Flora and Vegetation Survey of Digger Rocks And the RT Pipeline corridor (M74/58, M74/90, M74/57 and L77/44) For Western Areas NL

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Final

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Contents **Page #**

Appendices

Appendix 1: Map of the survey area.
Appendix 2: Species list of the surveyed area.
Appendix 3: CALM and WAHERB Databases search results for Rare and Priority species within the Forrestania project area.
Appendix 4: Coordinates of sample points taken during the survey.
Appendix 5: Locations of Priority Flora

1 Introduction

Western Areas NL (WSA) tenements at the Forrestania Nickel Project are located approximately 170 km south of Southern Cross, 80km east of Hyden and stretch 80km along the Forrestania Nickel Province. WSA proposes to expand its current exploration drilling program within the Digger Rocks project area. Additionally WSA propose to bury a 16km long dewatering pipeline from the Digger Rocks area to a farming property to the south west, where an evaporation pond is proposed to be constructed.

1.1 Previous surveys

Botanica Consulting have conducted several flora and vegetation surveys within the Digger Rocks project area since 2004. Two surveys which are relevant to this report area described below (2004 and 2005) and the results of which have been integrated with the 2006 results to produce this single report displaying a map of the vegetation groups present. The survey conducted in 2006 within the Digger Rocks area involved additional areas adjacent to those already surveyed in 2004. Since the vegetation groups recorded in 2006 are adjacent and are extensions of the vegetation groups recorded in 2004, the 2004 results have been integrated with the vegetation groups recorded in 2006.

1.1.1 2004

Jim's Seeds, Weeds and Trees Pty Ltd (JSWT) were commissioned by WSA to conduct a Flora survey of the Digger Rocks area in spring of 2004. The flora survey covered an area of 134ha and lies adjacent to the new additional survey area. The methods of the 2004 flora survey were similar to that of the 2006 methods described in section 2. Results of the 2004 survey have therefore been integrated within the 2006 results to form a larger area (Appendix 1).

1.1.2 2005

On the 16th December 2005, a Priority Flora search was completed within the area surveyed in 2004. This survey was specifically targeted at counting Priority species that may have been affected by a proposed drilling program in the area. The results of this survey have been included in sections 3 and 6 and also Appendices 1 and 5.

1.2 Topography

WSA tenements are located in the Forrestania system within the Mallee Botanical District of the South-West Botanical Province (Beard, 1990). The Forrestania system is developed on the greenstone belt, which extends from Mt Holland in the north to Hatters Hill in the south. This system encompasses a variety of communities related to the underlying geology and occurs in a mosaic form (Beard 1990).

1.3 Vegetation

In this system, eucalypt woodlands and small salt lakes on the heavy soils and mallees on the elevated lateritic soils inhabit weathered greenstones. The North, Middle and South Ironcap hills break up the relatively flat topography and comprise ridges of banded ironstone supporting distinctive heath and thicket associations (Beard 1990). A large watershed extends along the ironcap hills, with expansive *Banksia, Grevillea* and *Hakea* sandplain mallee heaths occurring west to the Rabbit Proof Fence and Eucalypt woodlands and mallee mosaics to the east. Encompassed within the sandplain heaths, eucalypt woodlands and mallee heaths inhabit the drainage lines trending south and west (Aquila, 1989). The South-West Botanical Province is characterised by plants from the *Myrtaceae, Proteaceae, Mimosaceae, Papilionaceae, Epacridaceae, Dilleniaceae, Rutaceae, Asteraceae*, and *Cyperaceae* families.

2 Methods

On the 1st, 2nd and 3rd October 2006, BC were commissioned by WSA to conduct a flora survey in an additional Digger Rocks project area (62ha) and a 16km x 45m (72ha) pipeline corridor from the Digger Rocks area to a farming property to the west owned by Rod Turpin. An area of 100ha on the farming property owned by Rod Turpin is proposed to have an evaporation pond constructed, this area was also surveyed (2006 total approximate survey area is 234ha).

Due to the methodologies being similar for the 2004 (134ha) and 2006 (234ha) surveys and similar vegetation types, the total survey area is approximately 368ha. A map of this resulting survey area is attached as Appendix 1.

The total survey area (368ha) was traversed via a four-wheel drive vehicle, a Kawasaki Mule and on foot by two people with a GPS unit. The vegetation groups were easily accessible throughout the survey area and were extensively covered. The proposed pipe line runs along side an existing road. Different vegetation groups, when encountered, were described and the vegetation associations were examined for the presence or absence of any DRF and Priority flora species within the area.

Not all species collected were in flower, therefore some were difficult to identify to a species level. These species are represented by a question mark (?) preceding the most likely taxonomical identification in Appendix 2.

This flora survey of the study area was planned and implemented as far as practicable according to the Environmental Protection Authority (EPA) Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia,* (EPA 2005).

Prior to the field survey, the results of the combined search of the Department of Conservation and Land Management (CALM) Declared Rare and Priority Flora (CALM, 2005) and the Western Australian Herbarium (WAHERB, 2005) databases, were examined for species recorded within the known coordinates (GDA94 50 H E748726 N6454685 and 50 H E780669 N6357655). The results of this database search are listed in Appendix 3. These significant flora species were examined on the Western Australian Herbarium's web page (WAHERB 2006) prior to the survey. Unknown specimens collected during the survey

were identified with the aid of samples housed at the Western Australian Herbarium, and where necessary, specialists were consulted.

Table 1 represents the definitions of Declared Rare and Priority ratings as extracted from DEC (2006).

Table 1: Definitions of Rare and Priority Flora Species (DEC, 2006).

R: Declared Rare Flora - Extant Taxa (= Threatened Flora = Endangered + Vulnerable)
Taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.
X: Declared Rare Flora - Presumed Extinct Taxa
Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.
P1: Priority One - Poorly Known Taxa
Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2: 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.
P3: 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.
P4: Priority Four - Rare Taxa
Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.

Pictures and vegetation descriptions of the locations of the priority flora (revealed in the databases search) were obtained from Florabase. These vegetation types were searched for during the survey and when/if they were observed during the survey, they were traversed on foot specifically looking for the threatened flora associated with that vegetation description. The sample locations and GPS coordinates recorded during the survey are outlined in Appendix 4.

BC used a method of partially combining both a random meander technique (Cropper, 1993) and a quantitative technique. The random meander technique was used on a whole

across the survey area. This technique can allow for greater coverage than a plot based survey and is less time consuming (NPWS, 2001). As the name suggests, the random meander technique involves traversing areas of suitable habitat in no set pattern, but roughly back and forth, whilst recording the different species present. However partial use of the quantitative vegetation analysis was used (i.e. representative sample points used, although quadrats were not setup) via utilizing sample points that were marked with a GPS unit and traversed within a minimum radius of 50m.

Prior to field work aerial photography was visually inspected and obvious differences in the vegetation assemblages were initially identified via vegetation density and colouration of aerial photography. These different vegetation associations were then visited and used as initial sample sites. Additionally locations of Priority species revealed in the databases search were overlayed on this aerial photography using MapInfo Professional 7.0. These locations were also visited in the field and used as sample points.

When/if new vegetation groups were observed during the survey, sample points were utilised here also.

At each sample point, information recorded comprised of the following:
-GPS location
-Photograph of vegetation
-Visual identification of plants within a 50m radius
-Dominant species
-Collection and documentation of unknown plant specimens within 50m radius
-GPS location, photo and collection of Threatened Flora if encountered

Presence/absence data of species from sample sites of similar vegetation was then compiled forming the best representative vegetation groups. Similar vegetation groups were recognised visually in the field.

2.1 Objectives

The objectives of this report were to:

- Traverse the survey area (M74/58, M74/90, M74/57 and L77/44).
- Identify and collect the vascular plant taxa in the survey area.
- Provide a description of the vegetation occurring within the survey area.
- Assess the vegetation condition according to Keighery (1994).
- Assess the clearing principles specifically relating to native vegetation as outlined in Schedule 5 attached to the *Environmental Protection Act 1986.*

2.2 Limitations to the Survey

The main limitations to this survey are as follows:

- The vegetation units for this study were based on visual descriptions of locations in the field. The distribution of these vegetation groups outside the study area is not known, however vegetation groups identified in the field were categorized via comparison to the best representative vegetation distributions throughout WA given on ANRA 2006.

- Field work was completed at the EPA's recommended time period (ie Spring) for detecting most ephemeral flora for both the 2004 and 2006 surveys. Although not all species were in flower, above average rainfall had occurred in October 2004 and September 2006 at Lake Carmody 43km from Digger Rocks (Figure 1).

- In the opinion of BC the survey area was covered extensively but not exhaustively. BC estimate that approximately 95% of the flora species in the survey area were recorded. This estimation takes into account the intensity of the survey work, the experience of the Botanist undertaking the work and the timing of the survey work.

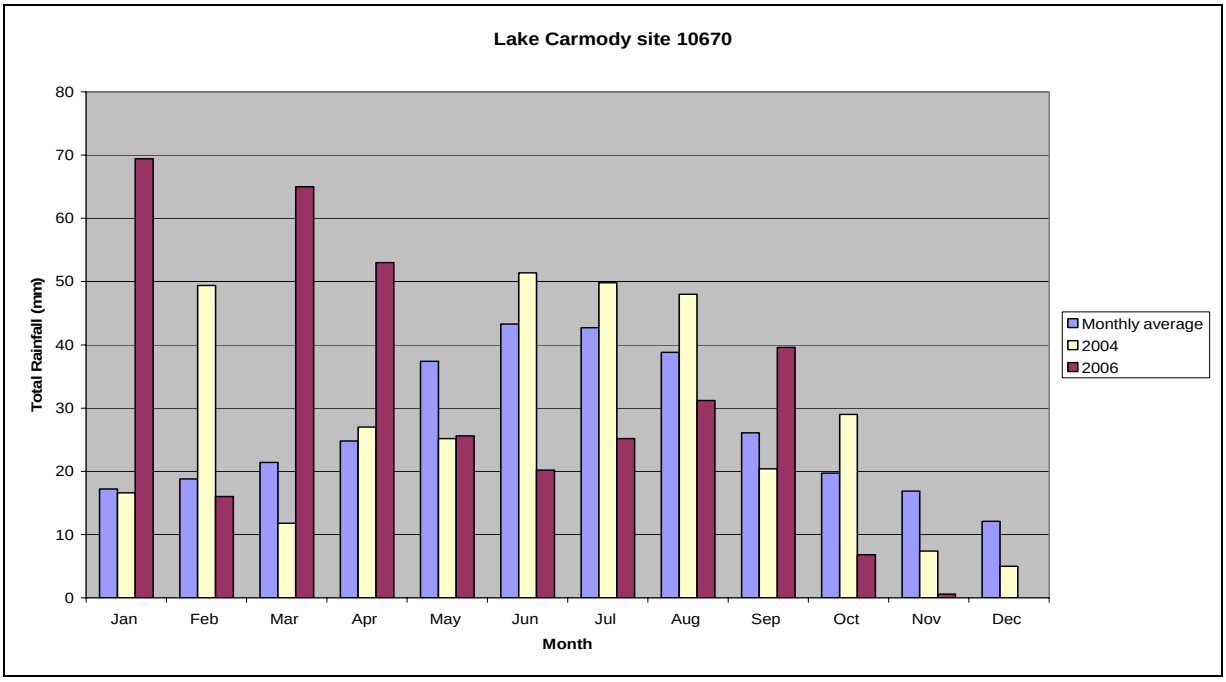

Figure 1: Total monthly rainfall for Lake Carmody 2004 and 2006 (BOM, 2006).

3 Results

Eleven vegetation groups were encountered within the survey area, Transitional Tall *Eucalyptus* woodland, *Eucalyptus rugulata* woodland, *Eucalyptus* mallee woodland, Melaleuca thicket, Casuarina shrubland, Fire regeneration area, Sandplain heath, Cleared farmland, Sandplain regrowth area, Ultramafic caprock vegetation (UCR) and Rehabilitation area. These eleven vegetation groups were represented by a total of 41 Families, 93 Genera and 228 Species.

3.1 Transitional Tall *Eucalyptus* woodland

3.1.1 Flora

Flora recorded in the Transitional Tall *Eucalyptus* woodland vegetation group was represented by 20 Families, 23 Genera and 46 Species (Appendix 2).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

No Priority Flora as defined by the Department of Conservation and Land Management (2005) were located in this vegetation group.

3.1.2 Vegetation

Flora recorded in this group was representative of Transitional Tall *Eucalyptus* woodland. The dominant species were *Eucalyptus flocktoniae ssp flocktoniae* and *E. urna.* Upperstorey species within this vegetation group include *E. salmonophloia, E. flocktoniae* and *E. urna,* while the mid-storey comprised of *many Melaleuca sp, Daviesia nematophylla, Senna artemisioides ssp filifolia, Halgania andromedifolia* and *Dodonaea bursariifolia.*

The understorey species include *Olearia muelleri, Wilsonia humilis, Atriplex stipitata, Astroloma serratifolium, Acacia intricata, A. deficiens* and *Microcybe albiflora.*

Broad scale clearing has occurred for agricultural purposes in this community within the survey area specifically restricted to the south western end of the pipeline route (west of the State Barrier Fence). Here several patches of remnant native vegetation are present surrounded by cleared farmland.

This vegetation is best represented by *Eucalyptus* woodlands according to ANRA (DEH, 2006), which covers 3.5% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 2 shows the Transitional Tall *Eucalyptus* woodland within the survey area.

Figure 2: Transitional Tall *Eucalyptus* woodland within the survey area.

3.2 *Eucalyptus rugulata* woodland

3.2.1 Flora

Flora recorded in the *Eucalyptus rugulata* woodland was represented by 17 Families, 35 Genera and 55 Species (Appendix 2).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

Four Priority Species were located during the survey. These species, *Eucalyptus rugulata* (P4), *Grevillea insignis ssp elliotii* (P3), *Grevillea lullfitzii* (P1) and *Stenanthemum liberum* (P1) were recorded at the locations shown in Appendix 5.

One known CALM record of *Grevillea insignis ssp elliotii* (P3) occurs within the survey area in this vegetation group. This location was confirmed whilst conducting the field work. Approximately 30 plants were recorded within the vicinity of this known location.

3.2.2 Vegetation

The vegetation recorded in this community was representative of a *Eucalyptus rugulata* woodland. The dominant species was *Eucalyptus rugulata*. Upper-storey species include *E. flocktoniae ssp flocktoniae and E. rugulata,* while the mid-storey species comprise *Allocasuarina campestris, Acacia frgilis, A. yorkrackiensis, Calothamnus quadrifidus, Hakea erecta, H. scoparia, Persoonia helix* and *Melaleuca cordata.*

Understorey species include: *Astroloma serratifolium, Hibbertia pungens, Westringia ceephalantha, Acacia sphacelata ssp sphacelata, Darwinia inconspicua, Verticordia plumosa var incrassate* and *Drummondita hassellii.*

No Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by *Eucalyptus* woodland according to ANRA (DEH, 2006), which covers 3.5% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 3 shows the *Eucalyptus rugulata* woodland within the survey area.

Figure 3: *Eucalyptus rugulata* woodland within the survey area.

3.3 *Eucalyptus* mallee woodland

3.3.1 Flora

Flora recorded in the *Eucalyptus* mallee woodland group was represented by 10 Families, 14 Genera and 30 Species (Appendix 2).

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

No Priority Species as defined by the Department of Conservation and Land Management (2005) were located during the survey.

3.3.2 Vegetation

The vegetation recorded in this community was representative of *Eucalyptus* mallee woodland. The upperstorey comprised of *Eucalyptus eremophila ssp eremophila, E. calycogona* and *E. cylindrocarpa* while the mid-storey comprised of *Eremophila drummondii, Melaleuca adnata, M. elliptica, M. hamata, Daviesia benthamii ssp acanthoclada* and *Hakea multilineata.*

Understorey species include *Coopernookia strophiolata, Westringia cephalantha, Acacia sphacelata ssp sphacelata* and *A. intricata.*

No Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by the mallee woodlands group according to ANRA (DEH, 2006), which covers 2% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 4 shows the *Eucalyptus* mallee woodland within the survey area.

Figure 4: *Eucalyptus* mallee woodland within the survey area.

3.4 *Melaleuca* thicket

3.4.1 Flora

Flora recorded in the *Melaleuca* thicket vegetation was represented by 11 Families, 15 Genera and 18 Species (Appendix 2).

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

No Priority Species as defined by the Department of Conservation and Land Management (2005) were located during the survey.

3.4.2 Vegetation

The vegetation recorded in this community was representative of a *Melaleuca* thicket. The dominant species was *Melaleuca hamata*. The upperstorey comprised of *Eucalyptus suggrandis ssp promiscua, Melelaeuca hamata* while the mid-storey comprised of *Goodenia pinifolia, Acacia hadrophylla, Leptospermum erubescens* and *Grevillea huegellii.*

Understorey species include *Lepidosperma brunonianum, Coopernookia strophiolata, Westringia cephalantha, Grevillea acuaria* and *Dodonaea bursariifolia.*

No Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by the Other shrublands group according to ANRA (DEH, 2006), which covers 1.7% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 5 shows the *Melaleuca* thicket within the survey area.

Figure 5: *Melaleuca* thicket within the survey area.

3.5 *Casuarina* shrubland

3.5.1 Flora

Flora recorded in the *Casuarina* shrubland was represented by 16 Families, 32 Genera and 60 Species (Appendix 2).

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

Two Priority Species were located during the survey. These species *Goodenia trichophylla* (P3) and *Grevillea lullfitzii* (P1) were recorded at locations shown in Appendices 1 and 5.

3.5.2 Vegetation

The vegetation recorded in this community was representative of a *Casuarina* shrubland. The upperstorey comprised of *Allocasuarina acutivalvis, A. corniculata* and *Eucalyptus leptophylla,* while the mid-storey comprised of *Acacia yorkrakiensis, A. cracentis, Leptospermum erubescens, Melaleuca cordata, Banksia elderiana, Dryandra cirsioides, Grevillea eriostachya* and *Hakea scoparia.*
Understorey species include *Hibbertia pungens, H. gracilipes, Dampiera eriocephala, Beaufortia interstans, Verticordia chrysantha* and *Drummondita hassellii.*

No Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by the Other shrublands group according to ANRA (DEH, 2006), which covers 1.7% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 6 shows the *Casuarina* shrubland within the survey area.

Figure 6: *Casuarina* shrubland within the survey area.

3.6 Fire Regeneration

3.6.1 Flora

Flora recorded in the Fire regeneration was represented by 8 Families, 11 Genera and 15 Species (Appendix 2).

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

One Priority Species was located during the survey. This species *Grevillea lullfitzii* (P1) was recorded at the locations listed in Appendix 5.

3.6.2 Vegetation

The vegetation recorded was representative of Fire regeneration. The upperstorey comprised of *Grevillea cagiana, G. eriostachya* and *Banksia elderiana,* while the mid-storey comprised of *Goodenia pinifolia, Eremophila densifolia, Melaleuca cordata* and *G. shuttleworthiana ssp obovata,*

Understorey species include *Lepidosperma brunonianum, Verticordia chrysantha* and *Drummondita hassellii*

No Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by the cleared modified native vegetation group according to ANRA (DEH, 2006), which covers 7.3% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 7 shows the Fire regeneration vegetation within the survey area.

Figure 7: Fire regeneration within the survey area.

3.7 Sandplain heath

3.7.1 Flora

Flora recorded in the Sandplain heath vegetation group was represented by 17 Families, 34 Genera and 45 Species (Appendix 2).

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

Two Priority Species were located during the survey. These species *Calytrix nematoclada* (P3) and *Grevillea prostrata* (P4) were recorded at locations shown in Appendices 1 and 5.

Grevillea prostrata (P4) was listed twice at one location on the CALM (2005) threatened flora database search results (sheet numbers 3463 and 3458) with an abundance of approximately 20 plants. This reference which occurs in the survey area was not located during the survey.

3.7.2 Vegetation

The vegetation recorded in this community was representative of Sandplain heath. The upperstorey comprised of *Allocasuarina campestris* and *Callitris preissii* while the mid-storey comprised of *Acacia multispicata, Calothamnus quadrifidus, Leptospermum erubescens, Melaleuca teuthidoides, Banksia elderiana, Grevillea cagiana, Hakea erecta* and *Santalum acuminatum.*

Understorey species include *Beaufortia interstans, Calytrix nematoclada (P3), Verticordia plumosa var inrassata* and *Drummondita hassellii.*

No Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by the Heath vegetation group according to ANRA (DEH, 2006), which covers 0.7% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 8 shows the Sandplain heath within the survey area.

Figure 8: Sandplain heath within the survey area.

3.8 Cleared farmland

3.8.1 Flora

Flora recorded in the cleared farmland was represented by 9 Families, 12 Genera and 13 Species (Appendix 2).

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

No Priority Species as defined by the Department of Conservation and Land Management (2005) were located during the survey.

3.8.2 Vegetation

The vegetation recorded was representative of cleared farmland. Species present included *Ptilotus polystachyus ssp polystachyus, Acacia lasiocalyx, Daviesia benthamii sp acanthoclada, Urodon dasyphyllus, Grevillea cagiana, Hakea erecta* and *Drummondita hassellii.*

Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by the cleared/modified native vegetation according to ANRA (DEH, 2006), which covers 7.3% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 9 shows the cleared farmland within the survey area.

Figure 9: cleared farmland within the survey area.

3.9 Sandplain regrowth

3.9.1 Flora

Flora recorded in the Sandplain regrowth group was represented by 6 Families, 9 Genera and 13 Species (Appendix 2). This area was previously cleared, however it has been left to regenerate to its natural condition from the seed bank in the topsoil. Observations of the regrowth would suggest it is 4-5 years old.

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

One Priority Species was located during the survey. This species *Grevillea lullfitzii* (P1) was recorded at the location listed in Appendix 5.

3.9.2 Vegetation

The vegetation recorded in this community was representative of Sandplain regrowth. The upperstorey comprised of *Acacia lasiocalyx* and *Eucalyptus sp* (sterile) while the mid-storey comprised of *Melaleuca cordata, M. adnata, Daviesia nematophylla* and *Exocarpos aphyllus.*

Understorey species include *Acacia sphacelata ssp sphacelata, Verticordia chrysantha* and *Grevillea heugellii.*

Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by cleared/modified native vegetation according to ANRA (DEH, 2006), which covers 7.3% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 10 shows the Sandplain regrowth within the survey area.

Figure 10: Sandplain regrowth within the survey area.

3.10 Ultramafic caprock vegetation (UCR)

3.10.1 Flora

Flora recorded in the UCR vegetation group was represented by 24 Families, 47 Genera and 88 Species (Appendix 2).

One DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) was found in the area surveyed. This species *Banksia sphaerocarpa var dolichostyla* (DRF) was recorded at the location shown in Appendices 1 and 5. The location is recorded 940m southwest of CALM's nearest known location (CALM, 2005).

Seven Priority Species were located in this vegetation group during the survey. These species *Logania exilis* (P2), *Acacia singula* (P3), *Eucalyptus rugulata* (P4) *Dryandra viscida* (P3), *Stenanthemum liberum* (P1), *Grevillea lullfitzii (P1)* and *Grevillea insignis ssp elliotii (P3)* were recorded at locations shown in Appendices 1 and 5.

One known location of Priority species *Grevillea lullfitzii* (P1) was revealed (sheet number PERTH 04209419) in the WAHERB (2005) Threatened Flora database search results for this vegetation group. This location is listed in Appendix 5. Abundance of this species at this location is described as scattered to common up the hill slope.

3.10.2 Vegetation

The vegetation recorded in this community was representative of UCR vegetation. The upperstorey comprised of *Eucalyptus eremophila ssp eremophila, E. flocktoniae sp flocktoniae* and *E. urna* while the mid-storey comprised of *Goodenia pinifolia, Calothamnus quadrifidus, Melaleuca cordata, M. adnata, M. hamata, M. cardiophylla, Daviesia nematophylla, Grevillea lullfitzii (P1), G. insignis ssp elliotiii (P3), Hakea multilineata* and *Petrophile divaricata.*

Understorey species include *Olearia muelleri, Lepidosperma brunonianum, Hibbertia pungens, Astroloma serratifolium* and *Westringia cephalantha,*

No Broad scale clearing has occurred for agricultural purposes in this community within the survey area.

This vegetation is best represented by the *Eucalyptus* woodland group according to ANRA (DEH, 2006), which covers 3.5% of the State of Western Australia.

A 50m radius area centred on the location of the DRF within this vegetation group has national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a). This 50m radius area is also considered an Environmentally Sensitive Area (ESA).

Figure 11 shows the UCR vegetation within the survey area.

Figure 11: UCR vegetation within the survey area.

3.11 Rehabilitation area

3.11.1 Flora

Flora recorded in the rehabilitation area was represented by 12 Families, 20 Genera and 31 Species (Appendix 2).

No DRF, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by CALM (2005) were found in the area surveyed.

No Priority Species as defined by the Department of Conservation and Land Management (2005) were located during the survey.

3.11.2 Vegetation

The vegetation recorded was representative of Rehabilitation. Species present included *Angianthus tomentosa, Olearia muelleri, Eucalyptus flocktoniae ssp flocktoniae, E. salubris, E. annulata, E. salmonophloia, Acacia deficiens, A. erinacea, A. hemiteles, Melaleuca adnata, Daviesia nematophylla, Dodonaea bursariiflora* and *D. viscosa.*

This vegetation is best represented by the cleared/modified native vegetation according to ANRA (DEH, 2006), which covers 7.3% of the State of Western Australia.

This vegetation group has no national environmental significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (DEH, 2006a).

Figure 12 shows the rehabilitation area within the survey area.

Figure 12: Rehabilitation area within the survey area.

4 Vegetation condition

The health condition of the vegetation groups including *Eucalyptus rugulata* woodland, *Eucalyptus* mallee woodland, *Melaleuca* thicket, *Casuarina* shrubland and Sandplain heath, is considered to be excellent. An excellent health condition is depicted as the vegetation structure intact despite disturbance affect and weeds are non-aggressive individual species. Despite there being no weed species, disturbance was very little but included historically cleared roads.

The Transitional Tall Eucalyptus woodland and the UCR vegetation groups would be classed as having very good health rating according to Keighery (1994). A very good health rating depicts that the vegetation structure was altered due to obvious signs of disturbance. This disturbance was in the form of historic tracks and drilling exploration.

The Sandplain heath, Fire regeneration and the Rehabilitation vegetation groups are classed as having a good health rating according to Keighery (1994). A good health condition depicts that the structure is affected by multiple disturbances, although retaining its basic structure, it has the ability to regenerate (Keighery, 1994). Disturbances were in the form of historic clearing and fire.

The Cleared farmland vegetation group would be classed as having a degraded health rating according to Keighery (1994). A degraded health is depicted as the vegetation structure being severely disturbed. It has the ability to regenerate to a good condition however this requires intensive management.

5 Introduced Species

One weed species was recorded in the survey area. This species *Centaurea melitensis* (Maltese Cockspur) was recorded in the rehabilitation area. This species in not on the DAF (2006) Declared Plants list.

6 Significant Species

The 368ha survey area revealed eleven vegetation communities comprising a combined total of 41 Families, 93 Genera and 228 Species. Of these species ten are classed as Priority Flora: *Goodenia trichophylla (P3), Calytrix nematoclada (P3), Eucalyptus rugulata (P4), Grevillea insignis ssp elliotii (P3), Grevillea lullfitzii (P1), Grevillea prostrata (P4), Dryandra viscida (P2), Logania exilis (P1), Acacia singula (P1), Stenanthemum liberum (P1),* and one is considered Declared Rare Flora: *Banksia sphaerocarpa var dolichostyla (DRF).*

- *Goodenia trichophylla* (P3)

  This slender perennial, herb or shrub is 0.2–0.3 m high, producing blue, purple and pink flowers from November through December. It occurs on grey sand with lateritic pebbles. Records of this species location is shown in Appendix 5.

Figure 13: *Goodenia trichophylla* sampled from within the survey area.

- *Calytrix nematoclada (P3),*

This shrub is described as 0.15–0.5 m high producing purple or pink flowers during September through January. It occurs in yellow or grey sand on sandplains.

The location of this record is shown in Appendices 1 and 5. The abundance of this plant at this location was approximately 20.

Figure 14: *Calytrix nematoclada* sampled from within the survey area

- *Eucalyptus rugulata (P4)*

This species is described as a tree (mallet), to 12 m high with smooth grey-olive oversilvery grey to pale tan-cream bark, decorticating in strips. Flowers are yellow or cream occurring in November. It occurs in orange laterite gravel on summits or gentle upland slopes.

This species was recorded by BC at locations shown in Appendices 1 and 5.

Figure 15: *Eucalyptus rugulata* within the survey area.

- *Grevillea insignis ssp elliotii (P3)*

This species is described as an erect, bushy, non-lignotuberous shrub, 1–2 m high producing red, pink, cream or white flowers mainly in October. It opccurs in gravelly sand or loam over ironstone hilltops or rises.

Locations of this plant are shown in Appendices 1 and 5.

Figure 16: *Grevillea insignis ssp elliotii* within the survey area.

- *Grevillea lullfitzii (P1)*

This species is described as a Shrub, 1.5 m high producing white flowers in December. It occurs in lateritic soils and shallow soils on granite.

Locations of this species are shown in Appendices 1 and 5.

Figure 17: *Grevillea lullfitzii* within the survey area.

- *Grevillea prostrata (P4)*

This species is described as a loose, prostrate shrub, 0.04–0.1 m high, 0.8–1.2 m wide, producing cream, white, pink or red flowers in August through January. It occurs in white sand, grey sand, yellow sand or gravel on sandplains.

Locations of this species are shown in Appendices 1 and 5.

Figure 18: *Grevillea prostrata* sampled from within the survey area.

- *Dryandra viscida* (P3)

Dryandra viscida is a Priority 3 species, which occurs exclusively within the hill area and stands1-2m tall. Coordinates N6376160 E763350 were taken during the survey marking its location. Less than fifty species occur within the UCR area of the Digger Rocks tenement.

Typical soils where this species occur are gravelly soils and lateritic rises. Flowers are yellow/orange.

Figure 19: *Dryandra viscida* (P3) occurring within the UCR

- *Logania exilis* (P2)

Logania exilis is a Priority 2 species, which occurs at the coordinates N6375827 E763765 within the UCR area of the Digger Rocks tenement. It is a slender tufted, sedge-like perennial bush 0.2-0.6 m tall.

Typical soils where this species occur are loam or lateritic soils. Flowers are white in colour.

Figure 20: *Logania exilis* (P2) occurring in the UCR.

- *Acacia singula* (P3)

Acacia singula is a Priority 3 species, which reaches 0.3-2m high, with yellow flowers and inhabits gravelly sand (white or yellow) over laterite, and occurs on rises and hilltops.

Figure 21: *Acacia singula* (P3) occurring on the UCR.

- *Stenanthemum liberum (P1)*

This species is described as a dwarf shrub, 0.5 m high, occurring in yellow sandy loam over laterite.

Locations of this species are shown in Appendices 1 and 5.

Figure 22: *Stenanthemum liberum* within the survey area.

- *Banksia sphaerocarpa var dolichostyla* (DRF)

This species grows to around 1-3 metres tall, within lateritic gravel, with yellow/orange coloured flowers.

Figure 23: *Banksia sphaerocarpa* var *dolichostyla* (DRF) occurring in the UCR vegetation.

7 Discussion

BC surveyed a total area of approximately 368ha, which included 134ha (2004 survey) and 62ha (2006 survey) within the Digger rocks area, 100ha on cleared farmland (2006 survey) and a 72ha (2006 survey) proposed pipeline route. Within the total area surveyed eleven vegetation groups were identified. One DRF and ten Priority Species were recorded within the survey area.

According to the Protected Matters Search Tool (DEH, 2006a), the survey area has no National Environmental Significance as defined by the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*, however it does state the possibility of habitat for DRF. Therefore a 50m radius surrounding the location of DRF within the UCR vegetation implicates an area of national significance, and is considered an ESA

7.1 Recommendations/Conclusions

- Disturbance to priority flora locations should be avoided if possible. It is strongly recommended that WSA seek consultation and advice from the DEC prior to the removal of any priority flora specimens.

- Disturbance to DRF locations must be avoided by law and it is strongly recommended that WSA seek consultation and advice from the DEC prior to the removal of any DRF specimens. Declared Rare Flora is protected under Section 23F of the Wildlife Conservation Act 1950 and Ministerial consent is required prior to any disturbance. In addition, DRF and the area within a 50m radius of its location is protected under Regulation 6 of the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 as this area is considered to be an Environmentally Sensitive Area. If disturbance is considered to be unavoidable, consultation and advice must be sought from the DEC and Ministerial consent in the form of a "Permit to Take Declared Rare Flora" obtained prior to disturbance taking place. Where relevant, a plan to manage potential impacts on DRF specimens/populations should be compiled before any disturbance takes place.

- All DRF species are protected under the EPBC Act 1999. Consultation with and approval from the Commonwealth Department of Environment and Heritage (DEH) is required if disturbance of, or impact to (either direct or indirect), any DRF specimens is likely.

For the purpose of this vegetation survey, the clearing principals specifically related are as follows.

It is of BC's opinion that for clearing principal:

(a) **Native vegetation should not be cleared if it comprises a high level of biological diversity.**

As stated in the Biodiversity Audit of Western Australia's 53 Biogeographical Subregions (CALM, 2002), Eucalypt woodlands in this Mallee 2 subregion have a particularly high floristic diversity and contain a high proportion of Declared Rare Flora. This survey revealed diverse flora that are not restricted to the project area but occur across the region.

Although the total survey area is approximately 368ha, the actual disturbance to native vegetation as projected by WSA will be much smaller. Approximately 100ha will be situated on already cleared farmland and only 15m x 16km (24ha) of the 45m x 16km pipeline route (72ha) will be cleared, thus giving WSA the option to avoid any significant Priority flora.

Future plans for the Digger Rocks project involves the clearing of up to 30ha. The area surveyed within the Digger Rocks project totals approximately 196ha.

The amount of clearing required will have no impact on the biological diversity of the area.

(c) **Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**

DRF species are protected under both the Wildlife Conservation Act 1950 and the Environmental Protection Act 1986. If disturbance of any DRF specimens, or vegetation within a 50m radius of any DRF specimens/populations is envisaged, then the DEC must be contacted and their approval obtained. In addition, DRF species are also protected under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999) and as such advice must be sought from the Commonwealth Department of the Environment and Heritage (DEH) to determine if their formal approval is required. These actions must take place prior to disturbance.

(d) **Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community (TEC).**

The definition of a Threatened Ecological Community (TEC) for the purposes of the clearing principles is defined under Regulation 7 of the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. No TECs that fall within this definition are located in the survey area. According to the DEH protected matters search tool, no TECs as listed for the purposes of protection under the EPBC Act 1999 are located in the survey area.

(e) **Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared**

Vegetation considered as a significant remnant of extensively cleared vegetation was identified during the survey. Remnant vegetation was identified in the far south western end of the pipeline route recognised as Tall Transitional *Eucalyptus* woodland. Small remnant patches shown within the Cleared farmland vegetation group (Appendix 1) were identified. However the vegetation contained within these patches is well represented in other areas surveyed in this report

some 16km to the east. No DRF or Priority Flora species were identified within these remnant vegetation patches.

(f) **Native vegetation should not be cleared if it is growing, in, or in association with, an environment associated with a watercourse or wetland**

No vegetation growing in, or in association with a watercourse or wetland was recorded during the survey.

(h) **Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**

The survey area lies approximately 4.8km north of the Jackson Nature Reserve which is a 910ha Class A Nature Reserve gazetted for the conservation of Flora and Fauna.

Although the total survey area is approximately 368ha, the actual disturbance as projected by WSA for native vegetation will be much smaller. Approximately 100ha will be situated on cleared farmland and only 15m of the 45m wide pipeline route will be cleared, thus giving WSA the option to avoid any significant Priority flora.

Future plans for the Digger Rocks project involves the clearing of up to 30ha. The area surveyed within the Digger Rocks project totals approximately 196ha.
This amount of clearing is sufficient distance from the Jackson Nature reserve so that the conservation values of the area will not be affected.

8 Personnel Involved

Jim Williams- Botanist (Diploma of Horticulture)

Eren Reid- Assistant Botanist (BSc- Biological Science)

Frank Obbens- Consultant Botanist (BA-Environmental Studies, BSc- first class honours).

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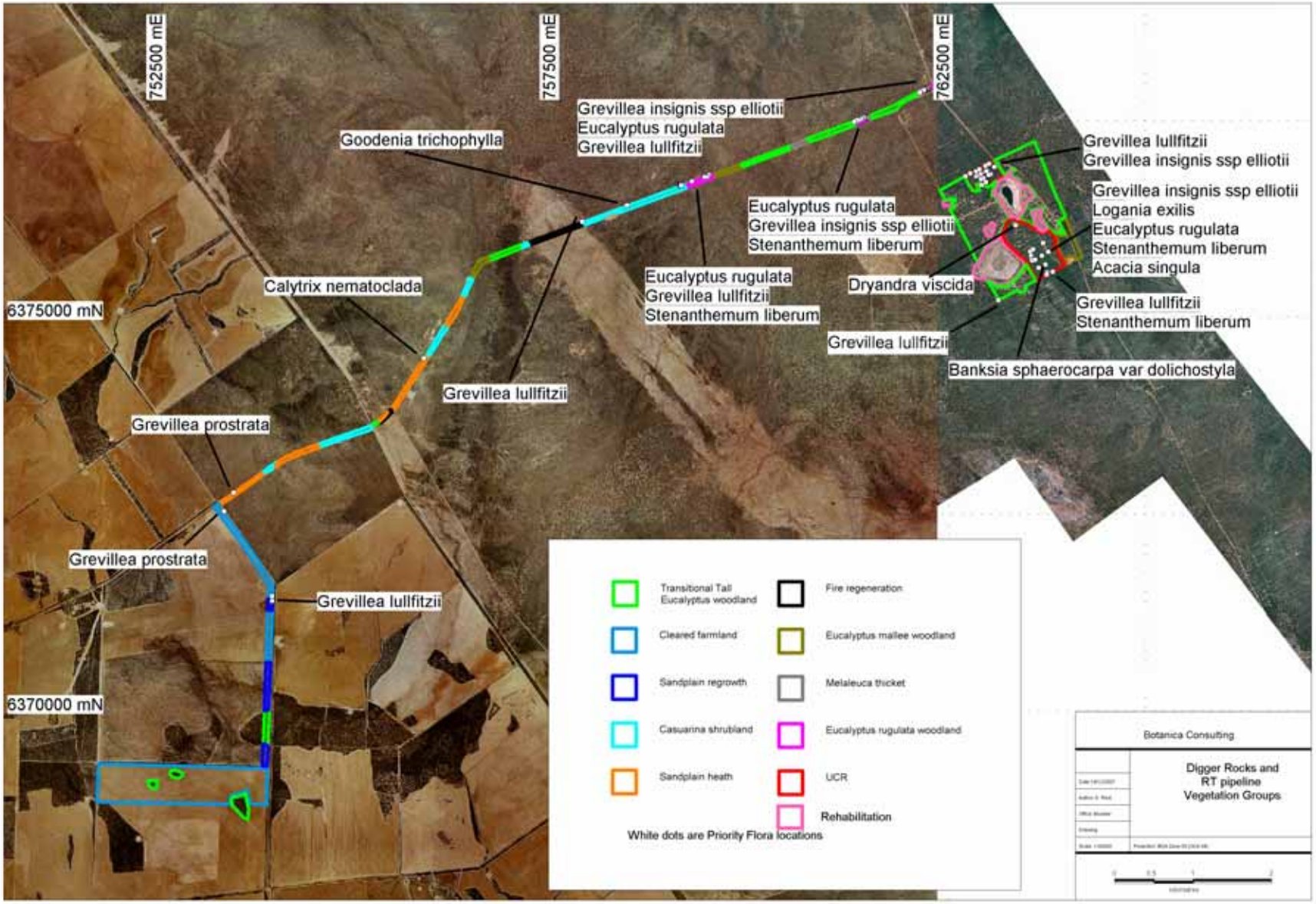
Appendix 1: Map of the surveyed area.



Appendix 2: Species list of the surveyed area.

Family		Genus	Species	Transitional Tall Eucalyptus woodland	Eucalyptus rugulata woodland	Eucalyptus mallee woodland	Melaleuca thicket	Casuarina shrubland	Fire regeneration	Sandplain heath	Cleared farmland	Sandplain regrowth	UCR	Rehabilitation
Amaranthaceae		Ptilotus	polystachyus ssp polystachyus								*			
Anthericacea		Laxmannia	? paleaca							*				
Asteraceae		Angianthus	tomentosa										*	*
Asteraceae		Asteridea	athrixioides										*	
Asteraceae		Calotis	hispidula											*
Asteraceae	#	Centaurea	melitensis											*
Asteraceae		Chrysocephalum	peteole											*
Asteraceae		Olearia	muelleri	*									*	*
Boraginaceae		Halgania	andromedifolia	*										
Boryaceae		Borya	constricta					*						
Caesalpiniaceae		Senna	artemisioides ssp filifolia	*										*
Casuarinaceae		Allocasuarina	acutivalvis					*		*				
Casuarinaceae		Allocasuarina	campestris		*					*				
Casuarinaceae		Allocasuarina	corniculata					*						
Casuarinaceae		Allocasuarina	microstachya							*				
Casuarinaceae		Allocasuarina	campestris										*	
Chenopodiaceae		Atriplex	stipitata	*										*
Chenopodiaceae		Atriplex	vesicaria											*
Chenopodiaceae		Enchyleana	tomentosa											*
Chenopodiaceae		Sclerolaena	diacantha											*
Chenopodiaceae		Sclerolaena	uniflora	*									*	
Convolvulaceae		Wilsonia	humilis										*	
Convolvulaceae		Wilsonia	humilis	*										
Cupressaceae		Callitris	preissii				*			*				
Cupressaceae		Callitriss	canescens										*	
Cyperaceae		Gahnia	ancistrophylla							*				
Cyperaceae		Lepidosperma	brunonianum				*	*	*	*		*	*	
Cyperaceae		Schoenus	brevisetis							*				
Dasypogonaceae		Lomadra	effusa							*				
Dilleniaceae		Hibbertia	? nutans		*	*								
Dilleniaceae		Hibbertia	gracilipes					*						
Dilleniaceae		Hibbertia	pungens		*			*					*	
Epacridaceae		Astroloma	serratifolium	*	*								*	
Epacridaceae		Coleanthera	myrtoides										*	
Epacridaceae		Leucopogon	cuneifolius		*									
Epacridaceae		Lysinema	ciliatum							*				
Euphorbiaceae		Monotaxis	grandiflora var obtusifolia						*					
Goodeniaceae		Coopernookia	strophiolata			*	*							
Goodeniaceae		Dampiera	angulata		*								*	
Goodeniaceae		Dampiera	eriocephala					*						
Goodeniaceae		Dampiera	tenuicaulis var curvula						*				*	
Goodeniaceae		Goodenia	incana					*			*			
Goodeniaceae		Goodenia	laevis								*		*	
Goodeniaceae		Goodenia	pinifolia		*		*	*	*				*	
Goodeniaceae		Goodenia	scapigera ssp scapigera										*	
Goodeniaceae		Goodenia	trichophylla (P3)					*						
Goodeniaceae		Goodenia	viscida										*	
Goodeniaceae		Scaevola	spinescens	*										*

Family		Genus	Species	Transitional Tall Eucalyptus woodland	Eucalyptus rugulata woodland	Eucalyptus mallee woodland	Melaleuca thicket	Casuarina shrubland	Fire regeneration	Sandplain heath	Cleared farmland	Sandplain regrowth	UCR	Rehabilitation
Haemodoraceae		Haemodorum	discolor								*			
Haloragaceae		Glischrocaryon	roei		*			*						
Lamiaceae		Cyanostegia	angustifolia							*				
Lamiaceae		Hemigena	entaxioides										*	
Lamiaceae		Hemigena	teretiuscula										*	
Lamiaceae		Hemigenia	sp Newdegate			*								
Lamiaceae		Pityrodia	terminalis					*		*				
Lamiaceae		Westringia	cephalantha	*	*	*	*						*	
Lamiaceae		Westringia	rigida										*	*
Lauraceae		Cassytha	melantha	*			*						*	
Lauraceae		Cassytha	nodiflora										*	
Loganiaceae		Logania	exilis (P2)										*	
Loganiaceae		Logania	judithiana							*				
Mimosaceae		Acacia	assimilis ssp assimilis							*				
Mimosaceae		Acacia	binata										*	
Mimosaceae		Acacia	cracentis					*		*				
Mimosaceae		Acacia	deficiens	*		*							*	*
Mimosaceae		Acacia	erinacea	*									*	*
Mimosaceae		Acacia	fragilis		*								*	
Mimosaceae		Acacia	hadrophylla		*	*	*							
Mimosaceae		Acacia	hemiteles											*
Mimosaceae		Acacia	intricata	*		*							*	*
Mimosaceae		Acacia	lasiocalyx								*	*		
Mimosaceae		Acacia	leptopetala	*										
Mimosaceae		Acacia	merrallii		*	*								*
Mimosaceae		Acacia	multispicata					*		*				
Mimosaceae		Acacia	poliochroa	*										
Mimosaceae		Acacia	singula (P3)										*	
Mimosaceae		Acacia	sphacelata ssp sphacelata	*	*	*						*		
Mimosaceae		Acacia	uncinella					*						
Mimosaceae		Acacia	viscifolia					*						
Mimosaceae		Acacia	yorkrakiensis		*			*						
Myoporaceae		Eremophila	dempsteri		*									
Myoporaceae		Eremophila	densiflora						*					
Myoporaceae		Eremophila	drummondii			*								
Myoporaceae		Eremophila	ionantha										*	
Myoporaceae		Eremophila	maculata											*
Myoporaceae		Eremophila	psilocalyx										*	
Myrtaceae		Baeckea	crispiflora										*	
Myrtaceae		Baeckea	crispiflora sens lat				*	*		*				
Myrtaceae		Beaufortia	interstans		*			*		*				
Myrtaceae		Calothamnus	quadrifidus		*					*			*	
Myrtaceae		Calytrix	breviseta ssp stipulosa										*	
Myrtaceae		Calytrix	nematoclada (P3)							*				
Myrtaceae		Darwinia	inconspicua		*									
Myrtaceae		Eucalyptus	annulata	*										*
Myrtaceae		Eucalyptus	calycogona	*	*	*								
Myrtaceae		Eucalyptus	cylindrocarpa			*								
Myrtaceae		Eucalyptus	eremophila ssp eremophila	*	*	*							*	
Myrtaceae		Eucalyptus	falcata										*	
Myrtaceae		Eucalyptus	flocktoniae ssp flocktoniae	*	*								*	*

Family		Genus	Species	Transitional Tall Eucalyptus woodland	Eucalyptus rugulata woodland	Eucalyptus mallee woodland	Melaleuca thicket	Casuarina shrubland	Fire regeneration	Sandplain heath	Cleared farmland	Sandplain regrowth	UCR	Rehabilitation
Myrtaceae		Eucalyptus	kondininensis	*										
Myrtaceae		Eucalyptus	leptophylla		*			*		*				
Myrtaceae		Eucalyptus	livida										*	
Myrtaceae		Eucalyptus	melanoxylon	*										
Myrtaceae		Eucalyptus	olivina		*								*	
Myrtaceae		Eucalyptus	platycorys					*						
Myrtaceae		Eucalyptus	rigida										*	
Myrtaceae		Eucalyptus	rugulata (P4)		*								*	
Myrtaceae		Eucalyptus	salmonophloia	*		*								*
Myrtaceae		Eucalyptus	salubris	*									*	*
Myrtaceae		Eucalyptus	sheathiana											*
Myrtaceae		Eucalyptus	sp (sterile)									*		
Myrtaceae		Eucalyptus	suggrandis ssp promiscua	*			*							
Myrtaceae		Eucalyptus	urna	*									*	
Myrtaceae		Leptospermum	erubescens		*		*	*		*				
Myrtaceae		Leptospermum	fastigiatum										*	
Myrtaceae		Melaleuca	acuminata	*				*						
Myrtaceae		Melaleuca	adnata	*		*						*	*	*
Myrtaceae		Melaleuca	cardiophylla	*									*	
Myrtaceae		Melaleuca	cordata		*			*	*			*	*	
Myrtaceae		Melaleuca	cuculata										*	
Myrtaceae		Melaleuca	eleuterostachya	*										
Myrtaceae		Melaleuca	elliptica	*		*								
Myrtaceae		Melaleuca	glaberrima		*									
Myrtaceae		Melaleuca	hamata		*	*	*	*					*	
Myrtaceae		Melaleuca	lateriflora	*										
Myrtaceae		Melaleuca	laxiflora				*							
Myrtaceae		Melaleuca	pangens										*	
Myrtaceae		Melaleuca	pauperiflora ssp pauperiflora	*									*	
Myrtaceae		Melaleuca	pentagona			*								
Myrtaceae		Melaleuca	pungens		*			*						
Myrtaceae		Melaleuca	strobophylla	*										
Myrtaceae		Melaleuca	teuthidoides					*		*				
Myrtaceae		Melaleuca	thyoides		*									
Myrtaceae		Melaleuca	uncinata										*	
Myrtaceae		Melaleuca	villosisepala							*				
Myrtaceae		Thryptomene	kochii		*			*		*				
Myrtaceae		Verticordia	chrysantha		*			*	*			*		
Myrtaceae		Verticordia	picta								*			
Myrtaceae		Verticordia	plumosa var incrassata		*			*		*				
Myrtaceae		Verticordia	roei ssp roei					*		*				
Papilionaceae		Daviesia	benthamii ssp acanthoclada			*					*			
Papilionaceae		Daviesia	cardiophylla		*			*				*		
Papilionaceae		Daviesia	lancifolia					*						
Papilionaceae		Daviesia	nematophylla	*		*						*	*	*
Papilionaceae		Daviesia	rhizomata							*				
Papilionaceae		Gastrolobium	crassifolium					*						
Papilionaceae		Gastrolobium	spinosum										*	
Papilionaceae		Gompholobium	gompholobioides					*					*	
Papilionaceae		Gompholobium	viscidulum		*									
Papilionaceae		Pultenaea	arida										*	

Family		Genus	Species	Transitional Tall Eucalyptus woodland	Eucalyptus rugulata woodland	Eucalyptus mallee woodland	Melaleuca thicket	Casuarina shrubland	Fire regeneration	Sandplain heath	Cleared farmland	Sandplain regrowth	UCR	Rehabilitation
Papilionaceae		Urodon	dasyphyllus					*			*			
Phormiaceae		Dianella	revoluta				*							
Pittosporaceae		Billardiera	? fusiformis	*										
Poaceae		Spartochloa	scirpoidea	*										
Pottiaceae		Barbula	calycina	*										
Proteaceae		Banksia	elderiana					*	*	*				
Proteaceae		Banksia	laevigata ssp fusco-lutea										*	
Proteaceae		Banksia	sphaerocarpa var. dolichostyla (DRF)										*	
Proteaceae		Banksia	violacea							*				
Proteaceae		Conospermum	brownii					*						
Proteaceae		Conospermum	stoechadis							*		*		
Proteaceae		Dryandra	cirsioides		*			*					*	
Proteaceae		Dryandra	erythrocephala					*		*				
Proteaceae		Dryandra	viscida (P3)										*	
Proteaceae		Grevillea	acuaria	*		*	*							
Proteaceae		Grevillea	cagiana					*	*	*	*			
Proteaceae		Grevillea	eriostachya					*	*					
Proteaceae		Grevillea	eryngioides					*	*	*				
Proteaceae		Grevillea	huegellii			*	*					*	*	
Proteaceae		Grevillea	insignis ssp elliotii (P3)		*								*	
Proteaceae		Grevillea	lullfitzii (P1)		*			*	*			*	*	
Proteaceae		Grevillea	prostrata (P4)							*				
Proteaceae		Grevillea	pterosperma					*						
Proteaceae		Grevillea	shuttleworthiana ssp obovata						*	*				
Proteaceae		Grevillea	thelmanniana ssp obtusifolia										*	
Proteaceae		Hakea	commutata			*							*	
Proteaceae		Hakea	corymbosa					*						
Proteaceae		Hakea	erecta		*			*		*	*			
Proteaceae		Hakea	lissocarpa										*	
Proteaceae		Hakea	multilineata		*	*		*					*	
Proteaceae		Hakea	oncogyne			*								
Proteaceae		Hakea	platysperma					*		*				
Proteaceae		Hakea	scoparia		*			*					*	
Proteaceae		Hakea	subsulcata	*		*							*	
Proteaceae		Isopogon	axillaris		*								*	
Proteaceae		Isopogon	scabrisculus ssp pubifloris					*		*				
Proteaceae		Persoonia	helix		*									
Proteaceae		Persoonia	quinquenervis								*			
Proteaceae		Persoonia	teretifolia			*								
Proteaceae		Persoonia	tortifolia										*	
Proteaceae		Persoonia	trinervis		*									
Proteaceae		Petrophile	divaricata		*			*					*	
Proteaceae		Petrophile	ericifolia		*									
Proteaceae		Petrophile	glauca					*						
Proteaceae		Petrophile	stricta					*						
Proteaceae		Petrophile	trifida					*						
Proteaceae		Synaphea	spinulosa ssp major							*				
Restionaceae		Lepidobolus	chaetocephalus							*				
Rhamnaceae		Cryptandra	intonsa										*	*
Rhamnaceae		Cryptandra	wilsonii											*

Family		Genus	Species	Transitional Tall Eucalyptus woodland	Eucalyptus rugulata woodland	Eucalyptus mallee woodland	Melaleuca thicket	Casuarina shrubland	Fire regeneration	Sandplain heath	Cleared farmland	Sandplain regrowth	UCR	Rehabilitation
Rhamnaceae		Stenanthemum	liberum (P1)		*								*	
Rhamnaceae		Trymalium	myrtillus ssp myrtillus	*										
Rutaceae		Boronia	inornata										*	*
Rutaceae		Drummondita	hassellii		*			*	*	*	*			
Rutaceae		Microcybe	albiflora	*									*	
Rutaceae		Phebalium	obovatum		*								*	
Santalaceae		Eucalyptus	aphyllus										*	
Santalaceae		Eucalyptus	sparteus										*	
Santalaceae		Exoxarpos	aphyllus									*		
Santalaceae		Exoxarpos	sparteus		*									
Santalaceae		Santalum	acuminatum	*	*	*	*	*	*	*				
Sapindaceae		Dodonaea	attenuata	*		*	*							
Sapindaceae		Dodonaea	bursariifolia	*	*	*	*							*
Sapindaceae		Dodonea	stenozyga										*	*
Sapindaceae		Dodonea	viscosa										*	*
Sterculiaceae		Keraudrenia	velutina		*			*					*	
Sterculiaceae		Lasiopetalum	ogilrieanum										*	
Sterculiaceae		Rulingia	cuneata		*									
Sterculiaceae		Thomasia	sarotes										*	
Stylidiaceae		Stylidium	breviscarpum										*	
Thymelaceae		Pimelea	? crecens ssp cracens							*				
Thymelaceae		Pimelea	aeruginosa		*									
Thymelaceae		Pimelea	angustifolia					*						
Tremandraceae		Halgania	lavandulacea					*						
Violaceae		Hybanthus	floribundus										*	
Violaceae		Hybanthus	floribundus ?ssp floribundus										*	
Xanthorrhoeaceae		Xanthorrhoea	sp (sterile)								*			
Xanthorrhoeaceae		Xanthorrhoea	sp (sterile)							*				

Appendix 3: Summary list of the CALM and WAHERB Databases search results for Rare and Priority species within the Forrestania area.

GENUS	SPECIES	RANK	INFRASP	CONS.CODE
Thomasia	gardneri			X
Acacia	lanuginophylla			R
Banksia	sphaerocarpa	var.	dolichostyla	R
Boronia	revoluta			R
Eucalyptus	steedmanii			R
Leucopogon	marginatus			R
Muelleranthus	crenulatus			R
Acacia	tetraneura			P1
Baeckea	sp.Forrestania(K.R.Newbey 1105)			P1
Baeckea	sp.Lake Cronin(K.R.Newbey 9191)			P1
Brachyloma	nguba			P1
Chorizema	circinale			P1
Dampiera	scaevolina			P1
Dicrastylis	capitellata			P1
Dillwynia	acerosa			P1
Eucalyptus	myriadena	subsp.	parviflora	P1
Gastrolobium	tenue			P1
Gnephosis	intonsa			P1
Grevillea	lullfitzii			P1
Grevillea	marriottii			P1
Hibbertia	axillibarba			P1
Hibbertia	carinata			P1
Melaleuca	agathosmoides			P1
Microcorys	sp.Forrestania(V.English 2004)			P4
Microcybe	pauciflora	subsp.	grandis	P1
Mirbelia	densiflora			P1
Mirbelia	taxifolia			P1
Pultenaea	daena			P1
Scaevola	tortuosa			P1
Stenanthemum	liberum			P1
Stylidium	validum			P1
Acacia	asepala			P2
Acacia	heterochroa	subsp.	robertii	P2
Acacia	kerryana			P2
Baeckea	sp.North Ironcap(R.J.Cranfield 105			P2
Bentleya	diminuta			P2
Boronia	westringioides			P2
Conospermum	sigmoideum			P2
Gastrolobium	rigidum			P2
Guichenotia	asteriskos			P2
Haegiela	tatei			P2
Hakea	pendens			P2
Isolepis	australiensis			P2
Keraudrenia	adenogyna			P2
Logania	exilis			P2
Microcorys	lenticularis			P2
Olearia	laciniifolia			P2
Stylidium	sejunctum			P2
Acacia	repanda			P3
Acacia	singula			P3
Acacia	undosa			P3
Baeckea	sp.Hatter Hill(K.R.Newbey 3284)			P3

GENUS	SPECIES	RANK	INFRASP	CONS.CODE
Baeckea	sp.Hyden(J.M.Brown 141)			P3
Calytrix	nematoclada			P3
Comesperma	calcicola			P3
Cryptandra	polyclada	subsp.	polyclada	P3
Daviesia	elongata	subsp.	implexa	P3
Dryandra	ferruginea	subsp.	flavescens	P3
Dryandra	viscida			P3
Elatine	macrocalyx			P3
Eucalyptus	exigua			P3
Euryomyrtus	leptospermoides			P3
Eutaxia	sp.Hatter Hill(K.R.Newbey 6532)			P3
Frankenia	drummondii			P3
Grevillea	insignis	subsp.	elliotii	P3
Grevillea	pilosa	subsp.	redacta	P3
Isoetes	brevicula			P3
Leucopogon	sp.Ironcaps(N.Gibson & K.Brown 307			P3
Melaleuca	macronychia	subsp.	trygonoides	P3
Microcorys	macredieana			P3
Monotoca	leucantha			P3
Persoonia	cymbifolia			P3
Phebalium	brachycalyx			P3
Pityrodia	sp.Yilgarn(A.P.Brown 2679)			P3
Synaphea	divaricata			P3
Verticordia	gracilis			P3
Verticordia	stenopetala			P3
Calamphoreus	inflatus			P4
Eremophila	biserrata			P4
Eremophila	racemosa			P4
Eucalyptus	cerasiformis			P4
Eucalyptus	deflexa			P4
Eucalyptus	georgei	subsp.	fulgida	P4
Eucalyptus	rhomboidea			P4
Eucalyptus	rugulata			P4
Grevillea	aneura			P4
Grevillea	dissecta			P4
Grevillea	prostrata			P4
Gyrostemon	ditrigynus			P4
Sowerbaea	multicaulis			P4

Appendix 4: GPS coordinates of sample points taken during the survey.

GDA94 50 H	
Easting	**Northing**
762325	6377842
762317	6377840
762322	6377853
762326	6377852
762322	6377857
762305	6377845
762294	6377849
762231	6377820
762185	6377814
762193	6377808
762188	6377815
762136	6377792
762056	6377778
762013	6377750
761689	6377630
761471	6377539
761474	6377545
761456	6377539
761452	6377533
761449	6377533
761444	6377534
761440	6377532
761438	6377526
761447	6377524
761450	6377523
761453	6377527
761463	6377532
761454	6377534
761451	6377528
761450	6377532
761438	6377534
761427	6377531
761427	6377531
761426	6377531
761424	6377531
761422	6377529
761423	6377526
761423	6377533
761411	6377527
761395	6377512
761384	6377514
761355	6377502
761361	6377502
761344	6377502
761334	6377498
761333	6377498
761299	6377477
761286	6377486
761212	6377452

GDA94 50 H	
Easting	**Northing**
760873	6377330
760743	6377283
760679	6377259
760528	6377204
760463	6377174
760092	6377041
759729	6376904
759837	6376947
759753	6376912
759687	6376888
759503	6376820
759458	6376810
759449	6376801
759427	6376785
759425	6376793
759427	6376776
759395	6376780
759375	6376773
759340	6376754
759234	6376721
759134	6376687
759087	6376669
759094	6376669
759096	6376671
759069	6376663
759055	6376656
758978	6376625
758928	6376609
758909	6376606
758863	6376588
758863	6376587
758864	6376586
758835	6376575
758827	6376570
758802	6376561
758802	6376561
758731	6376536
758707	6376529
758628	6376503
758630	6376502
758408	6376416
757918	6376235
757877	6376219
757843	6376207
757647	6376136
757609	6376122
757590	6376114
757568	6376106
757554	6376101
757347	6376024

GDA94 50 H	
Easting	**Northing**
757277	6375998
757157	6375956
757152	6375953
757025	6375905
756639	6375756
756409	6375485
756298	6375239
756276	6375194
756243	6375135
756207	6375073
756158	6374998
756099	6374907
756097	6374903
756057	6374843
755962	6374687
755862	6374523
755827	6374474
755783	6374405
755695	6374271
755469	6373924
755458	6373911
755401	6373826
755187	6373632
755235	6373681
755157	6373631
755135	6373621
754780	6373492
754477	6373384
754440	6373371
753983	6373180
753983	6373180
753874	6373106
753740	6373013
753642	6372942
753514	6372837
753225	6372604
753290	6372537
753374	6372397
753439	6372302
753507	6372218
753564	6372132
753629	6372032
751702	6368820
752355	6369050
752438	6369056
752623	6369163
752766	6369212
753403	6368804
753845	6369309
753854	6369625

GDA94 50 H	
Easting	**Northing**
753863	6369967
753878	6370567
753880	6370631
753896	6371257
753899	6371396
753900	6371458
762688	6376285
762636	6376743
762712	6376788
762773	6376822
762851	6376663
763017	6376651
762841	6376580
762837	6376848
762843	6376851
762888	6376876
762906	6376889
762966	6376919
762988	6376932
763013	6376946
762845	6376781
762856	6376788
762886	6376803
762907	6376816
762909	6376817
762950	6376839
762962	6376843
762972	6376852
762984	6376856
763077	6376907
763033	6376814
763009	6376801
762941	6376763
762912	6376748
762859	6376717
762914	6376678
762970	6376711
763748	6375560
763743	6375539
763715	6375529
763151	6375231
763127	6375212
762677	6374972
762289	6377937
762243	6377903
762243	6377907
762233	6377908
762232	6377903
762228	6377898
762223	6377898

GDA94 50 H	
Easting	**Northing**
762210	6377899
762199	6377896
762202	6377888
762206	6377882
762206	6377884
762206	6377884
762200	6377886
762197	6377889
762192	6377886
762190	6377883
762190	6377883
762181	6377881
762169	6377873
762145	6377864
762131	6377852
764062	6375764
764059	6375764
764057	6375764
763340	6376881
764124	6375916
763958	6376197
763930	6376240
763727	6375665
763607	6375713
763574	6375723
763416	6376002
763165	6375171
763867	6376202
763619	6375479
763423	6375324
763307	6375448
763129	6376103
763152	6376148
763133	6376156
762952	6376302
762748	6376171
762789	6375941
763374	6375489
763840	6375587
763701	6375930
763604	6376193
763134	6375832
763110	6375419
764085	6375782
763765	6375827
763823	6375862
763739	6375870
763340	6376882
763982	6375919
763840	6375585

GDA94 50 H	
Easting	**Northing**
763462	6375564
762687	6374972
763861	6375724
763724	6376040
763884	6375731
762837	6375675
763629	6376145
763538	6375831
763699	6375936
763572	6375857
763545	6375775
763550	6375732
763560	6375715
763682	6375777
763596	6375727
763643	6375624

Appendix 5: Locations of Priority Flora

	GDA94 50 H			
GPS waypoint	**EASTING**	**NORTHING**	**SPECIES**	**NUMBERS**
376	761471	6377539	Eucalyptus rugulta	E. rugulata woodland many trees
378	761456	6377539	Grevillea insignis sp elliotii	1
379	761452	6377533	Grevillea insignis sp elliotii	1
380	761449	6377533	Grevillea insignis sp elliotii	1
381	761444	6377534	Grevillea insignis sp elliotii	1
382	761440	6377532	Grevillea insignis sp elliotii	1
383	761438	6377526	Grevillea insignis sp elliotii	1
384	761447	6377524	Grevillea insignis sp elliotii	1
385	761450	6377523	Grevillea insignis sp elliotii	1
386	761453	6377527	Grevillea insignis sp elliotii	1
387	761463	6377532	Grevillea insignis sp elliotii	1
389	761451	6377528	Eucalyptus rugulta	1
390	761450	6377532	Eucalyptus rugulta	15
391	761438	6377534	Grevillea insignis sp elliotii	10
392	761427	6377531	Grevillea insignis sp elliotii	1
393	761427	6377531	Grevillea insignis sp elliotii	1
394	761426	6377531	Grevillea insignis sp elliotii	1
395	761424	6377531	Grevillea insignis sp elliotii	1
396	761422	6377529	Grevillea insignis sp elliotii	1
397	761423	6377526	Grevillea insignis sp elliotii	1
398	761423	6377533	Grevillea insignis sp elliotii	1
399	761411	6377527	Eucalyptus rugulta	1
400	761395	6377512	Grevillea insignis sp elliotii	1
401	761384	6377514	Grevillea insignis sp elliotii	1
403	761361	6377502	Stenanthemum liberum	2
405	761334	6377498	Grevillea insignis sp elliotii	1
406	761333	6377498	Grevillea insignis sp elliotii	1
407	761299	6377477	Eucalyptus rugulta	1
422	759449	6376801	Grevillea lullfitzii	1
423	759427	6376785	Stenanthemum liberum	1
425	759427	6376776	Stenanthemum liberum	1
426	759395	6376780	Stenanthemum liberum	1
429	759234	6376721	Grevillea lullfitzii	1
431	759087	6376669	Grevillea lullfitzii	1
432	759094	6376669	Grevillea lullfitzii	1
433	759096	6376671	Grevillea lullfitzii	1
453	757843	6376207	Grevillea lullfitzii	3
496	753290	6372537	Grevillea prostrata	1
514	753899	6371396	Grevillea lullfitzii	between these points is 97 plants
515	753900	6371458	Grevillea lullfitzii	
517	762243	6377903	Grevillea lullfitzii	2
518	762243	6377907	Grevillea insignis sp elliotii Eucalyptus rugulata	1 1
519	762233	6377908	Eucalyptus rugulata	1
520	762232	6377903	Eucalyptus rugulata	1
521	762228	6377898	Grevillea lullfitzii	1
522	762223	6377898	Grevillea lullfitzii	1
523	762210	6377899	Grevillea lullfitzii	1
524	762199	6377896	Grevillea lullfitzii	1
525	762202	6377888	Eucalyptus rugulata	1
526	762206	6377882	Grevillea lullfitzii Eucalyptus rugulata	1 1
528	762206	6377884	Grevillea insignis sp elliotii	1
529	762200	6377886	Grevillea insignis sp elliotii	1

	GDA94 50 H			
GPS waypoint	EASTING	NORTHING	SPECIES	NUMBERS
530	762197	6377889	Grevillea insignis sp elliotii Eucalyptus rugulata	1 1
532	762190	6377883	Eucalyptus rugulata	1
533	762190	6377883	Grevillea insignis sp elliotii	2
534	762181	6377881	Grevillea lullfitzii Eucalyptus rugulata	2 1
536	762145	6377864	Grevillea lullfitzii Eucalyptus rugulata	2 6
537	762131	6377852	Grevillea lullfitzii	2
547	762712	6376788	Grevillea lullfitzii	1
548	762773	6376822	Grevillea lullfitzii	3
552	762837	6376848	Grevillea lullfitzii	1
553	762843	6376851	Grevillea lullfitzii	40
554	762888	6376876	Grevillea insignis sp elliotii	1
556	762966	6376919	Grevillea lullfitzii	1
557	762988	6376932	Grevillea lullfitzii	1
558	763013	6376946	Grevillea lullfitzii	1
559	762845	6376781	Grevillea lullfitzii	3
560	762856	6376788	Grevillea lullfitzii	1
561	762886	6376803	Grevillea lullfitzii Grevillea insignis sp elliotii	1 1
562	762907	6376816	Grevillea insignis sp elliotii	1
563	762909	6376817	Grevillea lullfitzii Grevillea insignis sp elliotii	1 1
564	762950	6376839	Grevillea lullfitzii	25
565	762962	6376843	Grevillea lullfitzii	45
566	762972	6376852	Grevillea lullfitzii	3
567	762984	6376856	Grevillea lullfitzii	50
568	763077	6376907	Grevillea lullfitzii	10
569	763033	6376814	Grevillea lullfitzii	20
570	763009	6376801	Grevillea insignis sp elliotii	1
571	762941	6376763	Grevillea lullfitzii	10
572	762912	6376748	Grevillea lullfitzii	5
574	762914	6376678	Grevillea lullfitzii	36
575	762970	6376711	Grevillea lullfitzii	2
576	763748	6375560	Stenanthemum liberum Grevillea lullfitzii Grevillea insignis ssp eliotii	1 1 1
577	763743	6375539	Grevillea lullfitzii	1
580	763127	6375212	Grevillea lullfitzii	2
CALM	763819	6375570	Grevillea lullfitzii	1
CALM	753411	6372775	Grevillea prostrata	20
476	755827	6374474	Calytrix nematoclada	20
450	758408	6376416	Goodenia trichophylla	10
713	763765	6375827	Grevillea insignis ssp elliotii Logania exilis Eucalyptus rugulata Stenanthemum liberum Acacia singula	50 10 10 25 5
16	763727	6375665	Banksia sphaerocarpa var dolichostyla	10
1	763350	6376160	Dryandra viscida	50
314	763538	6375831	Eucalyptus rugulata Logania exilis	1 8
322	763699	6375936	Stenanthemum liberum	1
323	763572	6375857	Grevillea insignis ssp elliotii	15

	GDA94 50 H			
GPS waypoint	**EASTING**	**NORTHING**	**SPECIES**	**NUMBERS**
317	763545	6375775	Grevillea insignis ssp elliotii Eucalyptus rugulata	12 4
312	763550	6375732	Grevillea insignis ssp elliotii Eucalyptus rugulata	7 2
313	763560	6375715	Eucalyptus rugulata Logania exilis	2 1
318	763682	6375777	Stenanthemum liberum	5
316	763596	6375727	Stenanthemum liberum	2
311	763643	6375624	Logania exilis Eucalyptus rugulata	1 24