to undertaken maintenance. Having both high and low ground within one Reserve is very important and not common, adding emphasis to all the important aspects listed above.

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APPENDIX A

Taxa recorded during survey

LEGEND

ABBREVIATION	DESCRIPTION
sp.	Species
subsp.	Subspecies
var.	Variety
*	Weed
forma	Form not as obvious a distinction as variety or subspecies
ms	Unpublished name
?	Plant was vegetative at the time of survey. No positive identification was possible

Family	Taxon
Zamiaceae	*Macrozamia riedlei*
Typhaceae	**Typha orientalis*
Poaceae	*Amphipogon amphipogonoides*
	Amphipogon turbinatus
	Austrostipa elegantissima
	Neurachne alopecuroidea
Cyperaceae	*Chorizandra enodis*
	Cyathochaeta avenacea
	Lepidosperma drummondii
	Lepidosperma leptophyllum
	Lepidosperma longitudinale
	Lepidosperma squamatum
	Mesomelaena tetragona
	Schoenus bifidus
	Schoenus unispiculatus
	Tetraria capillaris
	Tetraria octandra
Restionaceae	*Alexgeorgea nitens*
	Desmocladus fasciculatus
	Hypolaena exsulca
	Loxocarya cinerea
	Lyginia imberbis
	Meeboldina cana
Juncaceae	*Luzula meridionalis*
Dasypogonaceae	*Lomandra hermaphrodita*
	Lomandra sericea
	Lomandra sonderi
Xanthorrhoeaceae	*Xanthorrhoea brunonis*
	Xanthorrhoea gracilis
	Xanthorrhoea preissii
Phormiaceae	*Dianella revoluta*
Anthericaceae	*Caesia micrantha*
	Chamaescilla corymbosa
	Laxmannia grandiflora
	Thysanotus patersonii
	Thysanotus sparteus
	Tricoryne elatior

Family	Taxon
Colchicaceae	
	Burchardia multiflora
	Burchardia umbellata
	Wurmbea dioica
Boryaceae	
	Borya sphaerocephala
Haemodoraceae	
	Anigozanthos manglesii
	Conostylis aurea
	Conostylis setigera
	Conostylis setosa
	Haemodorum brevisepalum
	Haemodorum paniculatum
	Phlebocarya ciliata
	Tribonanthes longipetala
Hypoxidaceae	
	Hypoxis occidentalis
Iridaceae	
	**Moraea flaccida*
	Orthrosanthus laxus
	Patersonia babianoides
	Patersonia juncea
	Patersonia occidentalis
	Patersonia rudis
	Patersonia umbrosa
	**Romulea rosea*
	**Sparaxis bulbifera*
Orchidaceae	
	Caladenia flava
	Diuris corymbosa
	Prasophyllum parvifolium
	Pterostylis recurva
	Pterostylis vittata
	Thelymitra crinita
Casuarinaceae	
	Allocasuarina fraseriana
	Allocasuarina humilis
Proteaceae	
	Adenanthos barbiger
	Banksia grandis
	Banksia littoralis
	Conospermum capitatum subsp. *capitatum*
	Dryandra bipinnatifida
	Dryandra lindleyana var. *lindleyana*
	Dryandra sessilis var. *sessilis*
	Dryandra squarrosa
	Grevillea synapheae

Family
Taxon

Proteaceae (cont.)
Hakea lissocarpha
Hakea prostrata
Hakea trifurcata
Hakea varia
Persoonia elliptica
Petrophile striata
Synaphea petiolaris
Santalaceae
Leptomeria cunninghamii
Loranthaceae
Nuytsia floribunda
Amaranthaceae
Ptilotus manglesii
Lauraceae
Cassytha racemosa
Droseraceae
Drosera erythrorhiza
Drosera gigantea
Drosera macrantha
Drosera menziesii subsp. *menziesii*
Drosera pallida
Drosera rosulata
Drosera stolonifera
Pittosporaceae
Billardiera fusiformis
Pronaya fraseri
Mimosaceae
Acacia applanata
Acacia barbinervis
Acacia extensa
Acacia nervosa
Acacia pulchella
Caesalpiniaceae
Labichea punctata
Papilionaceae
Bossiaea ornata
Bossiaea preissii
Bossiaea pulchella
Daviesia divaricata
Daviesia horrida
Daviesia incrassata
Daviesia preissii
Daviesia rhombifolia
Dillwynia laxiflora
Gastrolobium calycinum
Gastrolobium capitatum
Gastrolobium dilatatum

Family
Taxon

Papilionaceae (cont.)
Gompholobium knightianum
Gompholobium marginatum
Gompholobium preissii
Hovea chorizemifolia
Jacksonia sternbergiana
Kennedia coccinea
Kennedia prostrata
**Lotus subbiflorus*
Sphaerolobium medium
Templetonia drummondii
Viminaria juncea
Oxalidaceae
**Oxalis purpurea*
Rutaceae
Boronia cymosa
Boronia ovata
Boronia ramosa
Tremandraceae
Tetratheca hirsuta
Tetratheca pilifera
Euphorbiaceae
Phyllanthus calycinus
Rhamnaceae
Trymalium ledifolium
Dilleniaceae
Hibbertia commutata
Hibbertia huegelii
Hibbertia hypericoides
Hibbertia montana
Thymelaeaceae
Pimelea suaveolens
Myrtaceae
Baeckea camphorosmae
Calytrix depressa
Calytrix glutinosa
Corymbia calophylla
Eucalyptus marginata subsp. *thalassica*
Hypocalymma angustifolium
Kunzea micrantha
Melaleuca preissiana
Taxandria linearifolia
Haloragaceae
Gonocarpus cordiger
Apiaceae
Pentapeltis peltigera
Platysace compressa
Xanthosia huegelii

Family	Taxon
Epacridaceae	
	Astroloma pallidum
	Leucopogon australis
	Leucopogon capitellatus
	Leucopogon nutans
	Leucopogon propinquus
	Styphelia tenuiflora
Rubiaceae	
	Opercularia echinocephala
	Opercularia hispidula
	Opercularia vaginata
Goodeniaceae	
	Dampiera alata
	Dampiera linearis
	Lechenaultia biloba
	Scaevola calliptera
Stylidiaceae	
	Stylidium brunonianum
	Stylidium piliferum
	Stylidium schoenoides
Asteraceae	
	**Arctotheca calendula*
	Craspedia variabilis
	Hyalosperma cotula
	***Hypochaeris glabra*
	Lagenophora huegelii
	Senecio quadridentatus
	Trichocline spathulata

APPENDIX B

Quadrat Data

LEGEND

ABBREVIATION	DESCRIPTION
sp.	Species
subsp.	Subspecies
var.	Variety
*	Weed
forma	Form not as obvious a distinction as variety or subspecies
ms	Unpublished name
?	Plant was vegetative at the time of survey. No positive identification was possible

QUADRAT GI01

Location: Wetland on opposite side of creek along access track
Datum: 423041E; 6481781N
Soil: Silty grey sand
Litter: Leaves 5%; Branches 1%
Topography: Flat above creek
Vegetation Description: Low Woodland A of *Melaleuca preissiana* over Open Scrub of *Hakea varia* over Dense Tall Sedges of *Lepidosperma drummondii* and *Chorizandra enodis*
Vegetation Condition; Excellent
Notes: Scattered clumps of Bulrush in the area

TAXON	HEIGHT (cm)	% COVER
Austrostipa elegantissima	70	<1
Burchardia multiflora	10	<1
Chamaescilla corymbosa	5	<1
Chorizandra enodis	50	40
Drosera rosulata	1	<1
Hakea varia	300	5
Lepidosperma drummondii	70	40
Melaleuca preissiana	800	20
Patersonia occidentalis	20	<1
Schoenus bifidus	15	5
Tribonanthes longipetala	15	<1
Xanthorrhoea preissii	110	5
Banksia littoralis	Opportunistic	
Billardiera fusiformis	Opportunistic	
Corymbia calophylla	Opportunistic	
Cyathochaeta avenacea	Opportunistic	
Hypolaena exsulca	Opportunistic	

TAXON	HEIGHT (cm)	% COVER
Mesomelaena tetragona	Opportunistic	
Schoenus unispiculatus	Opportunistic	
**Typha orientalis*	Opportunistic	
Viminaria juncea	Opportunistic	

QUADRAT GI02

Location: Along track to higher ground above wetland
Datum: 423014E; 6481645N
Soil: Grey sandy loam, with 10% laterite pebbles on the surface
Litter: Leaves 30%; Branches 5%
Topography: Lower slope facing NW
Vegetation Description: Open Low Woodland A of *Eucalyptus marginata* subsp. *thalassica* over Low Scrub A of *Xanthorrhoea preissii* over Low Heath D dominated by *Hibbertia hypericoides* over Open Herbs and Open Tall Sedges
Vegetation Condition: 3
Notes: Dieback throughout the area - deaths in plots. Occasionally *Hakea prostrata* dominant

TAXON	HEIGHT (cm)	% COVER
Boronia ovata	25	2
Bossiaea ornata	30	<1
Burchardia umbellata	35	<1
Conostylis setosa	15	1
Dampiera linearis	5	<1
Desmocladus fasciculatus	5	<1
Drosera erythrorhiza	2	<1
Drosera macrantha	Twiner	<1
Dryandra lindleyana var. *lindleyana*	15	5
Eucalyptus marginata subsp. *thalassica*	1200	10
Gompholobium knightianum	20	<1
Gompholobium marginatum	10	<1
Grevillea synapheae	20	<1
Hakea lissocarpha	60	5
Hibbertia commutata	30	<1

TAXON	HEIGHT (cm)	% COVER
Hibbertia hypericoides	50	30
Labichea punctata	20	<1
Lepidosperma leptophyllum	70	2
Lepidosperma squamatum	70	10
Leucopogon capitellatus	30	1
Leucopogon propinquus	15	<1
Lomandra hermaphrodita	20	<1
Lomandra sericea	50	3
Mesomelaena tetragona	60	1
Patersonia babianoides	15	<1
Patersonia juncea	15	2
Petrophile striata	40	1
Stylidium piliferum	5	<1
Styphelia tenuiflora	50	<1
Tetraria capillaris	40	10
Tetratheca hirsuta	25	<1
Trichocline spathulata	10	1
Xanthorrhoea gracilis	100	5
Xanthorrhoea preissii	150	15
Acacia nervosa	Opportunistic	
Acacia pulchella	Opportunistic	
Alexgeorgea nitens	Opportunistic	
Allocasuarina humilis	Opportunistic	
Anigozanthos manglesii	Opportunistic	
Baeckea camphorosmae	Opportunistic	
Billardiera fusiformis	Opportunistic	
Borya sphaerocephala	Opportunistic	
Bossiaea preissii	Opportunistic	
Caesia micrantha	Opportunistic	
Calytrix glutinosa	Opportunistic	
Conostylis aurea	Opportunistic	
Conostylis setigera	Opportunistic	
Corymbia calophylla	Opportunistic	
Dampiera alata	Opportunistic	
Daviesia horrida	Opportunistic	
Dianella revoluta	Opportunistic	
Drosera menziesii subsp. *menziesii*	Opportunistic	
Dryandra bipinnatifida	Opportunistic	
Gastrolobium calycinum	Opportunistic	
Gastrolobium capitatum	Opportunistic	
Gastrolobium dilatatum	Opportunistic	
Gonocarpus cordiger	Opportunistic	
Haemodorum brevisepalum	Opportunistic	
Haemodorum paniculatum	Opportunistic	
Hakea prostrata	Opportunistic	
Hakea trifurcata	Opportunistic	
**Hypochaeris glabra*	Opportunistic	
Hypolaena exsulca	Opportunistic	

TAXON	HEIGHT (cm)	% COVER
Kennedia coccinea	Opportunistic	
Laxmannia grandiflora	Opportunistic	
Lechenaultia biloba	Opportunistic	
Lepidosperma longitudinale	Opportunistic	
Leptomeria cunninghamii	Opportunistic	
Loxocarya cinerea	Opportunistic	
Neurachne alopecuroidea	Opportunistic	
Opercularia vaginata	Opportunistic	
Orthrosanthus laxus	Opportunistic	
Phyllanthus calycinus	Opportunistic	
Ptilotus manglesii	Opportunistic	
**Romulea rosea*	Opportunistic	
Scaevola calliptera	Opportunistic	
Stylidium brunonianum	Opportunistic	
Synaphea petiolaris	Opportunistic	
Tetratheca pilifera	Opportunistic	
Thysanotus patersonii	Opportunistic	
Thysanotus sparteus	Opportunistic	
Trymalium ledifolium	Opportunistic	

QUADRAT GI03

Location: West of track to bore. Track to south of wetland/creek
Datum: 422885E; 6481649N
Soil: Grey silty clay
Litter: Leaves 15%; Logs 1%
Topography: Lower slope
Vegetation Description: Low Woodland B of *Corymbia calophylla* over Scrub of *Xanthorrhoea preissii* over Dense Tall Sedges of *Mesomelaena tetragona*
Vegetation Condition: Excellent
Notes: Below lower slope but above GI01 vegetation unit. Area damp

TAXON	HEIGHT (cm)	% COVER
Acacia nervosa	50	3
Borya sphaerocephala	5	1
Conostylis aurea	25	5
Conostylis setigera	15	<1
Corymbia calophylla	100	3
Cyathochaeta avenacea	70	1
Dampiera alata	30	2
Desmocladus fasciculatus	15	5
Dryandra lindleyana var. *lindleyana*	10	2
Gastrolobium capitatum	20	1
Hakea prostrata	30	<1
Hakea varia	300	2
Hypolaena exsulca	50	2
Kunzea micrantha	30	2
Lagenophora huegelii	5	<1
Lepidosperma squamatum	30	1

TAXON	HEIGHT (cm)	% COVER
Mesomelaena tetragona	70	70
Neurachne alopecuroidea	5	1
Schoenus bifidus	5	5
Tetraria octandra	30	1
Tribonanthes longipetala	15	1
Xanthorrhoea preissii	300	15
Daviesia horrida	Opportunistic	
Drosera gigantea	Opportunistic	
Drosera rosulata	Opportunistic	
Gastrolobium calycinum	Opportunistic	
Haemodorum brevisepalum	Opportunistic	
Haemodorum paniculatum	Opportunistic	
Hypocalymma angustifolium	Opportunistic	
Lomandra hermaphrodita	Opportunistic	
Melaleuca preissiana	Opportunistic	
Patersonia juncea	Opportunistic	
Ptilotus manglesii	Opportunistic	
Senecio quadridentatus	Opportunistic	
Viminaria juncea	Opportunistic	

QUADRAT GI04

Location: 100m from southern boundary. Below tennis courts
Datum: 422863E; 6481457N
Soil: Grey sand, few laterite pebbles
Litter: Leaves 20%; Branches 5%; Logs 20%
Topography: Middle slope
Vegetation Description: Open Woodland *of Eucalyptus marginata* subsp. *thalassica* and *Corymbia calophylla* over Low Scrub B of *Xanthorrhoea preissii* over Dwarf Scrub D dominated by *Hibbertia hypericoides*
Vegetation Condition: Good – unable to be in better condition due to presence of dieback
Notes: Deaths in Jarrah
GI04B also at 423155E; 6481452N
GI04C also at 423442E; 6481582N. At this site the trees were denser and there were more laterite pebbles on the surface

TAXON	HEIGHT (cm)	% COVER
Acacia applanata	30	<1
Acacia pulchella	50	1
Amphipogon amphipogonoides	10	<1
Anigozanthos manglesii	50	<1
Burchardia umbellata	60	1
Conostylis setosa	15	<1
Corymbia calophylla	15	5
Craspedia variabilis	70	<1
Dampiera linearis	5	<1
Desmocladus fasciculatus	5	3
Drosera pallida	Twiner	<1
Dryandra bipinnatifida	10	<1

TAXON	HEIGHT (cm)	% COVER
Dryandra lindleyana var. *lindleyana*	10	2
Eucalyptus marginata subsp. *thalassica*	15	5
Gompholobium knightianum	20	<1
Gompholobium marginatum	5	<1
Hakea lissocarpha	100	5
Hibbertia hypericoides	50	20
Hyalosperma cotula	5	<1
Hypocalymma angustifolium	50	2
Lagenophora huegelii	10	<1
Lepidosperma squamatum	70	3
Lomandra sonderi	50	5
Mesomelaena tetragona	70	2
Opercularia echinocephala	20	1
Orthrosanthus laxus	60	1
Phyllanthus calycinus	40	1
Scaevola calliptera	5	<1
Stylidium piliferum	25	<1
Stylidium schoenoides	10	<1
Tetraria capillaris	50	10
Tetraria octandra	60	<1
Tricoryne elatior	70	<1
Xanthorrhoea preissii	120	25
Allocasuarina fraseriana	Opportunistic	
Baeckea camphorosmae	Opportunistic	
Banksia grandis	Opportunistic	
Boronia ramosa	Opportunistic	
Bossiaea ornata	Opportunistic	
Bossiaea pulchella	Opportunistic	
Caesia micrantha	Opportunistic	
Cyathochaeta avenacea	Opportunistic	
Daviesia incrassata	Opportunistic	
Daviesia rhombifolia	Opportunistic	
Dianella revoluta	Opportunistic	
Drosera stolonifera	Opportunistic	
Gastrolobium dilatatum	Opportunistic	
Gompholobium preissii	Opportunistic	
Labichea punctata	Opportunistic	
Lechenaultia biloba	Opportunistic	
Lomandra sericea	Opportunistic	
Macrozamia riedlei	Opportunistic	
Patersonia babianoides	Opportunistic	
Patersonia juncea	Opportunistic	
Pimelea suaveolens	Opportunistic	
Pterostylis vittata	Opportunistic	
Ptilotus manglesii	Opportunistic	
Styphelia tenuiflora	Opportunistic	
Templetonia drummondii	Opportunistic	
Xanthosia huegelii	Opportunistic	

QUADRAT GI05

Location: At eastern end of where bitumen road, southern side, ends
Datum: 423056E; 6481382N
Soil: Grey sandy loam with 20% laterite outcropping
Litter: Leaves 40%; Branches 2%
Topography: Upper slope facing N
Vegetation Description: Low Forest A of *Corymbia calophylla* and *Eucalyptus marginata* subsp. *thalassica* over Open Low Woodland B of *Banksia grandis* over Low Heath C dominated by *Hibbertia hypericoides*
Vegetation Condition: Very good
Notes: Little dieback. Close to track but only a few areas with *Banksia grandis*

TAXON	HEIGHT (cm)	% COVER
Adenanthos barbiger	40	3
Amphipogon turbinatus	30	<1
Banksia grandis	500	03-Oct
Bossiaea ornata	60	2
Conostylis setosa	25	<1
Corymbia calophylla	1000	20
Dampiera linearis	10	<1
Daviesia preissii	50	<1
Dryandra bipinnatifida	15	<1
Dryandra lindleyana var. *lindleyana*	10	3
Dryandra sessilis var. *sessilis*	450	3
Eucalyptus marginata subsp. *thalassica*	900	20
Hibbertia commutata	50	1
Hibbertia huegelii	10	1
Hibbertia hypericoides	70	50

TAXON	HEIGHT (cm)	% COVER
Lepidosperma squamatum	50	1
Leucopogon nutans	70	1
Lomandra hermaphrodita	25	<1
Patersonia rudis	40	1
Petrophile striata	50	1
Stylidium piliferum	10	<1
Styphelia tenuiflora	50	1
Tetraria capillaris	70	35
Tetratheca hirsuta	30	1
Thysanotus sparteus	70	<1
Tricoryne elatior	50	<1
Xanthorrhoea brunonis	110	2
Xanthorrhoea gracilis	110	1
Xanthorrhoea preissii	250	5
Anigozanthos manglesii	Opportunistic	
Bossiaea pulchella	Opportunistic	
Burchardia umbellata	Opportunistic	
Gompholobium knightianum	Opportunistic	
Grevillea synapheae	Opportunistic	
Hibbertia montana	Opportunistic	
Hovea chorizemifolia	Opportunistic	
Kennedia coccinea	Opportunistic	
Lomandra sericea	Opportunistic	
Opercularia echinocephala	Opportunistic	
Persoonia elliptica	Opportunistic	
Pimelea suaveolens	Opportunistic	
Platysace compressa	Opportunistic	
Scaevola calliptera	Opportunistic	
Stylidium schoenoides	Opportunistic	

QUADRAT GI06

Location: Just to the west of the gate beyond oval
Datum: 423147E; 6481407N
Soil: Grey sandy loam with laterite pebbles on the surface
Litter: Leaves 80%; Branches 2%
Topography: Ridge/Upper slope facing N
Vegetation Description: Open Low Woodland A of *Eucalyptus marginata* subsp. *thalassica* over Thicket of *Dryandra sessilis* var. *sessilis* and *Dryandra squarrosa* over Open Low Sedges of *Tetraria capillaris*
Vegetation Condition: Good
Notes: Dieback in the area
Also at - GI06b 423466E; 6481458N

TAXON	HEIGHT (cm)	% COVER
Burchardia umbellata	50	<1
Dianella revoluta	60	<1
Drosera erythrorhiza	2	<1
Dryandra bipinnatifida	15	<1
Dryandra lindleyana var. *lindleyana*	20	<1
Dryandra sessilis var. *sessilis*	400	60
Dryandra squarrosa	250	10
Eucalyptus marginata subsp. *thalassica*	1400	5
Gompholobium knightianum	20	<1
Gompholobium marginatum	15	<1
Gompholobium preissii	15	<1
Hakea lissocarpha	60	<1
Hibbertia hypericoides	40	15
Lepidosperma squamatum	70	5
Leucopogon nutans	70	2

TAXON	HEIGHT (cm)	% COVER
Lomandra sericea	30	<1
Opercularia echinocephala	75	<1
Patersonia umbrosa	70	<1
Pentapeltis peltigera	2	<1
Petrophile striata	60	<1
Pimelea suaveolens	20	<1
Ptilotus manglesii	5	<1
Stylidium piliferum	10	<1
Tetraria capillaris	40	15
Tricoryne elatior	70	<1
Acacia barbinervis	Opportunistic	
Acacia pulchella	Opportunistic	
Amphipogon amphipogonoides	Opportunistic	
Banksia grandis	Opportunistic	
Boronia cymosa	Opportunistic	
Bossiaea ornata	Opportunistic	
Bossiaea preissii	Opportunistic	
Bossiaea pulchella	Opportunistic	
Caladenia flava	Opportunistic	
Calytrix depressa	Opportunistic	
Conostylis setosa	Opportunistic	
Corymbia calophylla	Opportunistic	
Daviesia incrassata	Opportunistic	
Daviesia rhombifolia	Opportunistic	
Desmocladus fasciculatus	Opportunistic	
Drosera macrantha	Opportunistic	
Drosera stolonifera	Opportunistic	
Gastrolobium dilatatum	Opportunistic	
Grevillea synapheae	Opportunistic	
Haemodorum paniculatum	Opportunistic	
Hibbertia huegelii	Opportunistic	
Hyalosperma cotula	Opportunistic	
Kennedia coccinea	Opportunistic	
Lechenaultia biloba	Opportunistic	
Leucopogon capitellatus	Opportunistic	
Opercularia vaginata	Opportunistic	
Persoonia elliptica	Opportunistic	
Phyllanthus calycinus	Opportunistic	
Pronaya fraseri	Opportunistic	
Scaevola calliptera	Opportunistic	
Sphaerolobium medium	Opportunistic	
Tetratheca hirsuta	Opportunistic	
Xanthorrhoea preissii	Opportunistic	

QUADRAT GI07

Location: Damp area to south of creek
Datum: 423403E; 6481727N
Soil: Brown sandy silt
Litter: N/A
Topography: Flat
Vegetation Description: Open Scrub of *Hakea varia* over Open Low Sedges dominated by *Lepidosperma drummondii* and *Chorizandra enodis* over Very Open Herbs
Vegetation Condition: Good to very good
Notes: Similar to Quadrat GI01 but more degraded

TAXON	HEIGHT (cm)	% COVER
Burchardia multiflora	30	1
Chorizandra enodis	30	30
Hakea varia	200	5
Hypoxis occidentalis	15	1
Lepidosperma drummondii	50	50
**Romulea rosea*	20	5
Tribonanthes longipetala	15	1
Haemodorum brevisepalum	Opportunistic	
**Lotus subbiflorus*	Opportunistic	
Meeboldina cana	Opportunistic	
Melaleuca preissiana	Opportunistic	
**Sparaxis bulbifera*	Opportunistic	
Wurmbea dioica	Opportunistic	

QUADRAT GI08

Location: Beside Toodyay Road on north side of creek
Datum: 423308E; 6481841N
Soil: Black sandy clay with a lot of peat
Litter: Leaves 30%; Branches 20%; Logs 10%
Topography: Drainage line
Vegetation Description: Dense Low Forest A of *Melaleuca preissiana* over Scrub of *Taxandria linearifolia* over Low Sedges of ?*Tetraria capillaris*
Vegetation Condition: Excellent

TAXON	HEIGHT (cm)	% COVER
Acacia applanata	40	<1
Acacia extensa	50	<1
Banksia littoralis	400	1
Cassytha racemosa forma *racemosa*	Twiner	<1
Leucopogon australis	120	1
Melaleuca preissiana	1000	90
Taxandria linearifolia	300	20
?Tetraria capillaris	40	20
Corymbia calophylla	Opportunistic	
Hakea prostrata	Opportunistic	
Lepidosperma drummondii	Opportunistic	
Macrozamia riedlei	Opportunistic	
Scaevola calliptera	Opportunistic	
Xanthorrhoea brunonis	Opportunistic	
Xanthorrhoea preissii	Opportunistic	

QUADRAT GI09

Location: To the west of the fire shed
Datum: 423356E; 6481894N
Soil: Pale grey sand
Litter: Leaves 70%
Topography: Lower slope
Vegetation Description: Low Woodland A of *Corymbia calophylla* over Open Low Scrub B of *Xanthorrhoea brunonis* over Herbs of *Phlebocarya ciliata* over Dense Low Sedges dominated by *Hypolaena exsulca*
Vegetation Condition: Excellent
Notes: Track to bore and shed within the property has a lot of weeds, including **Moraea flaccida*, **Oxalis purpurea* and annual grasses

TAXON	HEIGHT (cm)	% COVER
Acacia applanata	25	<1
Burchardia umbellata	70	1
Caesia micrantha	40	<1
Chamaescilla corymbosa	20	1
Conospermum capitatum subsp. *capitatum*	50	1
Conostylis setigera	25	5
Corymbia calophylla	1000	20
Craspedia variabilis	70	1
Dampiera alata	15	<1
Dampiera linearis	20	1
Desmocladus fasciculatus	20	5
Drosera macrantha	Twiner	<1
Gastrolobium capitatum	25	1
Hibbertia hypericoides	50	1

TAXON	HEIGHT (cm)	% COVER
Hypolaena exsulca	40	90
Jacksonia sternbergiana	120	1
Lepidosperma squamatum	90	5
Lomandra sericea	40	<1
Luzula meridionalis	50	<1
Lyginia imberbis	40	1
Meeboldina cana	60	1
Opercularia hispidula	25	<1
Phlebocarya ciliata	40	70
Prasophyllum parvifolium	20	<1
Thelymitra crinita	30	<1
Thysanotus patersonii	Twiner	<1
Xanthorrhoea brunonis	110	5
Xanthorrhoea preissii	120	5
Xanthosia huegelii	10	1
Acacia extensa	Opportunistic	
Acacia nervosa	Opportunistic	
Acacia pulchella	Opportunistic	
Adenanthos barbiger	Opportunistic	
**Arctotheca calendula*	Opportunistic	
Astroloma pallidum	Opportunistic	
Banksia littoralis	Opportunistic	
Bossiaea ornata	Opportunistic	
Daviesia divaricata	Opportunistic	
Dillwynia laxiflora	Opportunistic	
Diuris corymbosa	Opportunistic	
Dryandra lindleyana var. *lindleyana*	Opportunistic	
Eucalyptus marginata subsp. *thalassica*	Opportunistic	
Gonocarpus cordiger	Opportunistic	
Grevillea synapheae	Opportunistic	
Hakea prostrata	Opportunistic	
Hypocalymma angustifolium	Opportunistic	
Kennedia prostrata	Opportunistic	
Lechenaultia biloba	Opportunistic	
Leucopogon australis	Opportunistic	
Leucopogon capitellatus	Opportunistic	
Lomandra hermaphrodita	Opportunistic	
Macrozamia riedlei	Opportunistic	
Mesomelaena tetragona	Opportunistic	
**Moraea flaccida*	Opportunistic	
Nuytsia floribunda	Opportunistic	
Orthrosanthus laxus	Opportunistic	
**Oxalis purpurea*	Opportunistic	
Phyllanthus calycinus	Opportunistic	
Pterostylis recurva	Opportunistic	
Scaevola calliptera	Opportunistic	
Stylidium schoenoides	Opportunistic	
Tetraria octandra	Opportunistic	

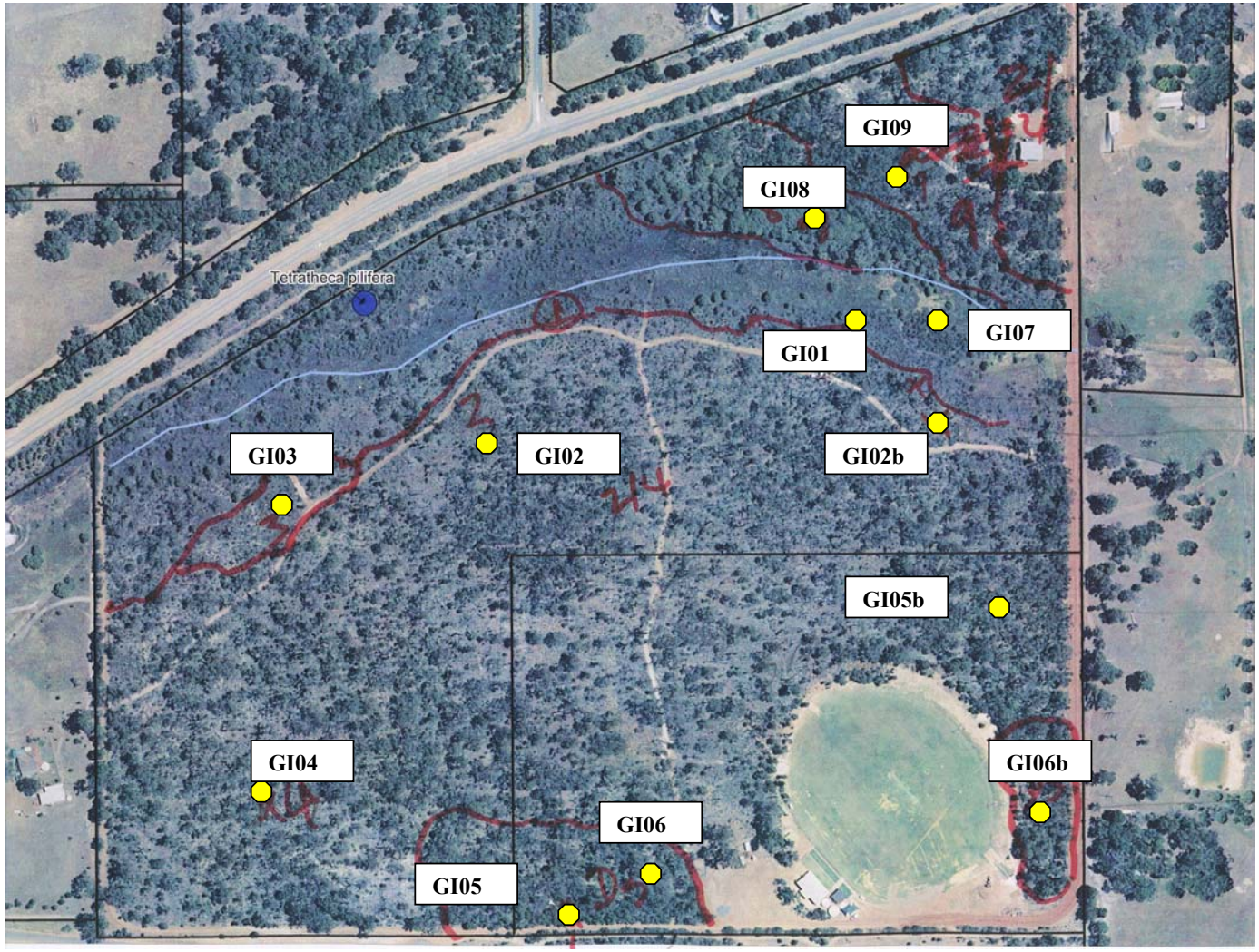
APPENDIX C

Maps

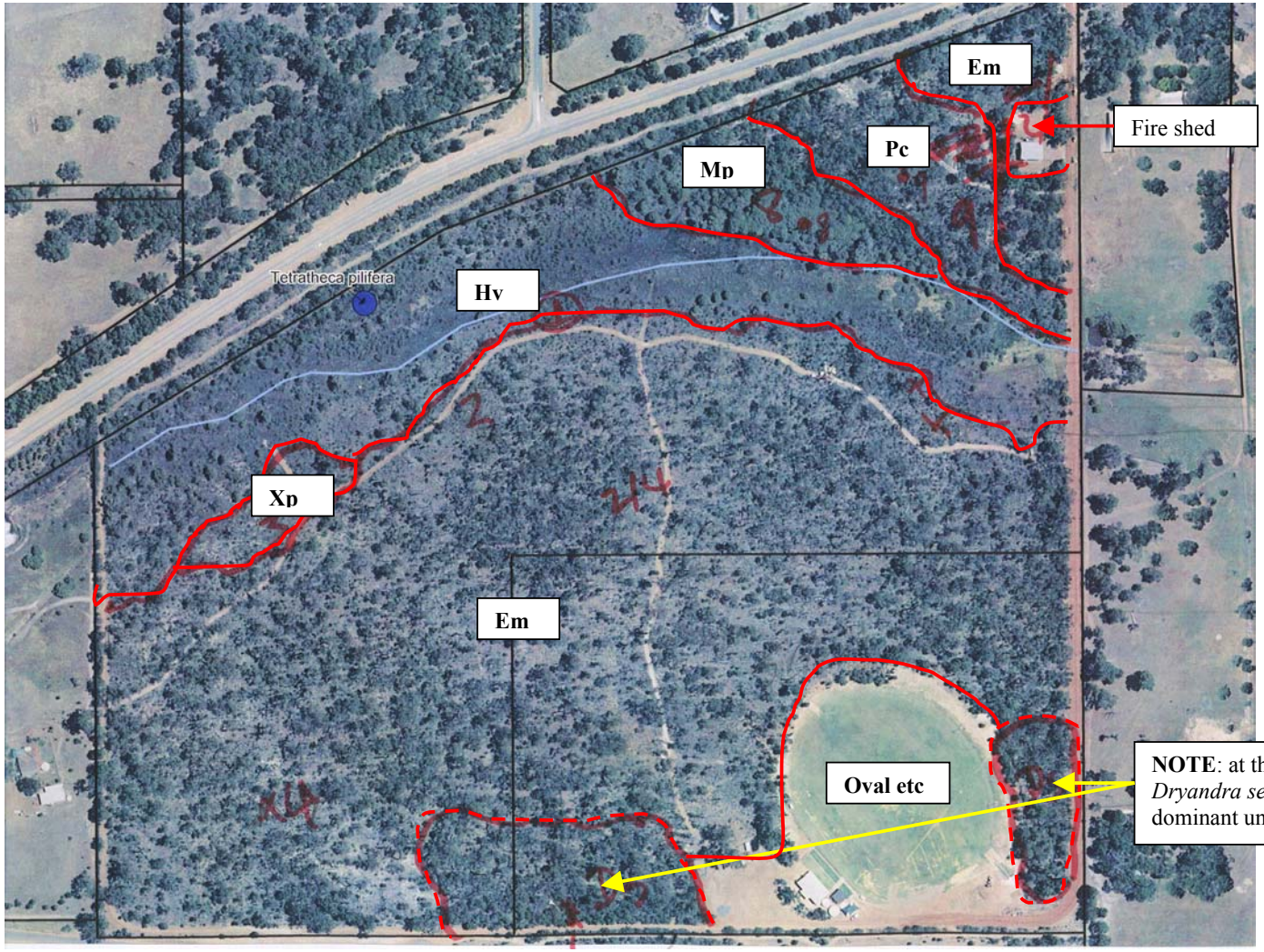
1. Location of quadrats
2. Vegetation units
3. Vegetation condition

LEGEND

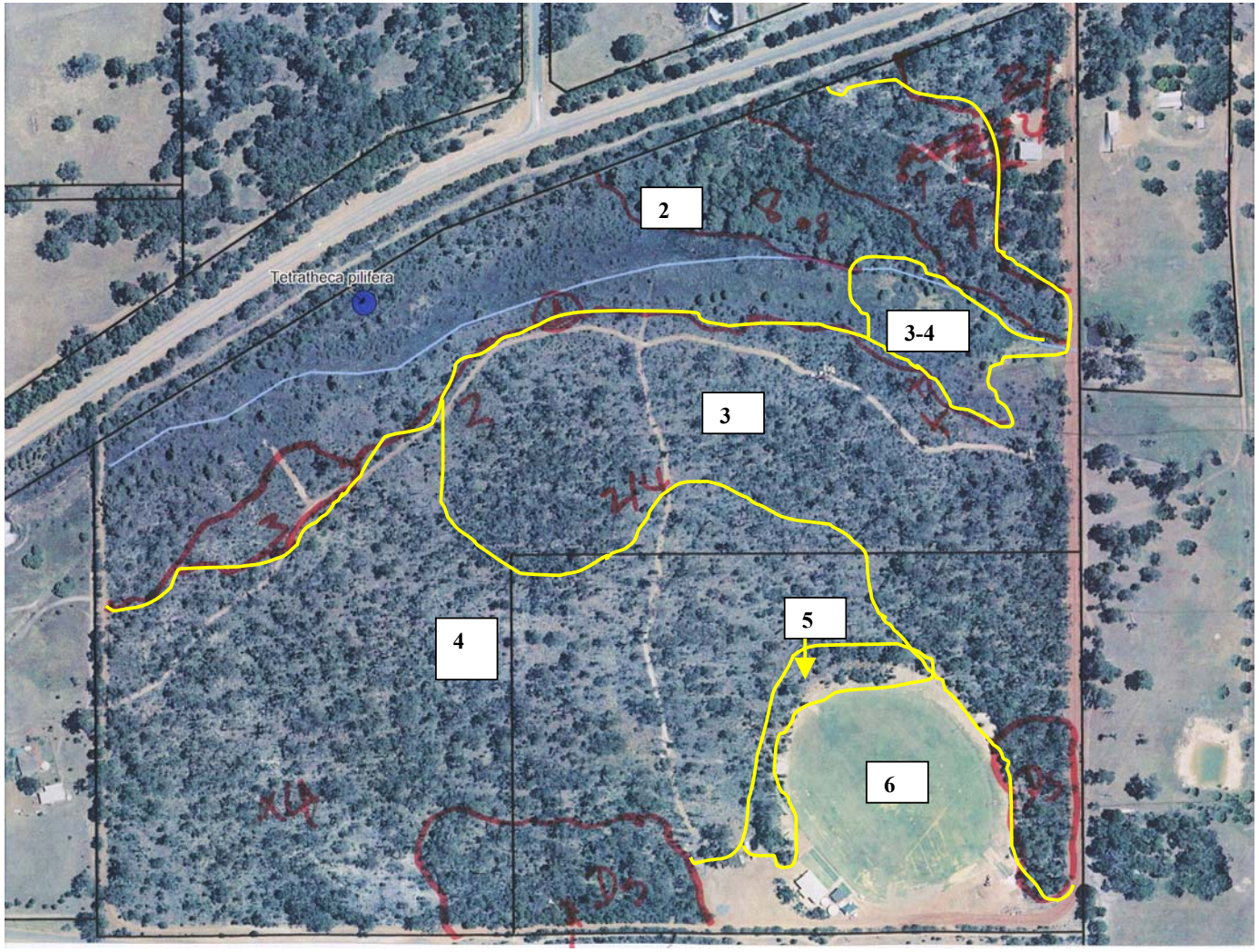
ABBREVIATION	DESCRIPTION
Vegetation Unit	
Em	Open Low Woodland A of *Eucalyptus marginata* subsp. *thalassica* over Thicket of *Dryandra sessilis* var. *sessilis* and *Dryandra squarrosa* or Low Scrub A of *Xanthorrhoea preissii* over Low Heath D dominated by *Hibbertia hypericoides* over Open Low Sedges dominated by *Tetraria capillaris*
Pc	Low Woodland A *of Corymbia calophylla* over Open Low Scrub B of *Xanthorrhoea brunonis* over Herbs of *Phlebocarya ciliata* over Dense Low Sedges dominated by *Hypolaena exsulca*
Xp	Low Woodland B of *Corymbia calophylla* over Scrub of *Xanthorrhoea preissii* over Dense Tall Sedges of *Mesomelaena tetragona*
Mp	Dense Low Forest A of *Melaleuca preissiana* over Scrub of *Taxandria linearifolia* over Low Sedges of ?*Tetraria capillaris*
Hv	Low Woodland A of *Melaleuca preissiana* over Open Scrub of *Hakea varia* over Open Low Sedges dominated by *Lepidosperma drummondii* and *Chorizandra enodis* over Very Open Herbs
Vegetation Condition	
2	Excellent
3	Very good
3-4	Varying between good and very good
4	Good



Map 1. Approximate location of quadrats



Map 2. Vegetation units



Map 3. Vegetation condition