M70/341, M70/345, M70/346 AND M70/339, HOPKINS ROAD CARABOODA

FLORA AND VEGETATION SURVEY

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pgv ENVIRONMENTAL

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1 INTRODUCTION

1.1 Background

Mining Tenements M70/341, M70/345, M70/346 and M70/339, Hopkins Road, Carabooda are located approximately 39km north of the Perth Central Business District (Figure 1) in the City of Wanneroo. The owners of the tenements, WA Limestone, plan to expand the existing Hopkins Road quarry into parts of each tenement (Figure 2) (the site).

The site is bounded by Cutler Road and partially cleared rural land to the west, Hopkins Road and native vegetation to the east, a harvested pine plantation to the north and native vegetation to the south (Figure 2). The proposed clearing in tenements M70/341 and M70/345 is separated from the proposed clearing in tenements M70/346 and M70/339 by the existing Hopkins Road quarry.

The total area of the proposed disturbance footprint is approximately 27.5ha of which approximately 24.5ha is previously uncleared native vegetation.

The site is located within a part of Bush Forever site 290 'Hopkins Road Bushland, Nowergup'.

PGV Environmental was commissioned by WA Limestone to undertake a flora and vegetation survey of the portions of tenements M70/346 and M70/339 proposed to be quarried and to update a previous flora and vegetation survey of tenements M70/341 and M70/345 undertaken by Coffey Environments in 2010.

1.2 Scope of Works

A Detailed Flora and Vegetation Survey of the proposed clearing in portions of tenements M70/346 and M70/339 was undertaken in accordance with EPA Technical Guidance *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016). The survey included the following:

- Desktop search and review of the Department of Biodiversity, Conservation and Attractions (DBCA) Threatened and Priority flora and ecological community Databases;
- A search of the Naturemap website (DBCA, 2020);
- A search of the Commonwealth Government's Protected Matters Search Tool (DAWE, 2020) to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation* (EPBC) *Act 1999*;
- Examination of historic and recent aerial photography and contour and soil maps to provisionally identify vegetation types and condition;
- Field survey using quadrats to record native and introduced species as well as a thorough site walkover of any areas of native vegetation;
- Recording of any significant plant species using a hand-held GPS;
- Description and mapping of vegetation types and vegetation condition;
- Analysis of the vegetation to see if any areas are representative of the Banksia Woodland or Tuart Woodland Tecs as listed under the EPBC Act; and
- Compilation of a flora list.

The Coffey (2010) survey was reviewed with respect to updating any plant species nomenclature and conservation status. The conservation status of vegetation types was reviewed particularly with respect to Threatened Ecological Communities which have been listed since the 2010 report.

The results of the Coffey Environments (2010) report were compiled into this report with some changes in vegetation types made to the Coffey descriptions to make them compatible with the PGV Environmental method of describing vegetation types.

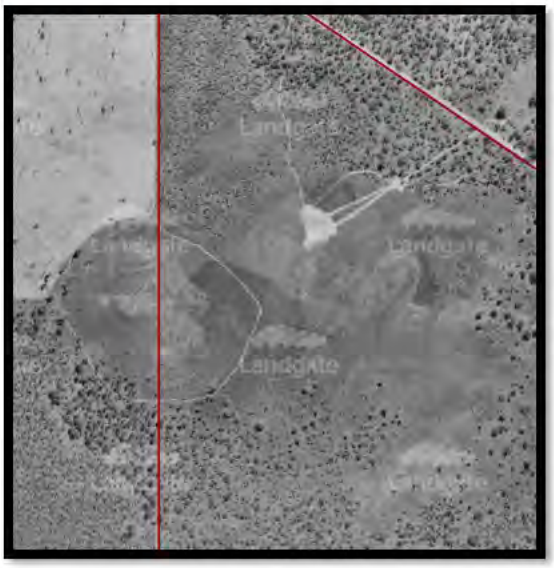
2 EXISTING ENVIRONMENT

2.1 Land Use

The site is currently zoned 'State Forest' under the Metropolitan Region Scheme (National Map, 2020) and under the City of Wanneroo Local Planning Scheme No. 2 (WAPC, 2001)

The earliest available historic aerial photograph on-line from 1965 (Landgate, 2020) shows that the site contains native vegetation (Plate 1) with limestone extraction having commenced in the current mining footprint.

Plate 1: Aerial Photograph 1953 (Landgate, 2020)



The 2000 photograph shows a large area of mining in the current quarry (Plate 2). A portion to the north of the quarry was cleared in 2000. Subsequent photos show the area cleared was not mined.

Plate 2: Aerial Photograph 2000 (Landgate, 2020)

The area surveyed for this report mostly contains native vegetation. The area cleared in 2000 regenerated to native bushland (Figure 2).

2.2 Topography

The northern part of the site slopes gently down from the west, at a high of around 70m Australian Height Datum (AHD) down to the east at around 55m AHD. The southern part of the site is very gently undulating with an elevation between 57 and 62m AHD (Figure 2).

2.3 Geology and Soils

2.3.1 Geology

The site is mapped as part of the Spearwood System which has the highest relief of the dune systems on the Swan Coastal Plain (Bolland, 1998). The Spearwood system consists of slightly calcareous Aeolian sand remnant from leaching of the underlying Pleistocene Tamala limestone (Davidson, 1995).

2.3.2 Soils

Two Spearwood soil units are mapped on the site and are described as follows:

- Karrakatta Shallow Soils Phase (211Sp_Kls) which are low hills and ridges with bare limestone or shallow siliceous or calcareous sand over limestone and are mapped over the majority of the site; and
- Karrakatta Sand Yellow Phase (211Sp_Ky) which are on low hilly to gently undulating terrain and are yellow sand over limestone at 1-2 m (DPIRD, 2020). This soil phase is located in a very small area on the western boundary.

2.4 Hydrology

Groundwater is at approximately 23 to 25m AHD, which is 32m to 47m below the surface level, and generally flows to the west (DWER, 2020). There are no wetlands mapped on the site (National Map, 2020).

3 METHODOLOGY

3.1 Database Searches

Searches of the following databases were undertaken for a 10km radius around the central point of the site prior to the site survey:

- Department of Biodiversity, Conservation and Attractions (DBCA) Declared Rare and Priority Flora database and Threatened Ecological Communities databases (Appendix 1);
- DBCA Naturemap Database (DBCA, 2020) (Appendix 2); and
- The Commonwealth Government's Protected Matters Search Tool to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation* (EPBC) *Act 1999* (DAWE, 2020). A radius of 5km was used for this database (Appendix 3).

3.2 Site Survey

A flora and vegetation survey of the site was conducted by Dr Paul van der Moezel of PGV Environmental on 8 October 2020.

The northern part of the site surveyed by Coffey Environments (2010) was walked to confirm the vegetation types and condition recorded in the 2010 survey and to record any additional plant species. Two 10m x 10m non-permanent quadrats were recorded in woodland vegetation in the northern part of the site to assist in the assessment of the Tuart Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community.

The southern part of the site which had not been surveyed previously was thoroughly walked to record all species in the survey area. Information on flora composition and vegetation structure was recorded in five 10m x 10m non-permanent quadrats located in representative vegetation types.

Most plant species were identified in the field. Some specimens were photographed or taken for identification at the Perth Reference Herbarium or office using standard reference guides.

3.3 Survey Conditions

The conditions that the survey was undertaken in are presented in Table 1 in order to assess the adequacy of the survey. In summary, there were no constraints to the survey.

Table 1: Statement of Botanical Survey Conditions

Issue	Constraints (Y/N)*	Comment
Competency/experience of the consultant conducting the survey	No	Dr Paul van der Moezel has extensive botanical survey experience in the Perth Metropolitan Region.
Proportion of the flora identified^	No	The timing of the survey in early October was optimal to identify most flora species on the site including all potential Threatened and Priority Flora. No follow-up survey required.
Sources of information (historic/recent or new data)	No	The flora in the Perth Metropolitan Region is well documented.
Proportion of the task achieved and further work that may need to be undertaken	No	No follow-up survey required as no Threatened Flora expected to occur in other seasons.
Timing/weather/season/cycle	No	The spring survey was optimal for most flora species. 2020 was a good year for ephemeral species, including orchids.
Disturbances (Fire)	No	The fire age of the vegetation was greater than 5 years.
Intensity of survey (e.g. In retrospect was the intensity adequate)	No	The time spent on the small site and ease of access made for a full coverage.
Completeness (e.g. was relevant area fully surveyed)	No	
Resources (e.g. degree of expertise available for plant identification)	No	Experienced botanist undertook most plant identifications on site.
Remoteness and/or access problems	No	Easily accessible site in the Perth Metropolitan Region.
Availability of contextual (e.g. bioregional) information for the study area.	No	Bush Forever

*Constraints have been rated as Significant, Moderate or No constraints

^Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey.

4 RESULTS

4.1 Flora Database Searches

A search of the DBCA Threatened Flora Databases: the WA Herbarium database (WAHerb), the Threatened (Declared Rare) and Priority Flora Species List (TFPL) (Appendix 1) and Naturemap Database (Appendix 2) indicates that a number of species that are listed as Endangered, Threatened or Priority have been located within a 10km radius of the site. The and the EPBC Act Protected Matters Search Tool (Appendix 3) indicates species that may have habitat within 5km radius of the site. The results from these database searches are shown in Table 2.

Table 3 lists the likelihood that any of these species could occur on the site based on the soil types and vegetation condition.

Table 2: Conservation Significant Flora Identified in Database Searches

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act
Caladenia huegelii	King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid	Schedule 1	Endangered
Calectasia cyanea	Blue Tinsel Lily	Schedule 1	Critically Endangered
Drakaea elastica	Glossy-leafed Hammer Orchid	Schedule 1	Endangered
Diuris purdiei	Purdie's Donkey-orchid	Schedule 2	Endangered
Drakaea micrantha	Dwarf Hammer-orchid	Schedule 2	Vulnerable
Marianthus paralius		Schedule 2	Endangered
Melaleuca sp. Wanneroo (G.J. Keighery 16705)		Schedule 2	Endangered
Andersonia gracilis	Slender Andersonia	Schedule 3	Endangered
Anigozanthos viridis subsp. *terraspectans*	Dwarf Green Kangaroo Paw	Schedule 3	Vulnerable
Diuris micrantha	Dwarf Bee-orchid	Schedule 3	Vulnerable
Eleocharis keigheryi	Keighery's Eleocharis	Schedule 3	Vulnerable
Eucalyptus argutifolia	Yanchep Mallee, Wabling Hill Mallee	Schedule 3	Vulnerable
Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)		Priority 1	
Drosera patens		Priority 1	
Drosera x sidjamesii		Priority 1	
Grevillea sp. Ocean Reef (D. Pike Joon 4)		Priority 1	
Haloragis sp. Parrot Ridge (G.J. Keighery 11563)		Priority 1	
Hydrocotyle striata		Priority 1	
Leucopogon maritimus		Priority 1	
Acacia benthamii		Priority 2	

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act
Amanita wadulawitu	Long-spored Lepidella	Priority 2	
Calectasia elegans	Elegant Tinsel Lily	Priority 2	
Fabronia hampeana		Priority 2	
Lecania sylvestris		Priority 2	
Lecania turicensis var. turicensis		Priority 2	
Poranthera moorokatta		Priority 2	
Rinodina bischoffii		Priority 2	
Stenanthemum sublineare		Priority 2	
Tetraria sp. Chandala (G.J. Keighery 17055)		Priority 2	
Thelymitra variegata	Queen of Sheba	Priority 2	
Adenanthos cygnorum subsp. chamaephyton		Priority 3	
Amanita carneiphylla	Miller's Pink-Gilled Lepidella	Priority 3	
Austrostipa mundula		Priority 3	
Beyeria cinerea subsp. *cinerea*		Priority 3	
Conostylis bracteata		Priority 3	
Cyathochaeta teretifolia		Priority 3	
Hibbertia leptotheca		Priority 3	
Jacksonia gracillima		Priority 3	
Lasiopetalum membranaceum		Priority 3	
Leucopogon sp. Yanchep (M. Hislop 1986)		Priority 3	
Pimelea calcicola		Priority 3	
Pithocarpa corymbulosa		Priority 3	
Placynthium nigrum	Blackthread Lichen	Priority 3	
Sarcozona bicarinata	Ridged Noon-flower	Priority 3	
Sphaerolobium calcicola		Priority 3	
Stylidium maritimum		Priority 3	
Stylidium paludicola		Priority 3	
Styphelia filifolia		Priority 3	
Conostylis pauciflora subsp. euryrhipis		Priority 4	
Conostylis pauciflora subsp. pauciflora		Priority 4	
Hibbertia helianthemoides		Priority 4	
Jacksonia sericea	Waldjumi	Priority 4	
Lepidium pseudotasmanicum		Priority 4	
Schoenus griffinianus		Priority 4	

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act
Stylidium longitubum	Jumping Jacks	Priority 4	
Tripterococcus sp. Brachylobus (A.S. George 14234)		Priority 4	

Conservation Codes are shown in Appendix 4

Table 3: Likelihood of Identified Significant Flora Species Occurring on the Site

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Caladenia huegelii	King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid	The Grand Spider-orchid prefers sand or clay loam. This species generally does not survive in disturbed areas.	Unlikely – Shallow sand over limestone not typical habitat for the species
Calectasia cyanea	Blue Tinsel Lily	The Blue Tinsel Lily prefers white, grey or yellow sand or gravel.	No – this species occurs in the south west near Albany
Drakaea elastica	Glossy-leafed Hammer Orchid	The Glossy-leafed Hammer Orchid prefers low-lying situations adjoining winter-wet swamps. This species does not survive in disturbed areas.	Highly Unlikely – not wetland habitat
Diuris purdiei	Purdie's Donkey-orchid	Purdie's Donkey Orchid occurs in grey-black sand in moist winter-wet swamps.	Highly Unlikely – not wetland habitat
Drakaea micrantha	Dwarf Hammer-orchid	Dwarf Hammer-orchid occurs in grey sands over dark, grey to blackish, sandy clay-loam substrates in winter wet depressions or swamps.	Highly Unlikely – not wetland habitat
Marianthus paralius		*Marianthus paralius* occurs in white sand and brown loam amongst heath on coastal limestone cliffs (DEC, 2009).	Highly Unlikely – not coastal limestone cliff
Melaleuca sp. Wanneroo (G.J. Keighery 16705)		*Melaleuca* sp. Wanneroo occurs in very shallow soils over limestone 'caprock' on ridges.	Possible
Andersonia gracilis	Slender Andersonia	Slender Andersonia occurs in white/grey sand, sandy clay, gravelly loam in winter-wet areas, near swamps.	Highly Unlikely – not wetland habitat
Anigozanthos viridis subsp. *terraspectans*	Dwarf Green Kangaroo Paw	The Dwarf Green Kangaroo Paw occurs on grey sand, clay loam in winter-wet depressions.	Highly Unlikely – not wetland habitat

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Diuris micrantha	Dwarf Bee-orchid	The Dwarf Bee-orchid is usually found on cleared firebreaks or open sandy patches that have been disturbed with in Jarrah Banksia woodland or thickets of Spearwood (*Kunzea ericifolia/ glabrescens*) (Williams *et al.*, 2001).	Unlikely – not typical habitat and has not previously been recorded in the area
Eleocharis keigheryi	Keighery's Eleocharis	Keighery's Eleocharis occurs in clay, sandy loam and is emergent in freshwater: creeks, claypans.	Highly Unlikely – not wetland habitat
Eucalyptus argutifolia	Yanchep Mallee, Wabling Hill Mallee	The Yanchep Mallee occurs in shallow soils over limestone on slopes or gullies of limestone ridges, outcrops.	Possible
Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)		*Baeckea* sp. Limestone is recorded from limestone outcrop/ridge in yellow sand derived from Tamala Limestone - Spearwood Dune System in bushland burnt 5+ years (Western Australian Herbarium, 2012).	Possible
Drosera patens		*Drosera patens* occurs in sandy soils on the margins of winter-wet depressions, swamps and lakes.	Highly Unlikely – not wetland habitat
Drosera x sidjamesii		*Drosera x sidjamesii* grows in peaty sand along lake margins, close to winter high-water line.	Highly Unlikely – not wetland habitat
Grevillea sp. Ocean Reef (D. Pike Joon 4)		*Grevillea* sp. Ocean Reef (D. Pike Joon 4) occurs in dry brown/grey sand, yellow brown sand on sandy dune, gully in coastal scrub.	Unlikely – is recorded from more coastal areas
Haloragis sp. Parrot Ridge (G.J. Keighery 11563)		*Haloragis* sp. Parrot Ridge (G.J. Keighery 11563) is recorded from a hill on margin of ridge in black sand over limestone (Western Australian Herbarium, 1989).	Possible but would be an extension of the range of this species
Hydrocotyle striata		*Hydrocotyle striata* occurs in clay near springs.	No – no suitable habitat
Leucopogon maritimus		*Leucopogon maritimus* occurs in Quindalup deep, calcareous sands, on the mid to upper slopes of dunes or in shallow sand over limestone, but avoiding the thicker vegetation of the swale (Hislop, 2011)	Possible
Acacia benthamii		*Acacia benthamii* grows on sand, typically on limestone breakaways	Known to occur on site (Coffey 2010)

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Amanita wadulawitu	Long-spored Lepidella	Long-spored Lepidella occurs in sandy soil with *Corymbia calophylla, Eucalyptus marginata, E. todtiana, E. camaldulensis, Jacksonia furcellata, Banksia attenuata and B. menziesii.* (McGurk et al., 2016).	Unlikely – not habitat typical to the species
Calectasia elegans	Elegant Tinsel Lily	Elegant Tinsel Lily occurs in deep grey quartz soils on gentle slopes, above damplands.	Highly Unlikely – not suitable habitat
Fabronia hampeana		*Fabronia hampeana* occurs on sheltered wet trunk of *Macrozamia dyeri* in shrub layer (Western Australian Herbarium, 2005a).	No – the host plant for this species occurs in Esperance
Lecania sylvestris		*Lecania sylvestris* typically occurs on limestone (Cranfield *et al.*, 2020).	Possible
Lecania turicensis var. turicensis		*Lecania turicens*is var. *turicensis* occurs on coastal rocks, limestone (Western Australian Herbarium, 1988).	Possible
Poranthera moorokatta		*Poranthera moorokatta* grows in white silica sand and has been recorded in Banksia woodland and in a shallow dampland (Barrett, 2012).	Highly Unlikely – not wetland habitat
Rinodina bischoffii		*Rinodina bischoffii* (lichen) occurs on limestone (Cranfield et al., 2020).	Possible
Stenanthemum sublineare		*Stenanthemum sublineare* grows in littered white sand on coastal plain (Rye, 2001).	Highly Unlikely – not suitable habitat
Tetraria sp. Chandala (G.J. Keighery 17055)		*Tetraria* sp. Chandala is recorded from a mound spring in peaty sand (Western Australian Herbarium, 2005b).	Highly Unlikely – not peaty habitat
Thelymitra variegata	Queen of Sheba	The Queen of Sheba orchid grows on sandy clay, sand and laterite.	Highly Unlikely – not suitable habitat
Adenanthos cygnorum subsp. chamaephyton		*Adenanthos cygnorum* subsp. *chamaephyton* occurs in grey sand, lateritic gravel.	Highly Unlikely – not lateritic habitat
Amanita carneiphylla	Miller's Pink-Gilled Lepidella	Miller's Pink-Gilled Lepidella is a deeply rooting species and grows in sandy soil.	Highly Unlikely – not typical to limestone habitat
Austrostipa mundula		*Austrostipa mundula* occurs on plains in grey sand (Western Australian Herbarium, 2001).	Highly Unlikely – not typical habitat
Beyeria cinerea subsp. *cinerea*		*Beyeria cinerea* subsp. *cinerea* grows in sand over limestone on road verges, gullies	Possible

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Conostylis bracteata		*Conostylis bracteata* occurs in sand, limestone on consolidated sand dunes.	Unlikely, not consolidated sand dune landform
Cyathochaeta teretifolia		*Cyathochaeta teretifolia* occurs in grey sand, sandy clay on swamps, creek edges.	Highly Unlikely – not wetland habitat
Hibbertia leptotheca		*Hibbertia leptotheca* grows near-coastal limestone ridges, outcrops and cliffs in coastal heaths and thickets usually dominated by species of *Melaleuca* and *Acacia* (Thiele, 2019).	Possible
Jacksonia gracillima		*Jacksonia gracillima* occurs in grey and brown well-drained sand.	Highly Unlikely – not typical habitat
Lasiopetalum membranaceum		*Lasiopetalum membranaceum* grows in sand over limestone.	Possible
Leucopogon sp. Yanchep (M. Hislop 1986)		*Leucopogon* sp. Yanchep occurs in light grey-yellow sand, brown loam, limestone, laterite, granite on coastal plain, breakaways, valley slopes, low hills.	Possible
Pimelea calcicola		*Pimelea calcicola* occurs in sand on coastal limestone ridges.	Possible
Pithocarpa corymbulosa		*Pithocarpa corymbulosa* occurs in gravelly or sandy loam amongst granite outcrops.	Highly Unlikely – not granite habitat
Placynthium nigrum	Blackthread Lichen	Blackthread Lichen is recorded from karst limestone on lagoon shore among salt marsh (Allan Herbarium, 1997).	Highly Unlikely – not saltmarsh habitat
Sarcozona bicarinata	Ridged Noon-flower	Ridged Noon-flower is found in white sand.	Possible
Sphaerolobium calcicola		*Sphaerolobium calcicola* grows in white-grey-brown sand, sandy clay over limestone, black peaty sandy clay on tall dunes, winter-wet flats, interdunal swamps, low-lying areas.	Highly Unlikely – not wetland habitat
Stylidium maritimum		*Stylidium maritimum* occurs in sand over limestone on dune slopes and flats in coastal heath and shrubland, open Banksia woodland.	Possible
Stylidium paludicola		*Stylidium paludicola* prefers peaty sand over clay in winter wet habitats in Marri and Melaleuca woodland, Melaleuca shrubland.	Highly Unlikely – not wetland habitat

Scientific Name	Common Name	Habitat*	Likelihood to occur on the site
Styphelia filifolia		*Styphelia filifolia* occurs in sandy soils of the coastal plain (with one known occurrence from the northern Darling Scarp), usually in Banksia or Jarrah woodland and in low-lying situations (Hislop and Lelièvre, 2017).	Highly Unlikely – not low-lying habitat
Conostylis pauciflora subsp. euryrhipis		*Conostylis pauciflora* subsp. *euryrhipis* occurs in white, grey or yellow sand on consolidated dunes in coastal areas.	Highly Unlikely – not dune habitat
Conostylis pauciflora subsp. pauciflora		*Conostylis pauciflora* subsp. *pauciflora* occurs in grey sand, limestone on hillslopes, consolidated dunes in coastal areas.	Unlikely, not coastal consolidated dune landform
Hibbertia helianthemoides		*Hibbertia helianthemoides* grows in clayey sand over sandstone or loam over quartzite on hills and scree slopes.	Highly Unlikely – not suitable habitat
Jacksonia sericea	Waldjumi	Waldjumi grows in calcareous and sandy soils.	Known to occur on site (Coffey 2010)
Lepidium pseudotasmanicum		*Lepidium pseudotasmanicum* occurs in loam, sand associated with granite.	Highly Unlikely – not granite habitat
Schoenus griffinianus		*Schoenus griffinianus* grows in white sand in low heath (Wilson, 1997).	Highly Unlikely – not typical habitat
Stylidium longitubum	Jumping Jacks	Jumping Jacks prefer sandy clay, clay in seasonal wetlands.	Highly Unlikely – not wetland habitat
Tripterococcus sp. Brachylobus (A.S. George 14234)		*Tripterococcus* sp. Brachylobus occurs in grey, black or peaty sand winter-wet flats	Highly Unlikely – not wetland habitat

* sourced from Florabase (DBCA, 2017) and SPRAT Database (DoEE, 2016) as well as the DBCA database searches unless otherwise denoted

4.2 TEC and PEC Desktop Search

A search of DBCA's Threatened (TEC) and Priority Ecological Communities (PEC) database was conducted within a radius of 5km around the site (47-0820EC) (Appendix 5). Three TECs and four Priority 3 PECs at State level were identified in the database search. Two of these are also listed as a TEC under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Three of the State listed PECs are listed under the EPBC Act as TECs. The communities identified in the database searches are outlined in Table 4.

Table 4: Threatened and Priority Ecological Communities likely to occur within 5km of the Site

Ecological Community	Description	Conservation Status WA	Status under the EPBC Act
CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered
SCP10a	Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson *et al.* (1994))	Endangered	Critically Endangered
SCP26a	*Melaleuca huegelii - Melaleuca systena* shrublands on limestone ridges (floristic community type 26a as originally described in Gibson *et al.* (1994))	Endangered	
SCP23b	Swan Coastal *Plain Banksia attenuata - Banksia menziesii* woodlands	Priority 3	Endangered as part of the Banksia WL SCP
SCP24	Northern Spearwood shrublands and woodlands	Priority 3	
Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered
Tuart woodlands	Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered

4.3 Flora

A total of 188 plant species were recorded in the Coffey Environments (2010) and PGV Environmental surveys (Appendix 6). The total consisted of 140 native and 48 introduced species. The percentage of introduced species (26%) is considered moderate. The number of native species is moderate to high relative to the area of native vegetation (24.5ha) and the diversity of vegetation types on sand over limestone soils.

The number of species recorded in the northern and southern parts of the survey area were very similar with 135 in the northern area and 131 in the southern area.

The plant Families with the highest representation of species were the Fabaceae (Pea and Wattle family – 23 species, including 19 native and 4 introduced), Proteaceae (Banksia family - 17 species, all native), Poaceae (Grass family – 18 species including 4 native and 14 introduced), Asteraceae (Daisy family – 14 species, including 8 native and 6 introduced), Myrtaceae (Eucalyptus, Melaleuca and others – 9 species, including 7 native and 2 introduced) and Asparagaceae (Lily family – 9 species, 8 native and one introduced.

There were no Threatened (Declared Rare) species recorded on the site.

Three Priority species were recorded on the site as follows:

- *Baeckea* sp Limestone P1 – 4 plants in the southern part of the site
- *Acacia benthamii* P2 – Occurs abundantly in the northern part of the site
- *Jacksonia sericea* P4 – Occurs commonly in the northern part and southern parts of the site.

Locations of the Priority species are provided in Figure 3 of this report and Figure 3 of Appendix 8.

Quadrat Data for the southern part of the site are provided in Appendix 7. Quadrat data for the northern part of the site are contained in the Coffey Environments (2010) report in Appendix 8.

Species richness in the five quadrats from the southern part of the site ranged from 30-49 species. There were between 13 and 17 introduced species in the quadrats representing 31 to 49% of the total number of species recorded in the quadrats.

Coffey Environments (2010) recorded 47-60 species in their five quadrats in the northern part of the site with 15-22 introduced species (32-45%).

The number of species in quadrats is moderate to high for the types of vegetation surveyed.

4.4 Vegetation

4.4.1 Vegetation Complex

Vegetation Complexes are a broad level of vegetation description which is based on the underlying geomorphology and rainfall (Heddle *et al*., 1980). The areas of remnant native vegetation on the site is part of the Cottesloe Complex– Central and South vegetation complex which is described as:

> Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *E. gomphocephala* – *E. marginata* (Jarrah) – *Corymbia calophylla* (Marri), closed heath on the limestone outcrops' (Heddle *et al.,* 1980).

The general description of the vegetation complex matches the vegetation types recorded on the site.

4.4.2 Vegetation Type

For small scale sites, such as the survey area, vegetation mapping can be further refined by using vegetation types which are described by the composition and structure of the dominant species rather than based on geomorphology.

Seven different native vegetation types were described and mapped on the site. The vegetation types on the northern part of the site were different to those present on the southern part. This is considered a result of the slightly different soil types in each area rather than a result of the different surveys.

The vegetation types are described in Table 5 and mapped on Figure 3.

Table 5: Vegetation Types on the Site

Vegetation Type	Description	Photograph
M70/341, M70/345		
BaAfBm *Banksia attenuata/ Allocasuarina fraseriana/B. menziesii* Low Open Forest over *Xanthorrhoea preissii* Tall Open Shrubland over *Hibbertia hypericoides/ Allocasuarina humilis* Open Low Heath	Occurs at the western end of the survey area. The Banksia and *Allocasuarina fraseriana* trees are 3-8m high and a density of around 40%. Common understorey species include *Xanthorrhoea preissii, Hibbertia hypericoides, Allocasuarina humilis, Mesomelaena pseudostygia, Desmocladus flexuosus* and *Acacia benthamii.* Soil type is yellow-brown sand. Coffey Environments (2010) quadrat Q1 representative of this vegetation type	
BaAf *Banksia attenuata/ Allocasuarina fraseriana* Low Woodland over *Xanthorrhoea preissii/ Hakea prostrata* Tall Shrubland over *Hibbertia hypericoides* Low Open Shrubland over *Tetraria octandra/Mesomelaena pseudostygia* Very Open Sedgeland	Occurs towards the western end of the survey area. Similar to the BaAfBm vegetation type but without *B. menziesii* in the tree canopy and with a slightly different understorey composition. Common species include *Xanthorrhoea preissii, Hakea prostrata, Hibbertia hypericoides, Tetraria octandra, Mesomelaena pseudostygia, Desmocladus flexuosus,* Soil type is yellow-brown sand. Coffey Environments (2010) quadrat Q3 representative of this vegetation type	

Vegetation Type	Description	Photograph
BsXp *Banksia sessilis/ Xanthorrhoea preissii* Tall Open Scrub over *Melaleuca systena/Hakea lissocarpha* Open Shrubland over *Jacksonia sericea/ Hibbertia hypericoides* Low Open Shrubland	Occurs towards the western end of the survey area and along the southern boundary in the area previously cleared but not mined. *Banksia sessilis and Xanthorrhoea preissii* are 3-3.5m high and around 30-40% cover. Typical understorey species include *Melaleuca systena, Hakea lissocarpha, Jacksonia sericea, Hibbertia hypericoides, Acanthocarpus preissii* and *Desmocladus flexuosus.* Soil type is yellow-brown sand with some surface limestone. Coffey Environments (2010) quadrats Q2 and Q6 are representative of this vegetation type	
EmBa *Eucalyptus marginata* Woodland over *Banksia attenuata* Open to Low Woodland over *Xanthorrhoea preissii* Open Shrubland over *Hibbertia hypericoides* Low Shrubland to Closed Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland	Occurs in the eastern half of the survey area. Jarrah (*Eucalyptus marginata*) is the main tree species up to 10m high with occasional Tuart (*E. gomphocephala*) over a sparse canopy of *Banksia attenuata* to 7m and generally less than 10% cover. Common understorey species include *Xanthorrhoea preissii, Hibbertia hypericoides, Mesomelaena pseudostygia, Desmocladus flexuosus* and *Hakea lissocarpha.* Soil type is yellow-brown sand. Coffey Environments (2010) quadrats Q4 and Q5 representative of this vegetation type.	

Vegetation Type	Description	Photograph
M70/346 and M70/339		
Em *Eucalyptus marginata* Low Open Woodland over *Xanthorrhoea preissii/ Macrozamia riedlei/ Hibbertia hypericoides* Open Heath over *Mesomelaena pseudostygia* Very Open Sedgeland	Occurs in the western half of the survey area. Jarrah is the only tall tree species present, with Tuart absent. *Banksia attenuata* and *B. menziesii* trees are very scattered at less than 1% cover. Common understorey species include *Xanthorrhoea preissii, Macrozamia riedlei, Hibbertia hypericoides, Mesomelaena pseudostygia, Acacia pulchella, Gompholobium tomentosum* and *Petrophile macrostachya.* The soil type is orange-brown sand. Quadrats CLS1 and CLS2 are representative of this vegetation type	
Eg *Eucalyptus gomphocephala* Low Open Woodland over *Banksia sessilis* Open Shrubland over *Xanthorrhoea preissii/ Hibbertia hypericoides/ Jacksonia sericea/* Closed Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland	Occurs in the northern half of the survey area. Tuart is the only tree species present, up to 8m high and 5-10% cover. Jarrah and Banksia trees are absent. The understorey contains a mid-stratum of sparse *Banksia sessilis* to 2m with *Acacia xanthina* common in some areas. Typical understorey species include *Xanthorrhoea preissii, Hibbertia hypericoides, Jacksonia sericea, Mesomelaena pseudostygia, Phyllanthus calycinus* and *Conostylis candicans.* The soil type is orange-brown sand with minimal surface limestone. Quadrats CLS4 and 5 are representative of this vegetation type	

Vegetation Type	Description	Photograph
EgEm *Eucalyptus gomphocephala/ E. marginata* Low Woodland over *Jacksonia sternbergiana/ Macrozamia riedlei* Shrubland over *Hibbertia hypericoides* Open Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland	Occurs in the southern central part of the survey area and is transitional between the Em and Eg vegetation types. Jarrah and Tuart are in equal proportion at around 10% cover each. Banksia trees are absent. Common understorey species include *Xanthorrhoea preissii, Macrozamia riedlei, Hibbertia hypericoides, Mesomelaena pseudostygia, Jacksonia sericea* and *Cassytha racemosa.* The soil type is orange-brown sand. Quadrat CLS3 is representative of this vegetation type	

4.4.3 Floristic Community Types

Floristic Community Types (FCT) are based on the whole floristic composition of the vegetation rather than being determined by soil type and geomorphology (Vegetation Complex) or the nature of the dominant species (Vegetation Types).

Coffey Environments (2010) determined the FCT in the northern survey area by analysing the quadrat data using computer PATN analysis. PGV Environmental determined the FCT of the southern survey area using the spreadsheet method which compares the species in the quadrats to the species found in each FCT (Table 12 in Gibson *et al.* 1994). Computer analysis of the southern quadrats was not a requirement of the scope of works.

Coffey Environments (2010) determined that the vegetation in the northern survey area represented two FCTs as follows:

- FCT 24 'Northern Spearwood shrubland and woodlands'
- FCT 28 'Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands'

FCT24 included the BsXp vegetation type while FCT28 included the BaAfBm, BaAf and EmBa vegetation types.

PGV Environmental determined that all three vegetation types in the southern survey area (Em, Eg and EgEm) most similar to FCT28 'Spearwood *Banksia attenuata* or *B. attenuata – Eucalyptus* woodland'. The result is consistent with the findings of Coffey Environments (2010) who found that the woodlands in the northern survey area were also FCT28.

4.4.4 Vegetation Condition

The condition of the vegetation was assessed according to the system of Keighery as described in Bush Forever (Government of Western Australia, 2000) (Table 6).

Table 6: Vegetation Condition Rating Scale

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate to it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Condition	Description
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

The condition of the vegetation is shown in Figure 4. Most of the native vegetation was assessed as being in Very Good condition with variations of Very Good-Excellent and Very Good-Good in some areas. The vegetation was not rated higher, as Excellent, due to the high percentage of introduced species in all quadrats and over the site in general.

The northern area previously cleared but not mined is rated as Good to Degraded with a higher percentage of weed cover in that area.

4.5 Conservation Significance of Flora and Vegetation

4.5.1 Flora

No Threatened flora species were recorded on the site. The two Threatened species that were identified as possibly being present on the site during the database search, *Eucalyptus argutifolia* and *Melaleuca* sp. Limestone are found on areas with more outcropping limestone than occurs on the site. Therefore, these two species are not considered likely to occur in the survey areas.

Three Priority species were recorded on the site as follows:

- *Baeckea* sp Limestone P1 – 4 plants in the southern part of the site
- *Acacia benthamii* P2 – Occurs abundantly in the northern part of the site
- *Jacksonia sericea* P4 – Occurs commonly in the northern part and southern parts of the site.

Four plants of the Priority 1 species *Baeckea* sp. Limestone were recorded in the southern survey area (Figure 6). *Baeckea* sp. Limestone is a medium sized shrub and was readily identifiable during the survey as it was in full flower (Plate 3). It is unlikely that additional plants occur in the survey area. *Baeckea* sp. Limestone is known to occur in the Cities of Wanneroo, Joondalup, Stirling and the Shire of Gingin.

Acacia benthamii was recorded as occurring abundantly in the northern survey area by Coffey Environments (2010). Over 200 plants were observed mostly in the *Banksia sessilis/Xanthorrhoea preissii* vegetation type and the western Banksia/Sheoak woodland (Figure 6). The presence of *Acacia benthamii* was confirmed in the PGV Environmental survey (Plate 4). No *A. benthamii* plants were recorded in the southern area due to the absence of the BsXp vegetation type and Banksia/Sheoak woodland. *Acacia benthamii* is known to occur from Gosnells to Dandaragan, typically on limestone breakaways.

Coffey Environments (2010) recorded over 700 *Jacksonia sericea* plants occurring in all vegetation types in the northern survey area. PGV Environmental also recorded *J. sericea* as common in the Tuart woodland vegetation in the southern survey area (Figure 6). Previous advice from the Department of Biodiversity, Conservation and Attractions on a nearby clearing permit application has indicated that the form of *J. sericea* in Carabooda is an intergrade between the more typical form of *Jacksonia sericea*

(P4) and *Jacksonia calcicola,* a commonly occurring species on limestone soil. The Carabooda form of *J. sericea* also occurs abundantly in the portion of Bush Forever Site 290 to the north of Old Yanchep Road (PGV Environmental, 2019).

Plate 3: *Baeckea* sp. Limestone on M70/346

Plate 4: *Acacia benthamii* on M70/345

Plate 5: *Jacksonia sericea* on M70/345

4.5.2 Vegetation

4.5.2.1 Vegetation Complex

The vegetation on the site is part of the Cottesloe Complex - Central and South (Heddle *et al.*, 1980). Approximately 32% of the pre-European vegetation extent of this complex remains, of which 14% is currently managed by DBCA (DBCA, 2018).

The percentage retention is above EPA's target for minimum 30% retention of vegetation complexes State-wide in the Perth and Peel Region Constrained Areas and the area in protection is above the 10% minimum criteria for vegetation complexes.

4.5.2.2 Threatened and Priority Ecological Communities

The FCT on the site was determined to be most similar to FCT 24 'Northern Spearwood shrubland and woodlands' and FCT28 'Spearwood *Banksia attenuata* or *B. attenuata – Eucalyptus* woodland'. FCT 28 is not a TEC or PEC at State level.

FCT24 is a Priority 3 Ecological Community at State level. The FCT24 PEC has previously been deemed of 'low to moderate conservation significance' through an appeal on a previous clearing permit application (CPS 2858/1) in 2011.

FCT28 is not listed as a Priority Ecological Community, however may be part of the broader ecological community 'Banksia Woodlands of the Swan Coastal Plain' which is listed as a PEC at State level and a TEC at Commonwealth level under the EPBC Act. Further analysis of the Banksia Woodland TEC is provided below.

The vegetation types containing Tuart trees have has potential to be part of the Tuart Woodlands and Forests of the Swan Coastal Plain TEC. An assessment of the TEC is provided below.

The vegetation types containing *Banksia attenuata* trees have has potential to be part of the Banksia Woodlands of the Swan Coastal Plain TEC. An assessment of the TEC is provided below.

4.5.2.3 Tuart Woodlands and Forests of the Swan Coastal Plain

Description

The Tuart Woodlands and Forests of the Swan Coastal Plain was listed as a Threatened Ecological Community (TEC) with a rating of Critically Endangered under the Commonwealth EPBC Act on 4 July 2019 (for brevity the community will be called the Tuart Woodland TEC in this report). A description of the Tuart Woodland TEC is available through the EPBC Act listing and more specifically the *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological* released by the Commonwealth Government (Commonwealth of Australia, 2019). According to the Conservation Advice the diagnostic characteristics of the TEC are:

Key diagnosis characteristics

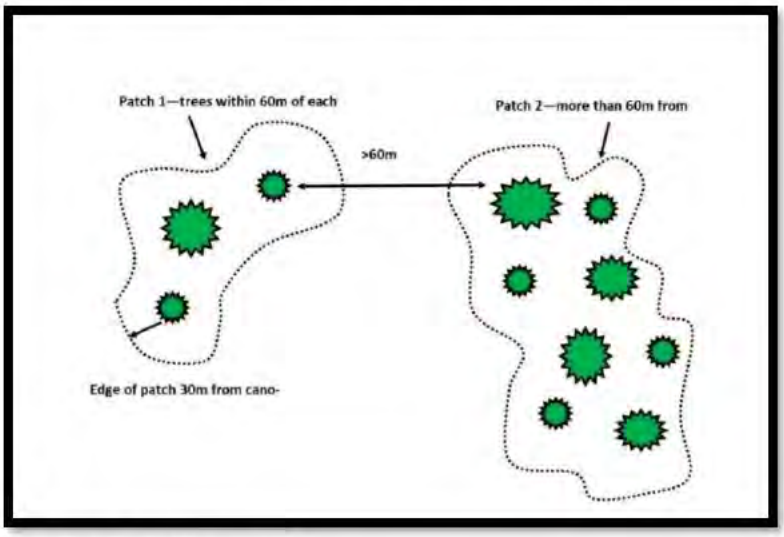
- The ecological community is limited to patches of vegetation (with their associated biota) that meet all of the following key diagnostic characteristics:
- Occurs in the Swan Coastal Plain Bioregion, Western Australia (IBRA v7. Department of the Environment 2012).
- Primarily occurs on the Spearwood and Quindalup dune systems but can also occur on the Bassendean dunes and Pinjarra Plain. It can occur on the banks of rivers and wetlands.
- The primary defining feature is the presence of at least two living established *Eucalyptus gomphocephala* (Tuart) trees in the uppermost canopy layer, although they may co-occur with trees of other species. There is a gap of no more than 60 m between the outer edges of the canopies of adjacent Tuart trees. These trees may occur either as single stemmed trees or as a mallee growth form.
- Most often occurs as a woodland but can occur in other structural forms, For example, forest, open forest, woodland, open woodland, and various mallee forms.
- Other tree species may be present in the canopy or sub-canopy. They commonly include: *Agonis flexuosa* (Peppermint) and *Banksia grandis* (Bull Banksia) (both in the southern part of the range), *Banksia attenuata* (Candlestick Banksia), *Eucalyptus marginata* (Jarrah); and less commonly, *Corymbia calophylla* (Marri), *Banksia menziesii* (Firewood Banksia) and *Banksia prionotes* (Acorn Banksia).
- An understorey of native plants is typically present, which may include grasses, herbs and shrubs, although this is often modified by disturbance. Some understorey plant species that are most commonly present are listed in Section 2.3.3 of the Conservation Advice.
- Native fauna species that are most commonly present are noted in Section 2.4 of the Conservation Advice (Commonwealth of Australia, 2019).

Defining a patch of the ecological community

- A patch of the ecological community is a discrete and mostly continuous area of vegetation that meets the key diagnostic characteristics.
- Boundaries for a patch can extend beyond a site or property boundary, or potential area of impact for a proposed action.
- The patch boundary is 30 m beyond the outer canopy of the established Tuart trees (≥15 cm diameter at breast height (DBH)), including dead Tuart trees (stags). See Plate 6

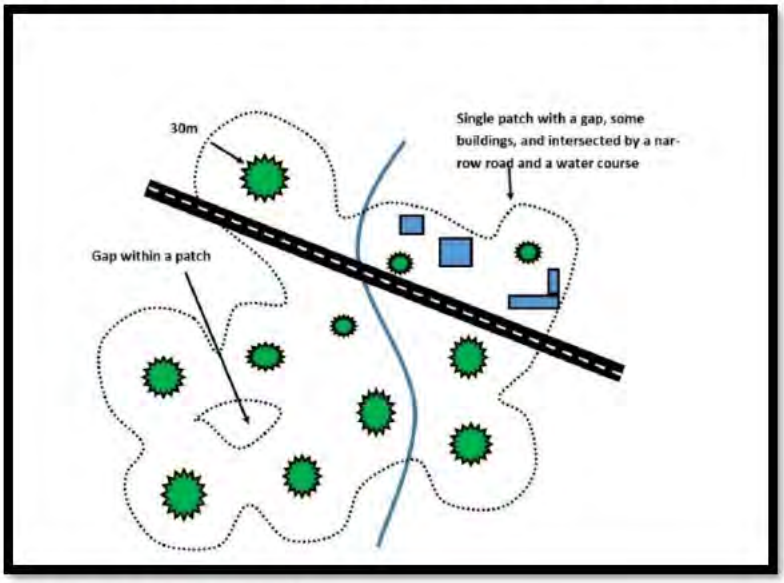
- Where a dead Tuart tree (stag) is being considered for inclusion in a patch of the ecological community, the vertical projection of its outermost remaining branches is used to define the edge of its canopy. If the species of a stag tree is unclear, if the edge of its canopy is within 60 m of an identified Tuart tree the stag is presumed to be a Tuart.
- Patches of Tuart woodlands and forests may contain areas that vary in structural or biological complexity. One part of a patch may have a larger number of mature trees and more ecological diversity, whereas another part of the same patch may demonstrate fewer mature trees and less groundcover. Areas with soil exposed and/or plant litter can also be expected within this ecological community.
- Variation in quality or condition of vegetation across a patch should not necessarily be considered to be evidence of multiple patches. Patches of the ecological community can be spatially variable and are often characterised by one or more areas within a patch that meet higher condition thresholds amongst areas of lower condition.
- If an area meets the key diagnostic characteristics but the average condition across that area falls below the minimum condition thresholds, the largest area or areas of at least 0.5 ha that meet minimum condition thresholds on average, should be specified as the patch or patches of the nationally listed ecological community. This may result in multiple patches of the ecological community being identified within the overall area first identified as meeting the key diagnostics.
- A patch may include small areas without understorey vegetation, such as bare ground, as well as waterbodies or hardscape (e.g. roads, paths, car parks, or buildings) that do not significantly alter the overall function of the ecological community. These small areas do not break up a patch, or divide a patch into multiple patches, as long as there are some parts of the canopy within 60 m of the outer edges of the canopies of adjacent Tuart trees (as per Plate 5). However, existing buildings and other human-made structures and gardens are not part of the nationally protected ecological community and should be excluded from the calculation of patch size and condition. See Plate 7 (Commonwealth of Australia, 2019).

Plate 6: Tuart TEC Patch boundaries



Source: Commonwealth of Australia, 2019

Plate 7: Variation within a patch, including small areas without understorey vegetation, and a small gap within a patch due to part of the Tuart canopy being >60 m apart



Source: Commonwealth of Australia, 2019

Condition thresholds and categories

For confirmed patches of the ecological community, following the key diagnostic characteristics and patch definition above (Step 1), determine the following requirements for information on condition to indicate if they are part of the nationally protected ecological community:

- If the patch is smaller than 0.5 ha it is **not** part of the nationally protected ecological community.
- If **the patch is at least 0.5 ha and up to 5 ha** in size, conduct on ground surveys. Patches in this size range are presumed to be part of the nationally protected ecological community unless surveys indicate they do not meet the minimum condition required for national protection. For patches in this size range inclusion in the nationally protected ecological community is determined by surveyed characteristics such as native plant species richness and contribution to cover, habitat values, evidence of regeneration and landscape characteristics.
- **All patches of 5 ha or greater** that meet the key diagnostic characteristics **are part of the nationally protected ecological community.** It is not necessary to conduct additional surveys to confirm that they meet biotic condition thresholds (Table 7) and that they are protected.

Table 7: Tuart TEC Condition Categories and Thresholds

All patches ≥5 ha is part of the nationally protected ecological community, regardless of their understorey condition. That is, thresholds in this table do not apply to patches ≥5 ha, but the key diagnostic characteristics and patch definition must be met.

Patch size Biotic thresholds	≥2 ha <5 ha	≥0.5 ha <2 ha
Very high condition ≥80 % of all understorey^ vegetation cover is native# Or At least 12 native understorey^ species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	Smaller patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY
High condition ≥60 % of all understorey^ vegetation cover is native# Or At least 8 native understorey^ species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	Smaller patches with high condition understorey. **AND** That either: have an important landscape role (≤100 m to native vegetation)* OR have a habitat role (≥2 very large trees per 0.5 ha)* OR show regeneration (≥15 seedlings and/or saplings per 0.5 ha)* PART OF THE PROTECTED ECOLOGICAL COMMUNITY
Moderate condition ≥50 % of all understorey^ vegetation cover is native# Or At least 4 native understorey^ species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with moderate condition understorey. **AND** That either: have an important landscape role (≤100 m to native vegetation)* OR have a habitat role (≥2 very large trees per 0.5 ha)* OR show regeneration (≥15 seedlings and/or saplings per 0.5 ha)* PART OF THE PROTECTED ECOLOGICAL COMMUNITY	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)

Patch size Biotic thresholds	≥2 ha <5 ha	≥0.5 ha <2 ha
Poor Has minimal or no native cover and species richness. That is: <50 % of all understorey^ vegetation cover is native# And Less than 4 native understorey^ species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)

Tuart Woodland TEC Assessment

The survey area contains Tuart trees in the following vegetation types:

EmBa – occurs in the eastern part of the northern survey area. Tuarts described as 'occasional;' in the Coffey Environments (2010) survey.

Eg – A common vegetation type in the southern survey area with Tuart as the dominant tree species

EgEm – occurs in the southern survey area as a mix of Tuart and Jarrah trees.

The presence of Tuart trees does not automatically mean that the Tuart Woodland TEC occurs on site.

The Conservation Advice contains the following step-wise approach to use in determining if the TEC occurs on a site:

- Step 1: Is the Tuart Woodlands and Forests ecological community in your proposed project site? Is it in other adjacent or off-site areas that may be impacted (for example, by introducing weeds)?
- Step 2: What is the patch size and condition category of the Tuart Woodlands and Forests in the proposed project site and in the surrounding area?

A survey of the vegetation containing Tuart trees was undertaken at the same time as the flora and vegetation survey on 8 October 2010. The survey included recording the location of Tuart trees and measuring plant species in 10m x 10m quadrats in areas containing Tuarts.

The assessment of the Tuart Woodland TEC on the site is outlined in Table 8 and Table 9.

Three patches of Tuart were mapped on the site, two in the northern survey area and one in the southern area. The two northern patches were separated due to the closest Tuart canopies being more than 60m apart in the two patches.

Step 1: Is the Tuart Woodlands and Forests ecological community in your proposed project site? Is it in other adjacent or off-site areas that may be impacted (for example, by introducing weeds)?

Table 8: Tuart Woodland TEC Step 1 Diagnostics

Key diagnostic characteristics♦	**Information**	**Key diagnostic questions*** (Refer to Section 3.2 of the Approved Conservation Advice for a complete explanation of these diagnostic features – other sections of the Approved Conservation Advice are referenced where relevant)	**Response (yes/no/possibly) and detailed comments. Use as much space as you need to fully answer the question#**
Location and physical environment	Bioregion	Is the proposal site within the Swan Coastal Plain IBRA bioregion?	Yes
Soils and Landform	Soil type	Is the soil type consistent with where the Tuart Woodlands and Forests may occur? (see Section 2.2.1♦)	Yes, Spearwood Dune soil type
	Location in the landscape, topography	Is the topography/physical environment consistent with where the Tuart Woodlands and Forests may occur? Is the site associated with any hydrology (groundwater/surface water)?	Yes, Tuarts commonly found in the Carabooda area. Not associated with any hydrology
Structure	Presence of Tuart trees	How many Tuart trees are present and are they consistent with the characteristics set out in the Approved Conservation Advice? **Note:** Please present this information in terms of total number of trees (dead, established, seedlings etc.) and trees per hectare of the footprint. Diagrams/maps should also be provided.	Sixteen Tuart trees in the northern survey area (plus additional trees outside adjoining the northern area. At least 50 established Tuarts in the southern survey area
	Structural form	What structural form is the vegetation?	Low Open Woodland
Composition	Dominant tree species, emergent tree layer, understory	Is the composition of the community consistent with the characteristics set out in the Approved Conservation Advice? What other tree species are present? How many native understorey species are present and what is the number of weedy species/proportion of weeds?	Tuarts occur in pure stands as well as with Jarrah. Native understorey species range from 16-29 in quadrats. Refer to quadrat data.

Key diagnostic characteristics♦	Information	Key diagnostic questions* (Refer to Section 3.2 of the Approved Conservation Advice for a complete explanation of these diagnostic features – other sections of the Approved Conservation Advice are referenced where relevant)	Response (yes/no/possibly) and detailed comments. Use as much space as you need to fully answer the question#
Defining a patch of Tuart Woodlands and Forests	Patch definition	What is the extent of the patch? **Note:** Descriptions of patch extent must include analysis of canopy extent and associated understorey vegetation (see Section 3.2.2♦). Patches may extend beyond the project area or include areas of infrastructure (i.e. road, powerline). The referral should make clear how, and how much of the patch will be directly or indirectly impacted.	Two patches recorded within the boundary of the site in the northern survey area and one in the southern survey area as follows: Patch 1 – 0.583ha Patch 2 – 1.215ha – extends off site, likely to be >5ha. Patch 3 – 8.305ha
Relationship with other ecological communities	Other vegetation communities	Are other vegetation communities present? What are they and how do they intergrade and/or interact with the Tuart Woodlands and Forests TEC? (see Section 3.2.3♦)	Other vegetation types without Tuart occur next to vegetation types containing Tuart trees.

The complete key diagnostic characteristics are provided in the Approved Conservation Advice.

* The Tuart Woodlands and Forests may include restored, planted or revegetated flora. Do not exclude vegetation from being classed as the Tuart Woodlands and Forests because it is a planted, restoration or revegetation site (unless it is a garden).

Comments should include references to appropriate supporting information and data.

Step 2: What is the patch size and condition category of the Tuart Woodlands and Forests in the proposed project site and in the surrounding area?

Table 9: Tuart Woodland TEC Step 2 Diagnostics

Size and condition♦	Information	Relevant content to be discussed in the referral (Refer to Section 3.3 of the Approved Conservation Advice for a complete explanation of these diagnostic features)	Detailed comments. Use as much space as you need to fully answer the question#
Patch Size	Patch size in hectares	Is the patch size large enough to meet the minimum patch size in this section? (Section 3.3♦) **Note:** Patch boundaries are not limited to the proposal site. You must make clear that the patch boundary is consistent with Section 3.2.2♦.	All three patches are larger than the 0.5ha minimum

Size and condition♦	Information	Relevant content to be discussed in the referral (Refer to Section 3.3 of the Approved Conservation Advice for a complete explanation of these diagnostic features)	Detailed comments. Use as much space as you need to fully answer the question#
Patch condition	Condition thresholds	Using the condition categories in this section, what is the patch condition? (Section 3.3.1♦) What is the quality and size (hectares) of the vegetation community in and around the site where the proposed action will occur? Is the patch expected to improve in condition (e.g. after appropriate fire management) or is there a threatening process underway that will reduce the current size and/or condition? **Note:** Refer to Section 3.4 – Step 3 – Further information to assist in identifying patches of the protected ecological community and avoiding significant adverse impacts If patch quality varies over the site; characterisation of the variation should be provided. Patch condition includes consideration of thresholds for characteristics such as plant species richness, landscape features, Tuart tree age and size and other habitat roles of the vegetation. Other vegetation condition measures (e.g. Keighery scale) do not necessary reflect the condition thresholds and both should be provided, where relevant. Where threats are identified (i.e. those listed in Appendix C of the Approved Conservation Advice) please provide further information on what these are and how they have impacted the condition.	All three patches have at least 12 native understorey species per 0.1ha. Therefore, the condition category of all patches is rated as Very High. A patch in Very High condition requires a minimum 0.5ha size to be the TEC. Therefore, all three patches meet the minimum condition threshold for the TEC.

♦ Further information on the key diagnostic characteristics is provided in the Approved Conservation Advice.

Comments should include references to appropriate supporting information and data. The response which includes the information does not need to be presented in table form.

(Commonwealth of Australia, 2019)

Conclusion

The conclusion of the assessment is that all three patches containing Tuart trees are part of the Tuart Woodlands and Forests TEC, as they meet the minimum size criteria for vegetation in Very High condition as rated by the Tuart Woodland TEC methodology. The total area of Tuart Woodland TEC on the site is estimated to be around 9ha (Figure 5). The patch of Tuart Woodland TEC extends out of the northern survey area to the east, north-east and south-east.

4.5.2.4 Banksia Woodland TEC Assessment

The Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (Banksia Woodland TEC) is listed as an Endangered TEC under the Commonwealth EPBC Act. The Banksia Woodland community is a conglomerate of a number of Banksia-dominated FCTs recognised at State level. FCTs 24 and 28, which occur on the site, are two of the FCTs that form part of the Banksia Woodland TEC. However, the identification of one of the relevant FCTs on a site is not of itself sufficient to assign the vegetation to the Banksia Woodland TEC. The vegetation needs to meet specific criteria to be considered the TEC.

The *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* (Commonwealth of Australia, 2016) (Conservation Advice) describes the Banksia Woodland TEC as:

> *The ecological community is a woodland associated with the Swan Coastal Plain of southwest Western Australia. A key diagnostic feature is a prominent tree layer of Banksia, with scattered eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range* (Commonwealth of Australia, 2016).

Table 10 assesses the vegetation type on the site against the Banksia Woodland TEC criteria contained in the Conservation Advice.

Table 10: Assessment of the Banksia Woodland of the Swan Coastal Plain TEC.

Feature	Characteristic	Vegetation Type		
		BaAfBm	**BaAf**	**EmBa**
		Banksia attenuata/Allocasuarina fraseriana/B. menziesii Low Open Forest over *Xanthorrhoea preissii* Tall Open Shrubland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath	*Banksia attenuata/Allocasuarina fraseriana* Low Woodland over *Xanthorrhoea preissii/Hakea prostrata* Tall Shrubland over *Hibbertia hypericoides* Low Open Shrubland over *Tetraria octandra/Mesomelaena pseudostygia* Very Open Sedgeland	*Eucalyptus marginata* Woodland over *Banksia attenuata* Open to Low Woodland over *Xanthorrhoea preissii* Open Shrubland over *Hibbertia hypericoides* Low Shrubland to Closed Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland
Banksia Species	The patch must include at least one of the following diagnostic species: • *Banksia attenuata* (Candlestick Banksia) • *Banksia menziesii* (Firewood Banksia) • *Banksia prionotes* (Acorn Banksia) • *Banksia ilicifolia* (Holly-Leaved Banksia).	*Banksia attenuata* and *B. menziesii* present	*Banksia attenuata* present	*Banksia attenuata* present.
Vegetation Structure	• A distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall), typically dominated or codominated[3] by one or more of the *Banksia* species (*B. attenuata, B. menziesii, B. ilicifolia, B. prionotes*); • An emergent tree layer of medium or tall (>10 m) height *Eucalyptus* or *Allocasuarina* (Sheoak) species may sometimes be present above the *Banksia* canopy. • An understory that is often highly species-rich consists of: – A layer of sclerophyllous shrubs of various heights; and, – A herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history.	• Banksia trees form a distinctive upper layer of low trees, representing about 2-25% canopy cover mixed with Sheoak (*Allocasuarina fraseriana*) trees • Sheoak (*Allocasuarina fraseriana*) trees co-occurring in this vegetation type. • Understorey of shrubs, sedges, herbs in Good to Very Good condition with a high diversity of native species including shrubs, sedges, climbing plants and ephemerals.	• Banksia trees form a distinctive upper layer of low trees with a canopy cover around 20% mixed with Sheoak (*Allocasuarina fraseriana*) trees • Sheoak (*Allocasuarina fraseriana*) trees co-occurring in this vegetation type. • Understorey of shrubs, sedges, herbs in Good to Very Good condition with a high diversity of native species including shrubs, sedges, climbing plants and ephemerals.	• Banksia trees form a sparse canopy cover less than 10% forming a reasonably distinctive upper layer of trees. • Jarrah (*Eucalyptus marginata*) is the main tree species with Tuart (*E. gomphocephala*) also present. • Understorey of shrubs, sedges, herbs, in Very Good to Excellent condition have a moderate diversity of native species including shrubs, sedges, climbing plants and ephemerals
Vegetation Condition	An area of Banksia woodland needs to be at least in Good condition to be considered the TEC.	Vegetation type is all in Very Good condition	Vegetation type is all Good to Very Good	Vegetation type is all Very Good to Excellent
Patch Size	The Banksia woodland TEC needs to meet a minimum 'patch' size depending on its condition to qualify as the TEC, as follows: • 'Pristine' – no minimum patch size • 'Excellent' – 0.5ha • 'Very Good' – 1ha • 'Good' – 2ha	BaAfBm vegetation type approximately 2.5ha in size which is above the minimum criterion of 1ha for vegetation in Very Good condition	BaAf vegetation type approximately 3.1ha in size which is above the minimum criterion of 1ha for vegetation in Very Good condition and 2ha for vegetation in Good condition	EmBa vegetation type on site approximately 4.0ha in size, extending to the north and east. Above the minimum criteria for vegetation in Very Good and Excellent condition
Conclusion		Meets the definition of the Banksia Woodland TEC in all features	Meets the definition of the Banksia Woodland TEC in all features	Does not meet the definition of the Banksia Woodland TEC as the Banksia trees do not form a distinctive upper layer of trees. Jarrah and Tuart trees are more common than being 'emergent' above the sparse Banksia.

(Commonwealth of Australia, 2016)

The relevant species of Banksia trees were only found to be present in three vegetation types in the northern survey area. The woodland vegetation in the southern survey area contained very few to no Banksia trees. In addition, the southern area did not have any dead trees or any seedlings/saplings of the relevant Banksia tree species suggestive of a disturbed or regenerating Banksia canopy. Therefore, the assessment in Table 10 has only been undertaken for the three vegetation types shown in Figure 3 that contain the relevant Banksia tree species. The vegetation types are:

- **BaAfBm** *Banksia attenuata/Allocasuarina fraseriana/B. menziesii* Low Open Forest over *Xanthorrhoea preissii* Tall Open Shrubland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath
- **BaAf** *Banksia attenuata/Allocasuarina fraseriana* Low Woodland over *Xanthorrhoea preissii/Hakea prostrata* Tall Shrubland over *Hibbertia hypericoides* Low Open Shrubland over *Tetraria octandra/Mesomelaena pseudostygia* Very Open Sedgeland
- **EmBa** *Eucalyptus marginata* Woodland over *Banksia attenuata* Open to Low Woodland over *Xanthorrhoea preissii* Open Shrubland over *Hibbertia hypericoides* Low Shrubland to Closed Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland

Conclusion

The conclusion of the assessment is the vegetation types BaAfBm and BaAf meet all the requirements of the Banksia Woodland TEC. The total area of Banksia Woodland TEC on the site is calculated to be 5.658ha (Figure 5).

The EmBa vegetation type was considered to not meet the definition of the Banksia Woodland TEC as the Banksia trees do not form a distinctive upper layer of trees. The Banksia trees are sparse and the Jarrah and Tuart trees present are more common than being just 'emergent'.

5 SUMMARY AND CONCLUSIONS

The Flora and Vegetation survey of the survey area by PGV Environmental (this report) and Coffey Environments (2010) resulted in the following findings:

- A total of 188 plant species were recorded during the two flora surveys. This total consisted of 140 native species and 48 (25%) introduced species;
- No Threatened (Declared Rare) flora species were recorded on the site;
- Three Priority flora species were recorded on the site as follow:
  - *Baeckea* sp Limestone P1 – 4 plants in the southern part of the site
  - *Acacia benthamii* P2 – Occurs abundantly in the northern part of the site
  - *Jacksonia sericea* P4 – Occurs commonly in the northern part and southern parts of the site.
- Seven different native vegetation types were described on the site, with four in the northern part and three in the southern area. Six of the vegetation types were woodlands of Jarrah, Tuart and/or Banksia/Sheoak on sand over limestone soils. The seventh vegetation type was a Parrot Bush (*Banksia sessilis/Xanthorrhoea preissii*) Shrubland on sand and outcropping limestone soils;
- The vegetation was rated from Good to Excellent condition with a moderate number of native species and a high proportion of weeds in the understorey, although not a high percentage weed cover;

- The egetation is part of the Cottesloe – Central and South Vegetation complex which is well retained in the Perth Metropolitan Region;
- The vegetation was assessed as being part of FCT28 'Spearwood *Banksia attenuata* or *B. attenuata* – *Eucalyptus* woodland' and FCT 24 'Northern Spearwood shrubland and woodlands'. FCT 24 is a Priority 3 ecological community at State level;
- Three patches of Tuart woodland were assessed as occurring in the northern and southern survey areas. All three patches were determined to meet the criteria for being recognised as part of the Tuart Woodlands and Forests of the Swan Coastal Plain ecological community which is listed as Critically Endangered under the Commonwealth EPBC Act and Priority 3 at State level. The total area of Tuart Woodland TEC on the site is calculated to be 10.103 ha;
- The BaAfBm and BaAf vegetation types in the northern survey area meet the criteria to be recognised as part of the Banksia Woodlands of the Swan Coastal Plain ecological community which is a Priority 3 community at State level and an Endangered TEC under the EPBC Act. The total area of Banksia Woodland TEC on the site is calculated to be 5.658 ha;
- Any proposed clearing of the Tuart Woodland TEC or Banksia Woodland TEC will require a Referral under the EPBC Act and likely Controlled Action assessment; and
- All vegetation types are foraging habitat for Carnaby's Black Cockatoo and many Tuart and some Jarrah trees would be considered potential breeding habitat. Any proposed clearing of Carnaby's Black Cockatoo habitat may need to be referred under the EPBC Act.

6 REFERENCES

Allan Herbarium (1997) Atlas of Living Australia; Australia's Virtual Herbarium Record Placynthium nigrum http://biocache.ala.org.au/occurrences/ab98eab4-f136-4c0d-b79e-78326a027802 Accessed May 2017 Perth, Western Australia

Barrett, R.L. (2012) *Poranthera moorokatta* (Phyllanthaceae), a rare new species from Perth, Western Australia *Nuytsia* 22(6): 399-407 Perth, Western Australia

Bolland, M. (1998) *Soils of the Swan Coastal Plain.* Department of Agriculture. Bunbury, Western Australia.

Coffey Environments (2010) Flora and Vegetation Assessment M70/341 and M70/345 Cutler Road, Carabooda Report Reference EP2010/015 Perth, Western Australia

Commonwealth of Australia (2016) *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community* Canberra, Australian Capital Territory.

Commonwealth of Australia (2019) *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community* Canberra, Australian Capital Territory.

Cranfield, R., Stocker, E. and Neuwirth, G. (2020) Lichens: Hidden Gems of Nambung National Park *Landscope*. https://library.dbca.wa.gov.au/static/Journals/080052/080052-32.008.pdf Accessed December 2020 Perth, Western Australia

Davidson, W.A. (1995) 'Hydrogeology and groundwater resources of the Perth region, Western Australia', *Western Australia Geological Survey*, Bulletin 142 Perth Western Australia

Department of Agriculture, Water and the Environment (DAWE) (2020) *Protected Matters Search Tool* http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf Accessed October 2020 Canberra, Australia

Department of Biodiversity, Conservation and Attractions (DBCA) (2017) *Florbase* https://florabase.dpaw.wa.gov.au/ Accessed 2017 Perth Western Australia

Department of Biodiversity, Conservation and Attractions (DBCA) (2018) *Remnant Vegetation Extent Stats 2018* Perth western Australia

Department of Biodiversity, Conservation and Attractions (DBCA) (2020) Naturemap Accessed September 2020 https://naturemap.dpaw.wa.gov.au/ Perth Western Australia

Department of Environment and Conservation (DEC) (2009) *Marianthus paralius Interim Recovery Plan 2009-2014*. Interim Recovery Plan No. 291. Perth, Western Australia.

Department of Primary Industries and Regional Development (DPIRD) (2020) Natural Resource Information. Accessed November 2020 http://maps.agric.wa.gov.au/nrm-info/ Government of Western Australia, Perth.

Department of the Environment and Energy (DotEE) (2016) Species Profile and Threats (SPRAT) Database. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl Commonwealth of Australia.

Department of Water and Environmental Regulation (DWER) (2020) *Perth Groundwater Map.* Accessed September 2020 https://maps.water.wa.gov.au/#/webmap/gwm Government of Western Australia, Perth.

Environmental Protection Authority (EPA) (2016) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* Perth Western Australia

Government of Western Australia (2000) Bush Forever - *Keeping the Bush in the City. Volume 2: Directory of Bush Forever Sites*. Perth, Western Australia.

Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980) Vegetation complexes of the Darling System, Western Australia. In *Atlas of Natural Resources of the Darling System of Western Australia*. Department of Conservation and Environment. Perth, Western Australia.

Hislop, M. (2011) New, locally endemic taxa in *Leucopogon* (Ericaceae: Styphelioideae: Styphelieae) from the Perth and midwest regions of Western Australia *Nuytsia* 21(2): 75-89 Perth, Western Australia

Hislop, M. and Puente-Lelièvre, C. (2017) Five new species of *Styphelia* (Ericaceae: Epacridoideae: Styphelieae) from the Geraldton Sandplains, including notes on a new, expanded circumscription for the genus *Nuytsia* 28:95-114 Perth, Western Australia

Landgate (2020) Historical Aerial Photography Accessed September 2020 https://www.landgate.wa.gov.au/bmvf/app/mapviewer/ Government of Western Australia, Perth.

McGurk, L.E., Giustiniano, D., Davision, E.M. and Watkin, E.L.J. (2016) *Amanita wadulawitu* (Basidiomycota), a new species from Western Australia, and an expanded description of *A. kalamundae Nuytsia* 27: 21-30 Perth, Western Australia

National Map (2020) Map-Based Access to Spatial Data from Australian Government Agencies http://nationalmap.gov.au/#wa Accessed October 2020 Government of Australia.

PGV Environmental (2019). *M70-126 and M70-266 Old Yanchep Road Flora, Vegetation and Fauna Assessment*. Report 2019-434. Prepared for Urban Resources, December 2019.

Rye, B.L. (2001) A taxonomic update of *Stenanthemum* (Rhamnaceae: Pomaderreae) in Western Australia , Nuytsia 13 (3): 495–507 Perth, Western Australia

Thiele, K.R. (2019) The *Hibbertia polystachya–H. spicata* (Dilleniaceae) species group in Western Australia *Nuytsia* 30: 291-308 Perth, Western Australia

Western Australian Herbarium (1989) Atlas of Living Australia; Australia's Virtual Herbarium Record for *Haloragis* sp. Parrot Ridge (G.J. Keighery 11563) Accessed March 2016 http://biocache.ala.org.au/occurrences/6d199a28-59d7-4e68-8714-537f66481a9a Perth, Perth, Western Australia

Western Australian Herbarium (1994) Atlas of Living Australia; Australia's Virtual Herbarium Record *Rinodina bischoffii* http://biocache.ala.org.au/occurrences/0fb24d74-d598-4649-9a04-ccaf73478709 Accessed May 2017 Perth, Western Australia

Western Australian Herbarium (2001) Atlas of Living Australia; Australia's Virtual Herbarium Record for *Austrostipa mundula* http://biocache.ala.org.au/occurrences/5d377bf5-98ec-4fbe-8723-4cfc8f8f534f Accessed March 2017 Perth, Western Australia

Western Australian Herbarium (2005a) Atlas of Living Australia; Australia's Virtual Herbarium Record Fabronia hampeana http://biocache.ala.org.au/occurrences/a6597c55-520f-4cbd-b048-5614581df41f Accessed March 2017 Perth, Western Australia

Western Australian Herbarium (2005b) Atlas of Living Australia Record *Tetraria* sp. Chandala http://biocache.ala.org.au/occurrences/a9c665cf-9f13-4d82-8bd5-d53cfd2f5c19 Accessed March 2016 Perth, Western Australia

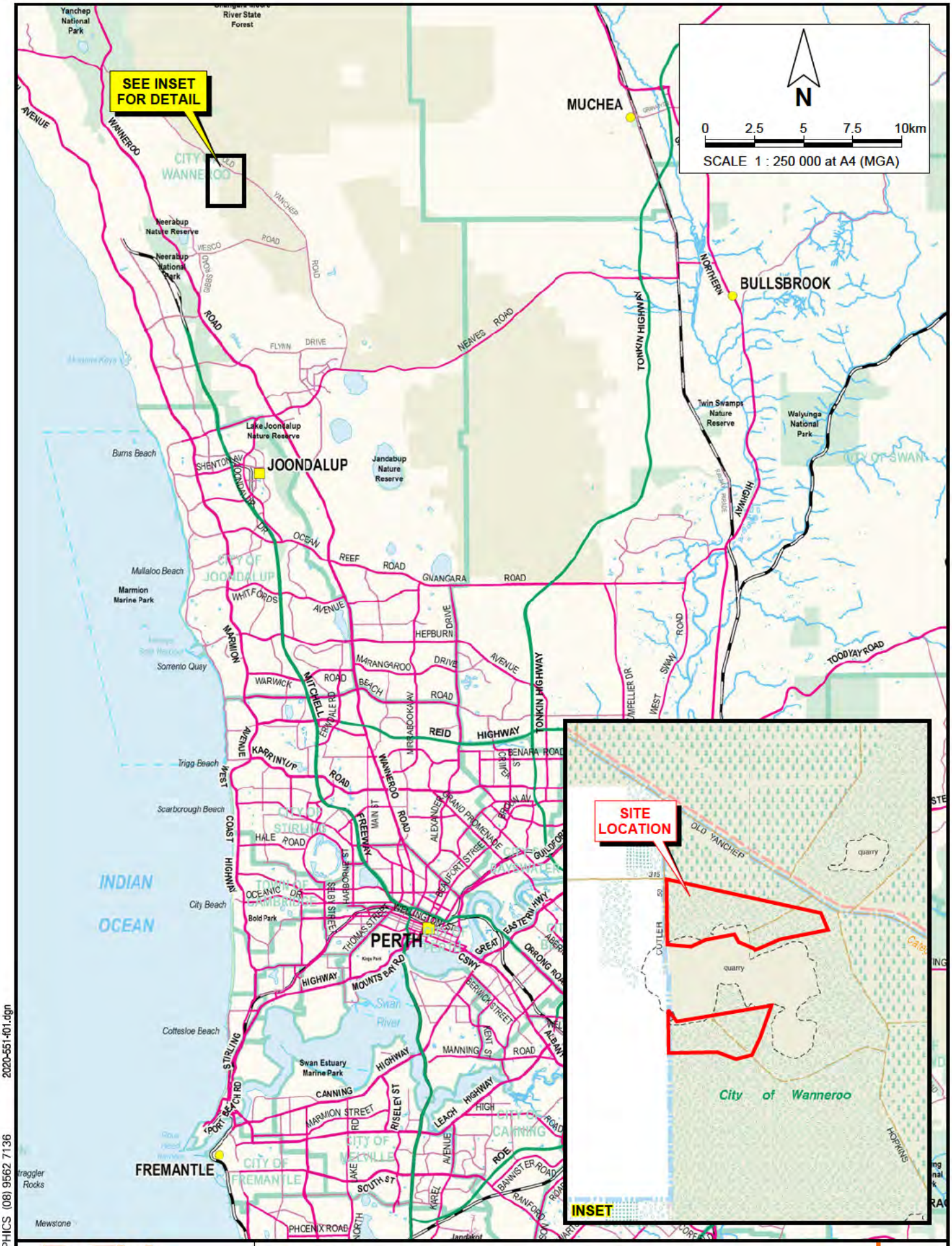
Western Australian Herbarium (2012) Atlas of Living Australia; Australia's Virtual Herbarium Record for Baeckea sp. Limestone http://biocache.ala.org.au/occurrences/7c4abf9b-8c70-41d2-ab52-20afe6570b20 Accessed November 2016 Perth, Western Australia

Western Australian Planning Commission (WAPC) (2001) *City of Wanneroo Local Planning Scheme No. 2* Perth, Western Australia

Williams, K., Horan, A., Wood, S. and Webb, A (2001) *Declared rare and poorly known flora in the Central Forest Region, Western Australian Wildlife Management Program No. 33*, Western Australian Department of Conservation and Land Management. Perth, Western Australia

Wilson, K.L. (1997) New species of Cyperaceae in Western Australia *Nuytsia* 11 (2): 269-282 Perth, Western Australia

FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-551-f01.dgn

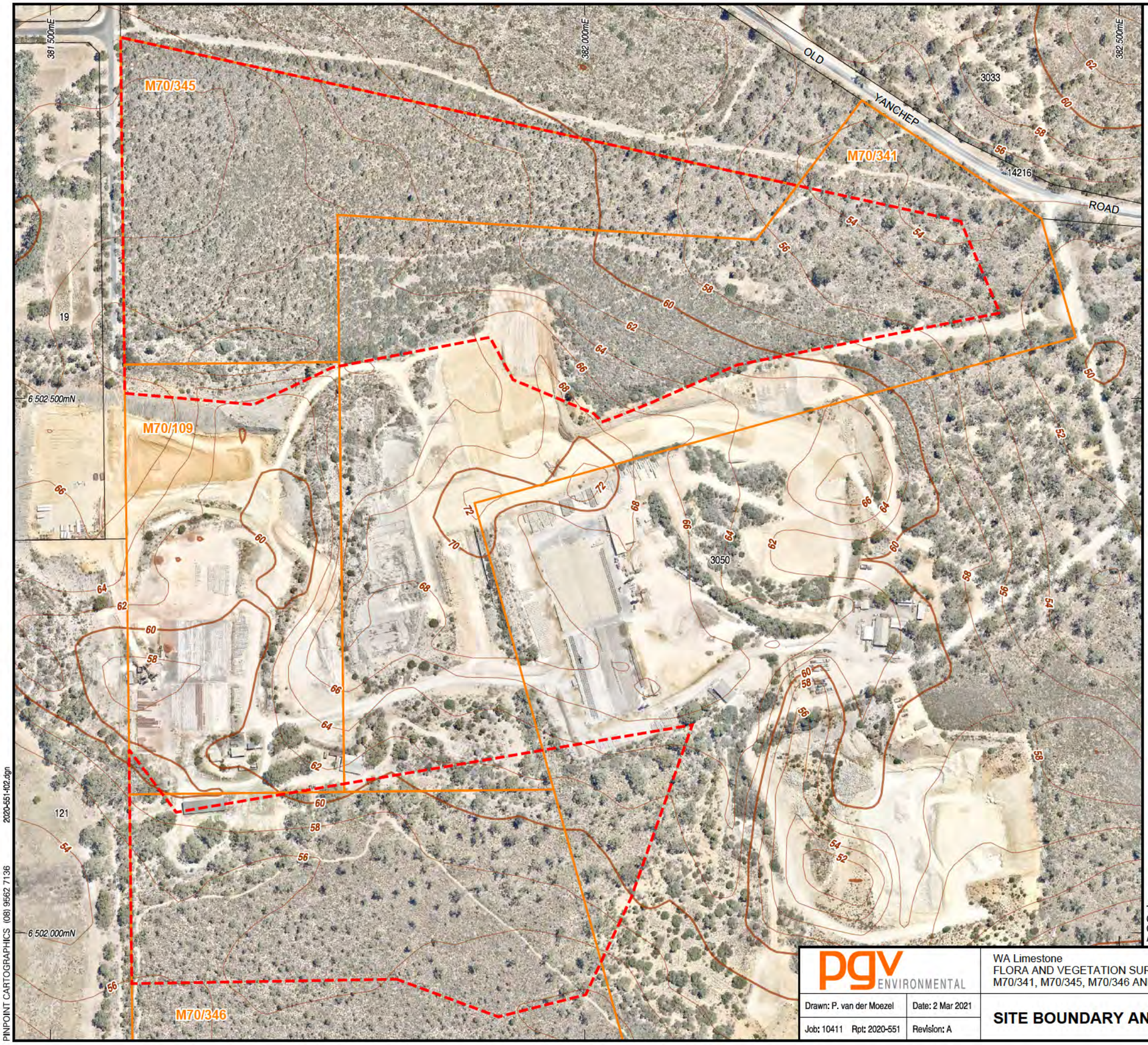
pgv ENVIRONMENTAL

WA Limestone
FLORA AND VEGETATION SURVEY
M70/341, M70/345, M70/346 AND M70/339, HOPKINS ROAD CARABOODA

Drawn: P. van der Moezel	Date: 2 Mar 2021
Job: 10411 Rpt: 2020-551	Revision: A

SITE LOCATION

Figure 1



N

0 50 100 150 200m

SCALE 1 : 3 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Tenement Boundary
- Topographic Contour

TENEMENT SOURCE: DMIRS, March 2020.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
CADASTRAL SOURCE: Landgate, March 2021.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown January 2021.

pgv ENVIRONMENTAL

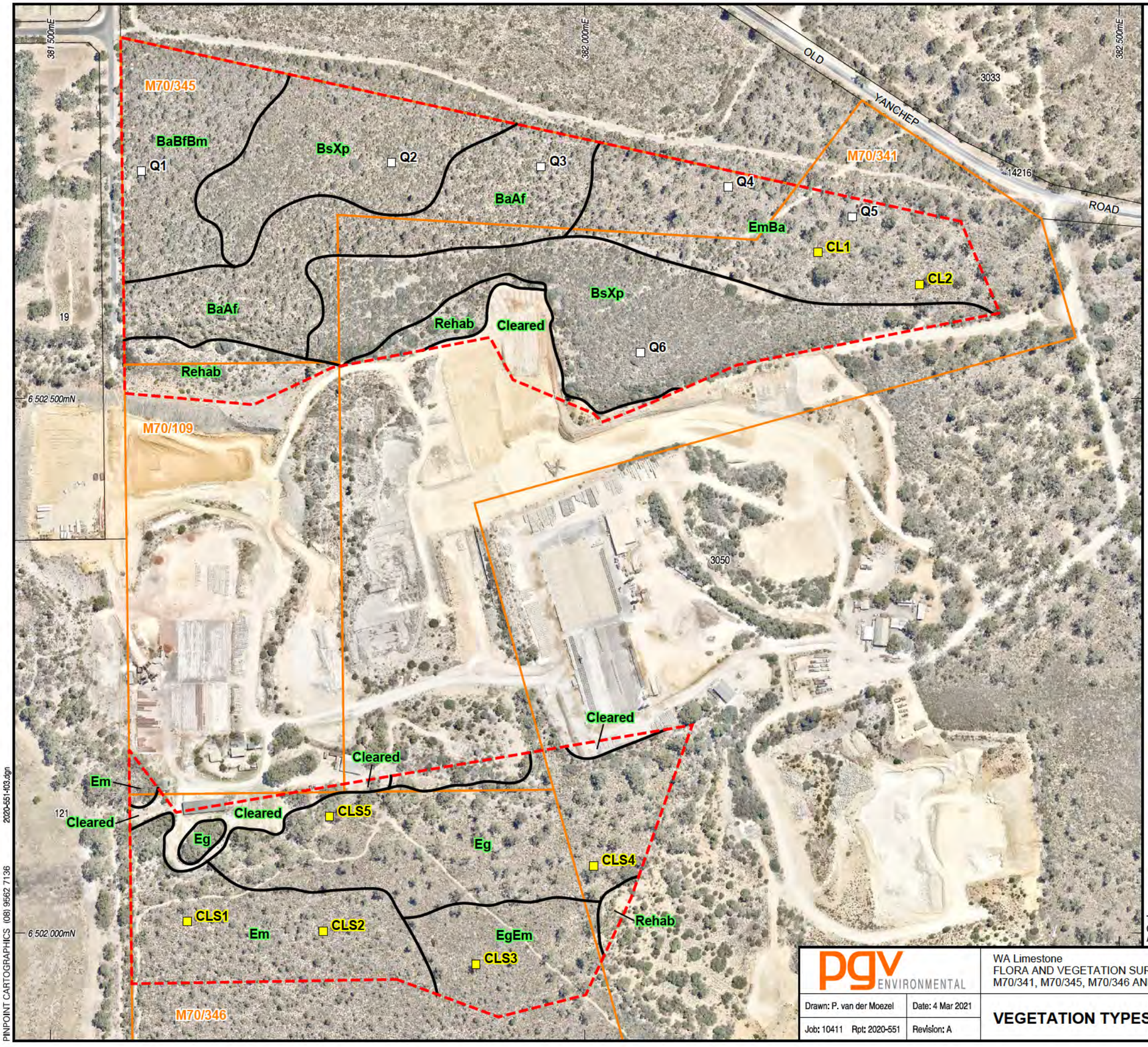
WA Limestone
FLORA AND VEGETATION SURVEY
M70/341, M70/345, M70/346 AND M70/339, HOPKINS ROAD CARABOODA

Drawn: P. van der Moezel | Date: 2 Mar 2021
Job: 10411 Rpt: 2020-551 | Revision: A

SITE BOUNDARY AND TOPOGRAPHY

Figure 2

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-551-f02.dgn



N

0 50 100 150 200m

SCALE 1 : 3 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Tenement Boundary
- Quadrat Location - Coffey Environments
- Quadrat Location - PGV Environmental
- Vegetation Type Boundary
- Em Vegetation Type

M70/341, M70/345 - Vegetation Types

BaAfBm
Banksia attenuata/Allocasuarina fraseriana/B. menziesii Low Open Forest over *Xanthorrhoea preissii* Tall Open Shrubland over *Hibbertia hypericoides/Allocasuarina humilis* Open Low Heath

BaAf
Banksia attenuata/Allocasuarina fraseriana Low Woodland over *Xanthorrhoea preissii/Hakea prostrata* Tall Shrubland over *Hibbertia hypericoides* Low Open Shrubland over *Tetraria octandra/Mesomelaena pseudostygia* Very Open Sedgeland

BsXp
Banksia sessilis/Xanthorrhoea preissii Tall Open Scrub over *Melaleuca systena/Hakea lissocarpha* Open Shrubland over *Jacksonia sericea/Hibbertia hypericoides* Low Open Shrubland

EmBa
Eucalyptus marginata Woodland over *Banksia attenuata* Open to Low Woodland over *Xanthorrhoea preissii* Open Shrubland over *Hibbertia hypericoides* Low Shrubland to Closed Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland

M70/346 and M70/339 - Vegetation Types

Em
Eucalyptus marginata Low Open Woodland over *Xanthorrhoea preissii/ Macrozamia riedlei/Hibbertia hypericoides* Open Heath over *Mesomelaena pseudostygia* Very Open Sedgeland

EgEm
Eucalyptus gomphocephala/E. marginata Low Woodland over *Jacksonia sternbergiana/Macrozamia riedlei* Shrubland over *Hibbertia hypericoides* Open Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland

Eg
Eucalyptus gomphocephala Low Open Woodland over *Banksia sessilis* Open Shrubland *Xanthorrhoea preissii/Hibbertia hypericoides/Jacksonia sericea* Closed Low Heath over *Mesomelaena pseudostygia* Very Open Sedgeland

TENEMENT SOURCE: DMIRS, March 2020.
CADASTRAL SOURCE: Landgate, March 2021.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown January 2021.

pgv ENVIRONMENTAL

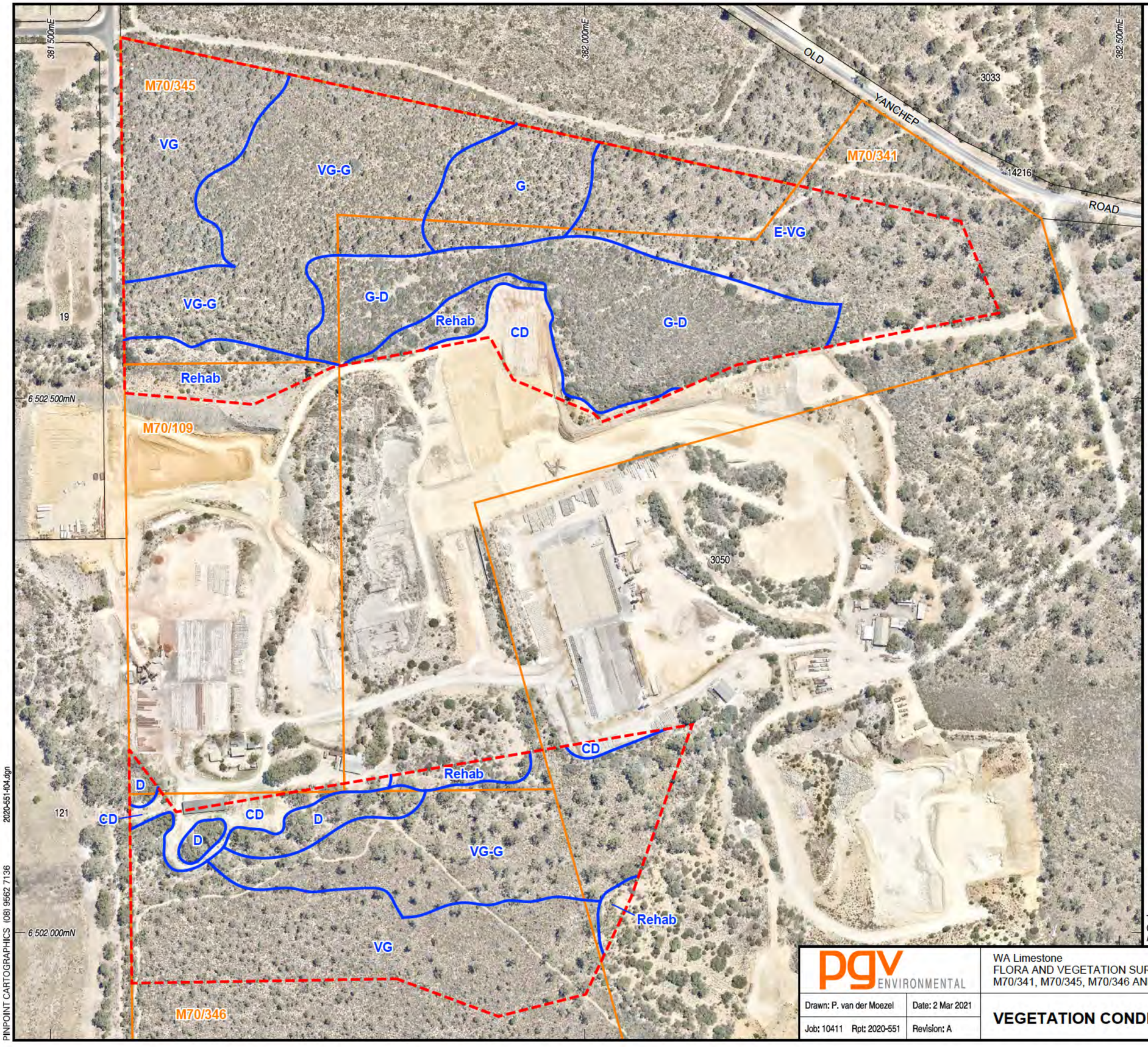
WA Limestone
FLORA AND VEGETATION SURVEY
M70/341, M70/345, M70/346 AND M70/339, HOPKINS ROAD CARABOODA

Drawn: P. van der Moezel | Date: 4 Mar 2021
Job: 10411 Rpt: 2020-551 | Revision: A

VEGETATION TYPES

Figure 3

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-551-f03.dgn



N

0 50 100 150 200m

SCALE 1 : 3 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Tenement Boundary
- Vegetation Condition Boundary
- Em Vegetation Condition

Vegetation Condition
(SOURCE: Bush Forever, Govt. of W.A., 2000)

P - Pristine
Pristine or nearly so, no obvious signs of disturbance.

Ex - Excellent
Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species.

VG - Very Good
Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

G - Good
Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

D - Degraded
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

CD - Completely Degraded
The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

Cl - Cleared
No native vegetation remaining.

TENEMENT SOURCE: DMIRS, March 2020.
CADASTRAL SOURCE: Landgate, March 2021.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown January 2021.

pgv ENVIRONMENTAL

WA Limestone
FLORA AND VEGETATION SURVEY
M70/341, M70/345, M70/346 AND M70/339, HOPKINS ROAD CARABOODA

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VEGETATION CONDITION

Figure 4

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-551-104.dgn

381 500mE
382 000mE
382 500mE
OLD YANCHEP ROAD
3033
14216
M70/345
M70/341
Patch 1
Patch 2
19
6 502 500mN
M70/109
3050
121
Patch 3
6 502 000mN
M70/346

N

0 50 100 150 200m

SCALE 1 : 3 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Tenement Boundary

Threatened Ecological Communities

- Tuart Woodland TEC
- Banksi Woodland TEC

TENEMENT SOURCE: DMIRS, March 2020.
CADASTRAL SOURCE: Landgate, March 2021.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown January 2021.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-551-f05.dgn

pgv ENVIRONMENTAL

WA Limestone
FLORA AND VEGETATION SURVEY
M70/341, M70/345, M70/346 AND M70/339, HOPKINS ROAD CARABOODA

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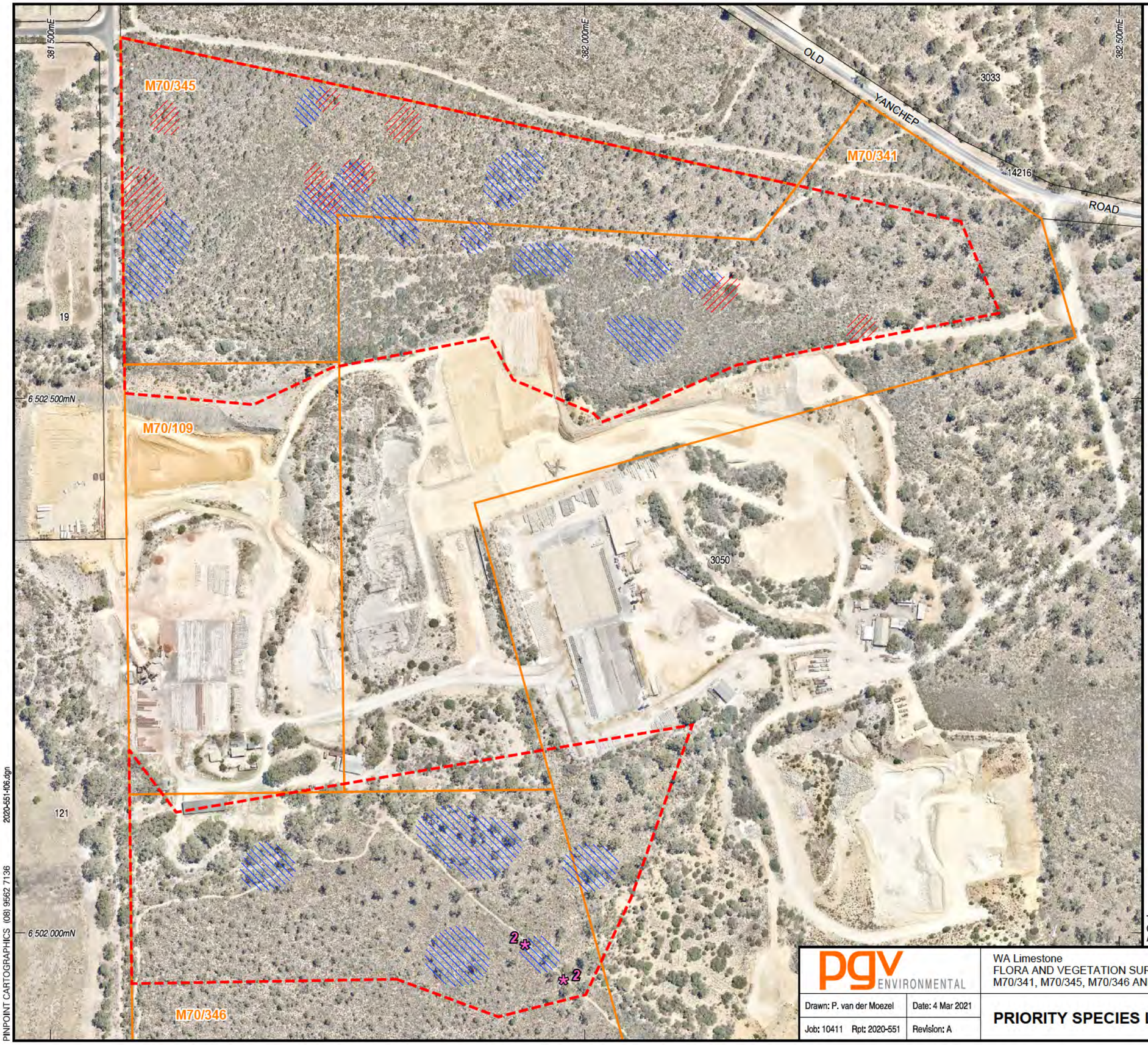
THREATENED ECOLOGICAL COMMUNITIES

Figure 5



N

0 50 100 150 200m

SCALE 1 : 3 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Tenement Boundary

Priority Species

- *Baeckea sp.* Limestone
- 2 Number of Plants
- *Jacksonia sericea*
- *Acacia benthamii*

TENEMENT SOURCE: DMIRS, March 2020.
CADASTRAL SOURCE: Landgate, March 2021.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown January 2021.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-551-f06.dgn

pgv ENVIRONMENTAL

WA Limestone
FLORA AND VEGETATION SURVEY
M70/341, M70/345, M70/346 AND M70/339, HOPKINS ROAD CARABOODA

Drawn: P. van der Moezel | Date: 4 Mar 2021
Job: 10411 Rpt: 2020-551 | Revision: A

PRIORITY SPECIES LOCATIONS

Figure 6

APPENDIX 1

DBCA Flora Database Searches

FID	PopId	Nameid	Taxon	Cons Status	WARank	PopNumber	SubPopCode	PopStatus	District	Vesting	Purpose1	CountDate	Method	Mat Count	Juv Count	SeedlCount	Live Total	CountType	Area Occupy	InFlower	PopConditi	HabConditi	HabNotes	SoilCondit	Landform	RockType	Gravel	SoilType	SoilColor	Drainage
309	86275	3237	Acacia benthamii	2		1			SWAN COASTAL	PRI		15/09/1975 0:00		0			0			N										
312	86278	3237	Acacia benthamii	2		4			SWAN COASTAL	MRD	VER	5/06/2000 0:00	ESTMT	71			71			N			VegClas: Open B.menziessii woodland over shrubland	MOIST	FLAT	LIMESTN		SAND	YELLOW	
1631	89656	11336	Adenanthos cygnorum subsp. chamaephyton	3		16			SWAN COASTAL	LGA	VER	13/11/1981 0:00	UNKNOWN	0			10			N						LATERITE		LOAM_SND		
4617	84935	1596	Caladenia huegelii	T	CR	22			SWAN COASTAL	LGA	VER	14/10/2004 0:00		0			0			N			Xanthorrhoea preissii, Patersonia sp., Hibbertia sp., Stirlingia latifolia.	DRY	RI_DUNE			SAND	GREY	
4937	104572	45757	Calectasia elegans	2		1	A		SWAN COASTAL	SPC	GVT	7/09/2006 0:00	ACT_IND	9			9			Y			Andersonia heterophylla, Austrodanthonia occidentalis, Austrostipa compressa, Beaufortia sp.		SLOPE	QUARTZ		SAND	GREY	
4938	104573	45757	Calectasia elegans	2		1	B		SWAN COASTAL	CC	FOR	20/10/2006 0:00	ACT_IND	2			2			Y			Open banksia, low woodland, dwarf scrubland		SLOPE	QUARTZ		SAND	GREY	
5947	97141	1425	Conostylis bracteata	3		1	A		SWAN COASTAL	LGA		29/03/1986 0:00		0			0			N			DomSp:Xanthorrhoea sp.		RI_DUNE					
5949	97143	1425	Conostylis bracteata	3		1	C		SWAN COASTAL	LGA	PAR	16/08/1986 0:00		0			0			N			DomSp: Banksia attenuata, Melaleuca acerosa		RI_DUNE	LATERITE				
5952	84822	1425	Conostylis bracteata	3		4			SWAN COASTAL	NON	UCL	6/11/1997 0:00		0			0			N			DomSp: Acacia spp., Ehrharta calycina.		CD_LKBED			SAND	GREY	
6100	89694	11388	Conostylis pauciflora subsp. euryrhipis	4		3			SWAN COASTAL	UNKNOWN		25/03/1987 0:00		0			0			N										
6103	89697	11388	Conostylis pauciflora subsp. euryrhipis	4		6			SWAN COASTAL	CC	FOR	26/07/1996 0:00	UNKNOWN	100			100			N			DomSp:Blackboys, Dryandra sessilus, Dryandra nivea, Native Wisteria	DRY	RIDGE	LIMESTN		SAND	YELLOW	
6115	89691	11388	Conostylis pauciflora subsp. euryrhipis	4		14			SWAN COASTAL	CC	FOR	22/10/1993 0:00		0			0			N					SLOPE	LIMESTN		SAND	YELLOW	
6117	110749	11388	Conostylis pauciflora subsp. euryrhipis	4		16			SWAN COASTAL	PRI		22/11/2013 0:00		1			0			Y				MOIST	RIDGE	LIMESTN	GRVL_50	SAND	GREY	

FID	PopId	Nameid	Taxon	Cons Status	WAR ank	PopNumber	SubPopCode	PopStatus	District	Vesting	Purpose1	CountDate	Method	Mat Count	Juv Count	SeedlCount	Live Total	CountType	Area Occupy	InFlower	PopConditi	HabConditi	HabNotes	SoilCondit	Landform	RockType	Gravel	SoilType	SoilColor	Drainage
6121	89771	11657	Conostylis pauciflora subsp. pauciflora	4		3			SWAN COASTAL	CC	QUA	7/09/1992 0:00		0			0			N										
6125	89775	11657	Conostylis pauciflora subsp. pauciflora	4		7			SWAN COASTAL	PRI		19/10/2007 0:00		0			0			Y			Dom sp: Bromus diandrus. OPen low heath over grassland.		SLOPE	LIMESTN		SAND	GREY	
6321	93209	16245	Cyathochaeta teretifolia	3		24			SWAN COASTAL	CC	FOR	2/12/2002 0:00		0			0			N										
8202	90764	13091	Eucalyptus argutifolia	T	VU	2			SWAN COASTAL	CC	FOR	13/12/2013 0:00	ACT_IND	29	1	0	0	PLANTS	471	N	HEALTHY	EXCELENT		DRY	OU_SLOPE	LIMESTN	GRVL_10	SAND	BROWN	WLL_DRND
8204	90767	13091	Eucalyptus argutifolia	T	VU	5			SWAN COASTAL	CC	FOR	5/04/2012 0:00	ACT_IND	47			0	CLUMPS	132	N	HEALTHY	EXCELENT	Habitat intact; no obvious disturbance.	DRY	FLAT	LIMESTN		SAND	BROWN	WLL_DRND
8205	90768	13091	Eucalyptus argutifolia	T	VU	6			SWAN COASTAL	PRI		22/11/2013 0:00	ACT_IND	45	0	0	0	PLANTS	222	N	HEALTHY			MOIST	OU_RIDGE	LIMESTN	GRVL_50	SAND	GREY	
8206	101587	13091	Eucalyptus argutifolia	T	VU	7	A		SWAN COASTAL	CC	FOR	6/12/2013 0:00	ACT_CLMP	2	0	0	0	CLUMPS	11	Y	HEALTHY	EXCELENT	QUARRY Despite being surrounded by a limestone mine this elevated and isolated remnant of vegetation on the top of the ridge is in very good to excellent condition.	DRY	OUTCROP	LIMESTN	GRVL_30	SAND	BROWN	
8207	101588	13091	Eucalyptus argutifolia	T	VU	7	B		SWAN COASTAL	CC	FOR	6/12/2013 0:00	ACT_CLMP	41	3	0	0	CLUMPS	446	Y	HEALTHY		Heath of Banksia sessilis var. cygnorum, Acacia lasiocarpa, Melaleuca huegelii, Melaleuca systena, Xanthorrhoea preissii, Acacia ?stenoptera, Hemiandra pungens, Trymalium ledifolium var. ledifolium with occasional Hakea prostrata, Cassytha ?racemosa, Tem	MOIST	SLOPE	LIMESTN		SAND	BROWN	
8208	90769	13091	Eucalyptus argutifolia	T	VU	8			SWAN COASTAL	CC	FOR	19/12/2013 0:00	ACT_CLMP	53	2	0	0	CLUMPS	31	Y	HEALTHY	EXCELENT		DRY	RIDGE	LIMESTN	GRVL_10	SAND	BROWN	WLL_DRND

FID	PopId	Nameid	Taxon	Cons Status	WARank	PopNumber	SubPopCode	PopStatus	District	Vesting	Purpose1	CountDate	Method	Mat Count	Juv Count	SeedlCount	Live Total	CountType	Area Occupy	InFlower	PopConditi	HabConditi	HabNotes	SoilCondit	Landform	RockType	Gravel	SoilType	SoilColor	Drainage
8210	90756	13091	Eucalyptus argutifolia	T	VU	10			SWAN COASTAL	WAT	WAT	5/04/2012 0:00	ACT_CLMP	21			0	CLUMPS	290	N	MODERATE	VRY_GOOD	Disturbance by rabbits has impacted the condition of the habitat.	DRY	SLOPE	LIMESTN		SAND	BROWN	WLL_DRND
8212	90758	13091	Eucalyptus argutifolia	T	VU	12			SWAN COASTAL	PRI		22/11/2013 0:00		0			0			N					FL_PLAIN	LIMESTN		SAND		
8213	90759	13091	Eucalyptus argutifolia	T	VU	13			SWAN COASTAL	LGA	REC	18/09/2013 0:00	ACT_IND	8			0	PLANTS	38	N	HEALTHY	GOOD	HABITAT CONDITION: Good-degraded	MOIST	SL_MI_GE	LIMESTN		SAND	GREY	WLL_DRND
8214	101581	13091	Eucalyptus argutifolia	T	VU	14	A		SWAN COASTAL	NON	UCL	13/12/2013 0:00	ACT_IND	32	0	0	0	PLANTS	339	N	MODERATE	EXCELENT		MOIST	SL_UP_ST	LIMESTN	GRVL_10	SAND	BROWN	
8215	101582	13091	Eucalyptus argutifolia	T	VU	14	B		SWAN COASTAL	NON	UCL	13/12/2013 0:00	ACT_IND	6			0	PLANTS	10	N	HEALTHY	EXCELENT		MOIST	RIDGE	LIMESTN		SAND	BROWN	
8216	90760	13091	Eucalyptus argutifolia	T	VU	15			SWAN COASTAL	LGA	REC	5/11/2013 0:00	ACT_IND	20			0	PLANTS	143	N	HEALTHY	GOOD	Shrub Malle of Eucalyptus argutifolia over Shrubland Melaleuca huegelii, Melaleuca systena, Acacia rostellifera, Spyridium globulosum, Hakea trifurcata, over Hardenbergia comptoniana, Opercularia vaginata, Leucopogon parviflorus, Dianella revoluta, Comes	MOIST	SL_UP_GE	LIMESTN		SAND	WHITE	
8218	101584	13091	Eucalyptus argutifolia	T	VU	17			SWAN COASTAL	PRI		3/08/2006 0:00	ACT_IND	1			0			N	MODERATE			MOIST	RIDGE	LIMESTN		SAND	BROWN	
9288	94987	20162	Fabronia hampeana	2		2			SWAN COASTAL	PRI		14/09/1994 0:00		0			0			N			Banksia, Macrozamia, Hibbertia, Xanthorrhoea, Dyandra, grasses, weeds.							
9290	104266	20162	Fabronia hampeana	2		4	A		SWAN COASTAL	PRI		12/01/2009 0:00		0			0			N			Dom sp: Xanthorrhoea preissii, Mesomelaena pseudostygia, Banksia sessilis, Spyridium globulosum					SAND		

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9291	104267	20162	Fabronia hampeana	2		4	B		SWAN COASTAL	PRI		12/01/2009 0:00		0			0			N			Dom sp: Macrozamia sp. & Banksia sp. Woodland.					SAND	YELLOW	
9292	104268	20162	Fabronia hampeana	2		4	C		SWAN COASTAL	PRI		12/01/2009 0:00		0			0			N			Banksia low open woodland. Dom sp: Acacia cyclops, Hibbertai hypericoides, Desmocladus flexuosus			LIMESTN		SAND	YELLOW	
9293	104269	20162	Fabronia hampeana	2		4	D		SWAN COASTAL	PRI		12/01/2009 0:00		0			0			N			Dom sp: Desmocladus flexuosus, Xanthorrhoea preissii, Hibbertia hypericoides & Banksia nivea.							
11544	87398	5133	Hibbertia helianthemoides	4		3			SWAN COASTAL	CC	FOR	2/12/2002 0:00		0			0			N			Low woodland. Lechenaultia floribunda, Bibbertia subvaginata, Beaufortia elegans, Patersonia occidentalis.							
11582	100789	49637	Hibbertia leptotheca	3		4	A		SWAN COASTAL	LGA	REC	21/09/1990 0:00		0			0			Y					SL_CLIFF	LIMESTN		SAND	GREY	
11583	100790	49637	Hibbertia leptotheca	3		4	B		SWAN COASTAL	LGA	REC	21/09/1990 0:00		0			0			N					SL_CLIFF	LIMESTN		SAND	GREY	
11588	100798	49637	Hibbertia leptotheca	3		9	A		SWAN COASTAL	PRI		14/10/2004 0:00	ESTMT	50			50			Y				DRY	OUTCROP	LIMESTN		SAND	GREY	
11589	100799	49637	Hibbertia leptotheca	3		9	B		SWAN COASTAL	PRI		14/10/2005 0:00	UNKNOWN	100			100			Y				DRY	OUTCROP	LIMESTN			WHITE	
11970	86874	4027	Jacksonia sericea	4		1			SWAN COASTAL	LGA	PAR	15/11/1979 0:00		0			0			N										
11972	98915	4027	Jacksonia sericea	4		4	A		SWAN COASTAL	PRI		27/12/1989 0:00		0			0			N				DRY	RI_DUNE	LIMESTN		SAND	YELLOW	
11973	98916	4027	Jacksonia sericea	4		4	B		SWAN COASTAL	NON	UCL	27/12/1989 0:00		0			0			N				DRY	RI_DUNE	LIMESTN		SAND	YELLOW	
11974	98917	4027	Jacksonia sericea	4		4	C		SWAN COASTAL	PRI		27/12/1989 0:00		0			0			N				DRY	RI_DUNE	LIMESTN		SAND	YELLOW	
11975	98919	4027	Jacksonia sericea	4		5	A		SWAN COASTAL	RAI	RRE	27/12/1989 0:00		0			0			N										
11976	98920	4027	Jacksonia sericea	4		5	B		SWAN COASTAL	MRD	VER	27/12/1989 0:00		0			0			N										
11977	98921	4027	Jacksonia sericea	4		5	C		SWAN COASTAL	MRD	VER	27/12/1989 0:00		0			0			N										
11978	98922	4027	Jacksonia sericea	4		5	D		SWAN COASTAL	MRD	VER	27/12/1989 0:00		0			0			N										

FID	PopId	Nameid	Taxon	Cons Status	WA Rank	PopNumber	SubPopCode	PopStatus	District	Vesting	Purpose1	CountDate	Method	Mat Count	Juv Count	Seedl Count	Live Total	CountType	Area Occupy	InFlower	PopConditi	HabConditi	HabNotes	SoilCondit	Landform	RockType	Gravel	SoilType	SoilColor	Drainage
11979	98923	4027	Jacksonia sericea	4		5	E		SWAN COASTAL	RAI	RRE	27/12/1989 0:00		0			0			N										
11980	98924	4027	Jacksonia sericea	4		5	F		SWAN COASTAL	PRI		27/12/1989 0:00		0			0			N										
11985	98929	4027	Jacksonia sericea	4		9	A		SWAN COASTAL	LGA	VER	26/03/1990 0:00	ESTMT	280			280			N					SLOPE	LIMESTN			BROWN	
11986	98930	4027	Jacksonia sericea	4		9	B		SWAN COASTAL	PRI		15/05/1990 0:00	ESTMT	###			###			N					SLOPE	LIMESTN		SAND	BROWN	
12333	87329	5038	Lasiopetalum membranaceum	3		11			SWAN COASTAL	CC	NPK	4/11/1987 0:00		0			0			Y			Growing under a jarrah tree in open woodland. On a flat - gently undulating slope. Occasional in area.		FLAT	LIMESTN		SAND	GREY	
13233	95536	25819	Marianthus paralius	T	EN	2			SWAN COASTAL	LGA	PAR	26/10/2006 0:00	ACT_IND	9			0	PLANTS		Y	HEALTHY	EXCELENT	Coastal limstone heath	DRY	SL_CLIFF	LIMESTN		SAND	WHITE	
13234	107424	25819	Marianthus paralius	T	EN	3			SWAN COASTAL	LGA	REC	12/06/2013 0:00	ESTMT	4	0	0	0	CLUMPS	5		HEALTHY			MOIST	RIDGE	LIMESTN	GRVL_30	SAND	GREY	WLL_DRND
13360	110769	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	EN	1			SWAN COASTAL	LGA	GVT	8/07/2014 0:00	PART_CNT	50			0	PLANTS	5364		HEALTHY	EXCELENT	Almost on the top of the ridge, slightly SW - W aspect.	MOIST	RIDGE	LIMESTN		FSA_LOAM		WLL_DRND
13361	110770	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	EN	2			SWAN COASTAL	PRI	UNKNOWN	7/04/2008 0:00	ESTMT	100			0	PLANTS	4022	Y		EXCELENT			OU_SLOPE	LIMESTN		SAND	BLACK	
13362	110789	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	EN	3	A		SWAN COASTAL	PRI		10/05/2017 0:00	ESTMT	15	1		0	PLANTS	100	N	HEALTHY	EXCELENT	Most of the plants occurred in: Tall open scrub of Melaleuca huegelii, Melaleuca sp Wanneroo with occasional Eucalyptus petrensis and Melaleuca systena, over open low heath of Acacia alata var. tetrantha, Thomasia triphylla over open sedgeland/herbland	DRY	OU_SLOPE	LIMESTN		SAND	GREY	WLL_DRND

FID	PopId	Nameid	Taxon	Cons Status	WA Rank	PopNumber	SubPopCode	PopStatus	District	Vesting	Purpose1	CountDate	Method	Mat Count	Juv Count	Seed ICount	Live Total	CountType	Area Occupy	InFlower	PopConditi	HabConditi	HabNotes	SoilCondit	Landform	RockType	Gravel	SoilType	SoilColor	Drainage
13363	111492	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	EN	3	B		SWAN COASTAL	RDL	MIN	27/11/2013 0:00	ACT_IND	1			0	PLANTS	4	N		EXCELENT	NOTE - Fire information was taken from Corporate Mapping Data. Not confirmed in the field			LIMESTN				
13364	111509	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	EN	3	C		SWAN COASTAL	RDL	MIN	30/09/2009 0:00	ACT_IND	41			0		2047	N		EXCELENT				LIMESTN				
13365	110790	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	EN	4	A		SWAN COASTAL	CC	FOR	26/11/2013 0:00	PART_CNT	46			0	PLANTS	####	N		EXCELENT	NOTE - Fire information was taken from Corporate Mapping Data. Not confirmed in the field			LIMESTN				
13366	111490	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	EN	4	B		SWAN COASTAL	CC	FOR	6/12/2013 0:00	ESTMT	20			0	PLANTS	475	Y		EXCELENT		DRY	RIDGE	LIMESTN		SAND		WLL_DRND
15099	103688	17543	Sarcozona bicarinata	3		1	A		SWAN COASTAL	LGA	REC	4/08/1992 0:00		0			0			N			White sand over yellow sand.					SAND	WHITE	
15100	103689	17543	Sarcozona bicarinata	3		1	B		SWAN COASTAL	LGA	REC	4/08/1992 0:00	ESTMT	0			25			Y			White sand over yellow sand.					SAND	WHITE	
15652	89298	7756	Stylidium longitubum	4		16			SWAN COASTAL	SPC		10/11/1994 0:00		0			0			N					FL_PALU			CLA_LOAM	BROWN	SEASINUN
15677	90804	13127	Stylidium maritimum	3		13			SWAN COASTAL	PRI		9/10/2004 0:00	ESTMT	100			100			Y			more illegible DomSp on RFRF	DRY	CREST	LIMESTN		SAND	GREY	
15678	90805	13127	Stylidium maritimum	3		14			SWAN COASTAL	PRI		12/10/2005 0:00	UNKNOWN	200			200			Y				DRY	RI_DUNE			SAND	WHITE	
15690	90811	13127	Stylidium maritimum	3		21			SWAN COASTAL	PRI		20/09/2002 0:00	UNKNOWN	6			6			N			DomSp: Acacia sp., Quandong		FL_PLAIN			SAND	WHITE	
16656	93721	44444	Tripterococcus sp. Brachylobus (A.S. George 14234)	4		17			SWAN COASTAL	PRI		10/11/1994 0:00		0			0			N			VegClass:Open Herbs		FL_PALU			CLA_LOAM	BLACK	SEASINUN

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
715	1218697	3237	Acacia benthamii	2						Yanchep	AUTO	3	6/09/1990
716	920320	3237	Acacia benthamii	2						E [of] Wanneroo	AUTO	3	23/09/1965
723	718297	3237	Acacia benthamii	2						East Wanneroo	AUTO	3	23/09/1965
735	5919223	3237	Acacia benthamii	2	Compact, perennial shrub. 1.3 m high x 1.3 m wide. Deep tap roots, tight texture. Root bark faint smell. Fruits absent. Growth phase active.	Hill. Grey sand.		locally frequent.		1.6 km SSW along track from junction of Smokebush Road,	GPS	1	1/03/2001
739	703656	3237	Acacia benthamii	2						Wanneroo	MAN	0	/09/1975
740	169579	3237	Acacia benthamii	2		Sand.				Woodville [Almost surely Woodvale in W.A.: R.S. Cowan].	MAN	1	/09/1901
741	8982627	3237	Acacia benthamii	2	Shrub, 1.3 m high.	Flat. Yellow brown sand.	Low open forest of Allocasuarina fraseriana, Banksia attenuata and B. menziesii over tall open shrubland of Xanthorrhoea preissii over low open heath of Hibbertia hypericoides and Acacia humilis over very open grassland/sedgeland of Mesomelaena pseudosty			Mineral lease M70/341 and M70/345 within Bush Forever Site 290, Nowergup, City of Wanneroo	GPS	1	12/10/2009
4925	1014773	11336	Adenanthos cygnorum subsp. chamaephyton	3	Prostrate mat like shrub.	Lateritic sandy loam. Roadside.			Abundance: Common, ca 10 plants.	8 km E of Muchea	MAN	3	13/11/1981

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
5692	8320926	18195	Amanita carneiphylla	3	Pileus 100 mm, 66 mm diameter, cream, applanate, non-striate appendiculate margin, slightly viscid, strong 'amanita' smell, context white. Universal veil on the pileus: white, floccose warts mainly in the central 2/3 of the pileus, adnate. Lamellae: pale	Emerging from deep sand.	Banksia woodland, species of trees and other woody plants nearby: Banksia attenuate, B. menziesii, Jacksonia furcellata.	gregarious.	Microscopic character details housed with specimen. Gill piece taken for sequencing 27.1.13. · E. Davison.	Yanchep	UNK	2	25/04/2003
5843	8616035	46333	Amanita wadulawitu	2	Macroscopic characters: Pileus: 67 mm, white, convex, margin appendiculate, non-sulcate, context white, no smell. Universal veil on pileus: white, as small warts over whole pileus, adnate. Lamellae: white, adnate, 10 mm broad, crowded, margin concolorous	In deep sand.	Banksia woodlands, near Banksia attenuata, B. menziesii, Eucalyptus todtiana nearby.			Yanchep National Park	UNK	2	25/04/2003
5845	8616027	46333	Amanita wadulawitu	2	Macroscopic characters: Pileus: up to 70 mm, white, plane, non-sulcate, context white, no smell. Universal veil on pileus: white, as small warts in centre of pileus, adnate. Lamellae: white, adnexed, 8 mm broad, crowded, margin concolorous, fimbriate. To	In deep sand.	Banksia woodlands, near Banksia attenuata, B. menziesii, Eucalyptus marginata and Jacksonia furcellata.			Yanchep National Park	UNK	2	25/04/2003
7767	5166071	35317	Austrostipa mundula	3			Tuart woodland.			Yanchep Road,	AUTO	4	/08/1963

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
8049	8443122	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Erect shrub 1 m high x 1 m wide.	Limestone outcrop/ridge. Yellow sand. Sand derived from Tamala Limestone - Spearwood Dune System. Limetone. Burnt 5+ years.	Heath thickets in good condition. Banksia sessilis var. cygnorum, Spyridium globulosum, Acacia rostellidera, Calothamnus quadrifidus, Melaleuca systena, Hibbertia hypericoides, Lechenaultia linarioides, Conostylis candicans subsp. candicans, Pelargonium	widespread on limestone, 100+ plants.		Edgewater Quarry, bound by Joondalup Drive, Treetop Avenue and Regatta Drive, City of Joondalup	GPS	1	17/09/2012
8051	3378632	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Open shrub 1 m high. Flowers white.	Soil - sand (dry).				Trichet Road, Wanneroo	AUTO	3	9/12/1981
8053	3378640	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Tall compact-straggly shrub, 2 m high. Flowers white.	Grey sand. Hill side.	Banksia woodland.			Trischett Road, SW of Jandabup Lake, Wanneroo	MAN	0	21/12/1981
8055	3416119	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Shrub 1.8-2 m high, flowers white.	Limestone.				Neerabup Park	AUTO	3	21/10/1970
8060	3416089	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1						Wanneroo	AUTO	3	/11/1901
8061	7404808	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1		Limestone ridges SCP26a.			FCT26a Hadrell road. Transect road myhad 02, 10 m transect ID JP05, preburn plot.	Yanchep	GPS	1	5/09/2005

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
8062	4424840	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Upright shrub to 2m.	Soil: Yellow sand and exposed limestone. Topography/drainage: Well drained gentle S facing slope of limestone ridge. Geomorphology: Tamala limestone (spearwood).	Vegetation: Eucalyptus patrensis Shrub Mallee over Bossiaea eriocarpa Dwarf Scrub C over mixed Open Dwarf Scrub D over Conostylis pauciflora Very Open Herbs.			Ridges MPA (M4) 250 m N of Bailey Rd, 1.5 km E of Wanneroo Rd (Yan-14).	MAN	0	22/10/1993
8063	9139419	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Upright shrub to 2 m. White flowers.	Flat, sandy soil. Limestone.	Vegetation dominated by Banskia sessilis and Baeckea sp.	extensive population, 2307 plants recorded.		Neerabup, to S of Water Corporation's treatment plant	GPS	1	26/09/2017
8064	9139532	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Upright shrub to 2.5 m. White flowers.	Moderate east-facing slope. Yellow grey sand.		120+ plants.		City of Wanneroo. Ca. 300 m W of Wanneroo Road, ca. 2.5 km N of the intersection with Romeo Road	GPS	1	9/11/2017
8065	9139540	34161	Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	1	Upright shrub to 2 m. White flowers.	Flat, sandy soil.	Banksia woodland.	7 plants.		Nanika Park, along Nanika Crescent, Neerabup	GPS	1	28/09/2017
10820	1202995	34236	Beyeria cinerea subsp. cinerea	3	Spreading low twiggy shrub, to 30 cm x 40 cm. Flowers inconspicuous, female green, male yellow. Dioecious.	Ridge. Sand over limestone.	Low shrubland.	common in area.		Parrot Ridge, Yanchep National Park, 50 km N of Perth	AUTO	3	23/09/1989
12998	7215363	45757	Calectasia elegans	2	Herbaceous perennial shrub ca 40 cm x 50 cm in height with multiples stems and stilted roots. Flowers blue and fading to white.	On gentle slope above dampland, deep grey quartz sand. Last fire ca 20-30 years ago.	Banksia menziesii - Banksia attenuata - Banksia woodland (30-50% cover < 6m in height) over Regelia inops (2-10% cover <1.2 m in height) mixed low shrubs (10- 30% cover <0.5 m in height) rushes, sedges, perennial monocots (10-30%) and herbs-grasses (2-10	only two plants found.		ca 300 m E of Perry Road in Chitty Road bushland (Bush Forever Site No. 398), Pinjar (City of Wanneroo)	GPS	1	8/11/2005

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12999	8008213	45757	Calectasia elegans	2	Small compact shrub to 30 cm high and 30 cm wide. mature fruit present.	Flat to gentle slope. Grey sand.	With Banksia attenuata, Banksia menziesii, Stirlingia latifolia.			Ca 300 m E of Perry Road within Chitty Road Nature Reserve. Pinjar, City of Wanneroo	GPS	1	11/12/2008
13001	8617767	45757	Calectasia elegans	2	Erect perennial subshrub to c. 45 cm high. Typical purple flower with red anthers; stilt roots present; plants in full flower.	Flat plain with deep grey sand. Long unburnt area.	Low Banksia woodland with moderately dense vegetation. Associated species: Banksia spp., Stirlingia latifolia, Melaleuca spp., Eremaea spp., Hibbertia spp., Leucopogon spp.	several populations in this vicinity of 2 or 3 plants.		Melaleuca State Forest, ca 380 m W of powerline track, ca 2.7 km S from the intersection of Neaves and Gallagher Roads	GPS	1	16/09/2008
13002	8617740	45757	Calectasia elegans	2	Erect perennial subshrub to c. 45 cm high. Typical purple flower with red anthers; stilt roots present; plants in full flower.	Flat plain with deep grey sand. Long unburnt area.	Low Banksia woodland with moderately dense vegetation. Associated species: Banksia spp., Stirlingia latifolia, Melaleuca spp., Eremaea spp., Hibbertia spp., Leucopogon spp.	several populations in this vicinity of 2 or 3 plants.		Melaleuca State Forest, ca 170 m W of powerline track, ca 800 m S from the intersection of Neaves and Gallagher Roads	GPS	1	16/09/2008
15509	2052148	1425	Conostylis bracteata	3			Blackboy - Parrotbush association.			Yanchep National Park	AUTO	4	12/10/1965
15510	2052121	1425	Conostylis bracteata	3	Loosely tufted herb, leaves in flattened fascicles, margins with white appressed to spreading plumose hairs.	Swale in undulating consolidated dunes, some outcropping limestone.	In coastal scrub of Dryandra sessilis, Acacia saligna, A. xanthina, Xanthorrhoea preissii, Banksia attenuata, Melaleuca acerosa.			Mullaloo, c. 1 km inland, recreation reserve W of intersection of Waltham and Gunida Streets	AUTO	3	16/08/1986
15512	5305691	1425	Conostylis bracteata	3	Perennial herb, flowers yellow.	Plain near lake. Grey sand.	Jarrah with Banksia attenuata, B. menziesii, Burchardia congesta, Hibbertia hypericoides, Acacia spp., Ehrharta calycina.	occasional.		Remnant Banksia woodland (Block 9471), ca 2 km S of Burns Beach Road, E side of Lake Joondalup, Yellagonga Regional Park,	MAN	0	6/11/1997
15514	5931436	1425	Conostylis bracteata	3		Top of sand dune.				Mullaloo	MAN	3	19/11/1962

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15516	1744321	1425	Conostylis bracteata	3	Loosely tufted herb to 80 cm diameter; leaf margins with white plumose appressed hairs <1 mm long; perianth 10-12 mm long, pale yellowish green outside, golden yellow inside tube, lobes cream inside, becoming golden yellow at base and near apex, conspicu	E slopes of a consolidated sand dune.	Low heath of Acanthocarpus preissii, Acacia lasiocarpa.		Rendered extinct by housing development on August 17.	Kallaroo, 25 km NNW of Perth; 50 m SSW of Juno Crescent on the verge of Dampier Avenue	MAN	0	16/08/1986
15517	8755388	1425	Conostylis bracteata	3	Tufted herb to 20 cm tall. Flowers yellow. Plants flowering at the time of collection. Leaves arranged into flattened, broadly fan-like clusters. The leaf margins glabrescent.	Grey sand, on mid-slope.	Acacia rostellifera and Melaleuca systena mid shrubland. Lomandra maritima low open herbs.	1 mature plant.	Project: 3536.	2 Quinns Road, Mindarie, within Bush Forever No 397	GPS	1	4/11/2015
15669	1174800	11388	Conostylis pauciflora subsp. euryrhipis	4	Tufted herb with narrow, yellow-green leaves, glabrous with marginal hairs.		Eucalyptus argutifolia aff. conglobata in Heath A-C with Dryandra sessilis, Melaleuca huegelii, M. acerosa, Grevillea thelemanniana, Diplolaena, Xanthorrhoea, Hakea spp.,Dryandra nivea and Conospermum.			Quarry N of Bailey Road, N of Yanchep National Park	MAN	0	//
15676	4525205	11388	Conostylis pauciflora subsp. euryrhipis	4	Perennial herb.	Soil: Yellow sand and exposed limestone. Topography/drainage: Well drained gentle S facing slope of limestone ridge. Geomorphology: Tamala limestone (spearwood).	Vegetation: Eucalyptus patrensis Shrub Mallee over Bossiaea eriocarpa Dwarf Scrub C over mixed Open Dwarf Scrub D over Conostylis pauciflora Very Open Herbs.			Ridges MPA (M4) 250 m N of Bailey Rd, 1.5 km E of Wanneroo Rd (Yan-14).	GPS	1	22/10/1993
15677	4966554	11388	Conostylis pauciflora subsp. euryrhipis	4		N and NE aspect. Ridge. Dry yellow sand over limestone/sheet boulder.	Completely open, treeless but scrubby site with Melaleuca heugelii, M. acerosa, Grevillea thelemanniana, blackboys, Acacia pulchella, Dryandra sessilis, D. nivea, native Wisteria.	100+ plants.		Yanchep State Forest, situated 350 m S down Obidos Road from the junction of Mistletoe Road	MAN	0	26/07/1996

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15682	4059034	11388	Conostylis pauciflora subsp. euryrhipis	4	Tufted perennial herb, flowers yellow.	On grey calcareous sand.				Alkimos Block, W Carabooda Lake, Site 4	MAN	3	23/10/1989
15684	9208054	11388	Conostylis pauciflora subsp. euryrhipis	4	Stoloniferous herb, 20 cm high.	Interdunal flat or swale. White calcareous sand. > 7 years since fire.	Allocasuarina lehmanniana subsp. lehmanniana high open shrubland over Spyridium globulosum, Olearia axillaris, Acacia cyclops high shrubland over Melaleuca systena, Rhagodia baccata low open shrubland over Desmocladus asper, Lepidosperma pubisquameum ver			C. 1.9 km S of Yanchep, 6 km W of Yanchep Beach Road - Wanneroo Road intersection which is 54 km N of Perth CBD	GPS	1	1/10/2007
15687	5982138	11388	Conostylis pauciflora subsp. euryrhipis	4		S slope, on sand dunes; dry white sand; long unburnt.	Low heath 0.3 m tall, 30-70% cover.	c. 20 mature plants in a 5 x 20 m area.		Site 18, NW corner of the Alkimos Estate, 100 m from the coast,	MAN	3	25/10/1996
15689	7836457	11388	Conostylis pauciflora subsp. euryrhipis	4		Yellow-brown sand over limestone, slope, private lease. NW aspect.	Acacia rosterllifera and Spyridium globulosum Tall Open Scrub over Melaleuca systena Low Open Shrubland over mixed Herbland-Grassland.		Healthy population with flowers. Potential threat from clearing.	Eglington, W of Marmion Avenue, S of Pipindinny Road	GPS	1	17/10/2007
15690	7858833	11388	Conostylis pauciflora subsp. euryrhipis	4	Tufted perennial.	Sand, secondary dunes.	Scaevola crassifolia, Lomandra maritima, Rhagodia baccata, Hardenbergia comptoniana, Threlkeldia diffusa, Hemiandra pungens, Acanthocarpus preissii.			Alkimos	GPS	0	1/03/2007

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15695	8816565	11388	Conostylis pauciflora subsp. euryrhipis	4	Herb to 13 cm. Flowers yellow.	Limestone ridge. Grey sand over limestone. Burnt Summer 2009.	Shrub mallee of Eucalyptus argutifolia and E. petrensis over Shrubland of Scaevola spp., Acacia truncata, Melaleuca huegelii and Trymalium ledifolium. Associated species: Hardenbergia comptoniana, Grevillea preissii, Acacia alata var. tetrantha.	small dense patch (ca 20 m x 20 m).		1.1 km S of Breakwater Drive, on the edge of a disused quarry, Two Rocks	GPS	1	22/11/2013
15696	9039023	11388	Conostylis pauciflora subsp. euryrhipis	4	Herb.	Dunes.	Acacia cochlearis and Melaleuca systena low open shrubland.			Alkimos, Perth	GPS	1	20/10/2016
15699	4613481	11657	Conostylis pauciflora subsp. pauciflora	4						Smoke Tree Hill in state forest just NE of Yanchep National Park, c. 57 km N of Perth,	MAN	0	7/09/1992
15709	7836449	11657	Conostylis pauciflora subsp. pauciflora	4		Grey sand over limestone, slope private lease, W aspect.	Melaleuca systena and Scaevola globulifera Open Low Heath over Austrostipa flavescens, Lolium perenne and Bromus diandrus Grassland.		Healthy population with flowers. Potential threat from clearing.	Eglington, W of Marmion Avenue, S of Pipindinny Road	GPS	1	19/10/2007
16323	2076802	16245	Cyathochaeta teretifolia	3	Tall grass like plant 1 m high.	In peat swamp.				8.38 km N along Galacher Road off Neeves Road	MAN	0	7/02/1980
16328	6533078	16245	Cyathochaeta teretifolia	3	Erect tufted sedge to 1.5 m by 0.4 m.	Sumpland, black humic sand over ?clay. Plants in wettest section of sumpland.	Hakea varia and Melaleuca teretifolia Heath A.			SW corner of Della and ?Marshall Roads, Beechboro	GPS	1	8/12/1995
16336	6808077	16245	Cyathochaeta teretifolia	3	Grass like or sedge.		Low forest, Melaleuca preissiana, Astartea fascicularis, Hypocalymma angustifolium, Banksia littoralis.			Gnangara Mound	MAN	3	2/12/2002
19219	7881312	31233	Drosera patens	1						Pinjar Road, Wanneroo	UNK	2	19/11/1991

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19309	7579101	30712	Drosera x sidjamesii	1						Pinjar Road, Wanneroo	GPS	1	4/12/1984
19311	7881525	30712	Drosera x sidjamesii	1						Pinjar Road, Wanneroo	UNK	2	4/12/1984
21334	8153302	13091	Eucalyptus argutifolia	T	Mallee to 2.5 m. Flowers white.	Slight slope/ridge. Grey/white sand over limestone.	With Acacia cyclops, Hakea prostrata, Lomandra maritima, rhagodia baccata, Spyridium globulosum.			Within Beaumarks Park, Mindarie. Approch population from Beaumarks Court as park is fenced at the back. Population faces Long Beach Promenade	GPS	1	8/01/2009
21335	8153310	13091	Eucalyptus argutifolia	T	Mallee to 2.5 m. Flowers white.	Slight slope/ridge. Grey/white sand over limestone.	With Acacia cyclops, Hakea prostrata, Lomandra maritima, rhagodia baccata, Spyridium globulosum.			Within Beaumarks Park, Mindarie. Approch population from Beaumarks Court as park is fenced at the back. Population faces Long Beach Promenade	GPS	1	8/01/2009
21342	1051490	13091	Eucalyptus argutifolia	T	Mallee 1.5 m tall with smooth bark.	Brown sand and coarse limestone outcrops.				Parrot Ridge, N of Yanchep.	MAN	3	9/04/1987
21344	1123149	13091	Eucalyptus argutifolia	T		Lower ridge slope. Sheet sand/brown boulder/dry yellow soil.	Thickets of Melaleuca sp., Melaleuca hueglii, Dryandra sessilus and Dryandra nivea, Blackboy (Xanthorrhoea preissi), Hakea trifurcata.			Yanchep State Forest, 200 metres from the most S point of Compt. 68 Yanchep Pine Plantation [6 km NNE of Yanchep].	MAN	2	27/04/1990
21347	1123130	13091	Eucalyptus argutifolia	T		At foot of and bordering very steep and rocky limestone ridge. Dry brown sheet sand.	Completely open, apart from odd Nuytsia floribunda and stands of Euc. foecunda. Blackboy (Xanthorrhoea preissii) Hake trifurcata, Dryandra sessilus and nivea. Ac. pulchella, Templetonia retusa, Mel. hueglii.			Yanchep State Forest, 400 metres S down Obidos Road, from junction Mistletoe Road.	MAN	4	16/03/1990

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21350	1123661	13091	Eucalyptus argutifolia	T		ESE aspect. Lower ridgetop slope. Sheet sand/brown boulder. Completely open to treeless site.	Melaleuca huegelii, Xanthorrhoea preissii, Dryandra sessilis/nivea, Hakea trifurcata, Hibbertia hypericoides, Native wisteria.			Ridge State Forest, 260 metres along Hopkins Road, from junction of Wesco Road [Near Lake Pinjar].	MAN	2	6/08/1990
21351	4110544	13091	Eucalyptus argutifolia	T	Mallee to 3 m.	Dune slope, grey sand over limestone.	Mallee, Eucalyptus petrensis over heath.	rare in area.		Mindarie South, 30 km N of Perth	AUTO	3	22/04/1991
21352	1452274	13091	Eucalyptus argutifolia	T	Mallee to 2.5 m. Flowers ?, in bud. Smooth barked.	Limestone ridge, shallow sand over limestone.		locally common.		Parrott Ridge, Yanchep, 50 km N of Perth	AUTO	3	17/11/1989
21355	1286471	13091	Eucalyptus argutifolia	T	Malll to 3 m high, conical, necked buds.	Top of gully adjacent to hill top, brown sand over limestone.	Shrubland.	occasional.	Same population as 90017 & 90018.	Parrot Ridge near Trig Point	MAN	2	17/09/1990
21356	1286463	13091	Eucalyptus argutifolia	T	Mallee 3 m high, squat necked buds.	Top of gully adjacent to hill top, brown sand over limestone.	Shrubland.	occasional.	Same population as 90017 & 90019.	Parrot Ridge near Trig Point	MAN	2	17/09/1990
21357	1286455	13091	Eucalyptus argutifolia	T	Mallee to 3m high, ovoid buds.	Gully head next to hill top, brown sand over limestone.	Shrubland.	occasional.		Parrot Ridge near Trig Point,	MAN	2	17/09/1990
21358	1050516	13091	Eucalyptus argutifolia	T	Mallee 1.5 m tall with smooth bark.	Brown sand and coarse limestone outcrops.				Parrot Ridge, N of Yanchep	MAN	3	9/04/1987
21363	5854814	13091	Eucalyptus argutifolia	T	Spreading, multi-stemmed, smooth barked mallee.	E-facing slope. Brown sand, exposed limestone over limestone.	Mallee over heath. With Dryandra sessilis, Melaleuca spp., Xanthorrhoea preissii, Hibbertia sp., Hybanthus sp. and Conostylis sp.	15		Parrot Ridge, NNE of limestone quarry, E side of hill,	GPS	1	11/10/2001

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21371	8816549	13091	Eucalyptus argutifolia	T	Mallee, up to 2 m.	Limestone ridge. Grey sand over limestone. Burnt Summer 2009.	Shrub Mallee of Eucalyptus argutifolia and E. petrensis over shrubland of Scaevola spp., Acacia truncata, Melaleuca huegelii and Trymalium ledifolium. Associated species: Hardenbergia comptoniana, Grevillea preissii, Acacia alata var. tetrantha, Conostyl	small dense patch (ca 20 m x 20 m).		1.1 km S of Breakwater Drive, Two Rocks. On the edge of a disused quarry	GPS	1	22/11/2013
21372	9139524	13091	Eucalyptus argutifolia	T	Mallee to 2 m high.	At the base of a limestone ridge. Grey sand.		ca. 6 plants.		City of Wanneroo. Ca. 600 m S of Carabooda Road and ca. 300 m NE of Water Corporation's Carabooda tank	GPS	1	7/11/2017
21374	2160765	13091	Eucalyptus argutifolia	T		Slight gully situation nestles between two limestone ridges. Sand/boulder/brown/ yellow/dry/limestone.	Completely open and treeless with dense scrubland. Dryandra's nivea/ sessilus, Hakea trifurcata, Melaleuca huegelii, Blackboys (Xanthorrhoea preissii), Templetonia retusa.	32 clumps.		Quarry Reserve 5204, 250 m from junction of Myrtle road and 380 m at 195 deg.	MAN	0	15/11/1991
21375	2117223	13091	Eucalyptus argutifolia	T		Slight gully situation nestled between two limestone ridges. Limestone/boulder/ sand/brown/yellow/dry.	Completely open & treeless with dense scrubland. Dryandra's nivea/ sessilus, Hakea trifurcata, Melaleuca huegelii, Blackboys (Xanthorrhoea preissii), Templetonia retusa.	32 clumps, undisturbed.		Quarry Reserve 5204, 250 m from the junction of Myrtle road and 380 m at 195 deg. to rare mallees	MAN	0	15/11/1991

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25081	8076626	20162	Fabronia hampeana	2		Private property in depression between limestone outcrops with yellow sand. Potential threat by urban development. Last burnt summer 2001.	Banksia low open woodland with occasional Eucalyptus decipiens, Macrozamia riedlei, Acacia rostellifera and Hypocalymma angustifolium.		Condition of population: Healthy.	Lot 17 Marmion Avenue, Clarkson (along W boundary of the site), 34 km N of Perth CBD	GPS	1	12/01/2009
25082	5939658	20162	Fabronia hampeana	2	Fertile moss.	On trunk of Macrozamia.	Emergent large Banksia over Macrozamia, Hibbertia, Xanthorrhoea, grasses, weeds and thick Dryandra regrowth.			Between Neerabup National Park and developing suburb of Kinross, 28 km NNW of Perth	MAN	3	14/09/1994
29974	8422710	33737	Grevillea sp. Ocean Reef (D. Pike Joon 4)	1	Erect, spreading shrub. To 1.5 m x 3 m.	Sand dune. Dry brown / grey sand.	Coastal sand scrub with Acacia, Banksia sessilis, Spiridium globulosum, Clematis, Calothamnus, Pelargonium, Dianella, Hardenbergia.	40 - 60 plants (D. Pike November 2008).		Ocean Reef Road, Ocean Reef	GPS	1	15/08/2012
29975	8422605	33737	Grevillea sp. Ocean Reef (D. Pike Joon 4)	1	Erect, spreading shrub - clonal. To 1.5 m x 3 m.	Sand dune / gully. Dry brown / grey sand.	Coastal sand scrub with Acacia, Banksia sessilis, Spiridium globulosum, Clematis, Calothamnus, Pelargonium, Dianella, Hardenbergia.	40 - 60 plants (D. Pike November 2008).	Does not appear to set fruit (D. Pike's observation).	Ocean Reef Road, Ocean Reef: between the boat harbour and Ocean Reef Road	GPS	1	6/09/2012
29976	7860579	33737	Grevillea sp. Ocean Reef (D. Pike Joon 4)	1	Dense, spreading shrub to 2 m high x 3 m wide. Plants in late flower.	Quindalup dunes. Dry, bare, light yellow-brown sand.	Tall shrubland. With Acacia rostellifera, Dryandra sessilis, Spyridium globulosum.	One apparently clonal population of 40-60 plants.		Ocean Reef, suburb of Perth	GPS	1	/11/2008

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29977	8509603	33737	Grevillea sp. Ocean Reef (D. Pike Joon 4)	1	Compact perennial shrub 150 cm high x 200-300 cm wide.	Broad dune swails. Grey shallow sand. Numerous limestone boulders.	Acacia rostilifera, Conostylis sp., Tetraria octandra, Spyridium globulosum, Acanthocarpos preissii, Desmocladus flexuosus, Phyllanthus calycinus, Dianella revoluta, Lepidosperma sp., Banksia sessilis, Clematis sp., Hardenbergia comptoniana, Rhagodia bac	26-50 plants plus additional 6-10 juveniles within 40 m radius.		Bush Forever Site 325, bounded by Boat Harbour Quay and Ocean Reef Road in Ocean Reef	GPS	1	16/10/2013
31139	1618261	41180	Haloragis sp. Parrot Ridge (G.J. Keighery 11563)	1	Erect, ? perennial soft shrub or herb to 30 cm. In flower but largely in bud.	On hill on N margin of ridge in black sand over limestone.	Melaleuca tall closed shrubland.	rare or locally common.		Parrot Ridge, Yanchep National Park, 50 km N of Perth	AUTO	2	30/09/1989
31140	8984689	41180	Haloragis sp. Parrot Ridge (G.J. Keighery 11563)	1	Annual herb 10-40 cm high; fruiting.	Eastern mid-slope of ridge to W of track; orange brown sand over limestone.	Tall shrubland of Acacia rostellifera with Banksia sessilis, Melaleuca systena and M. huegelii, over Xanthorrhoea preissii and Hibbertia hypericoides.	c. 15 mature individuals, 10 juveniles and 40 dead juveniles were seen during a partial survey of the slopes and ridge top.		c. 920 m N of Bailey Road on Obidos Road, Parrot Ridge, NE of Yanchep	GPS	1	5/01/2018
31141	9018883	41180	Haloragis sp. Parrot Ridge (G.J. Keighery 11563)	1	Small, many branched spreading ? herb, to c. 0.4 m x 0.3 m, 4-merous reddish stigmas and 8 exserted stamens.	Upper to mid-slope of limestone ridge. Shallow brown/grey sandy loam and limestone outcropping, 10 years since fire.	Open Shrubland of Melaleuca systena, M. huegelii, M. cardiophylla and Banksia sessilis over Low Shrubland of Eremophila glabra, Banksia dallanneyi subsp. dallanneyi, Acacia lasiocarpa, A. pulchella, Grevillea preissii, Beyeria cinerea, Dodonaea aptera, A	a patch of plants, ca. 170 plants recorded in 0.8 ha.	Bush Forever Site 381. Plants occur within TEC - Limestone Ridges 26a.	'Parrot RidgeÃ¢â‚¬â„¢. In State Forest 65, ca. 675 m S of Mistletoe and Obidos roads junction, then ca. 200 m W	GPS	1	7/12/2016

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
31142	9018891	41180	Haloragis sp. Parrot Ridge (G.J. Keighery 11563)	1	Small, many branched spreading ? herb, to c. 0.4 m x 0.3 m.	Mid-slope flat, E of limestone ridge, 10 years since fire.	Open Shrubland of Acacia rostellifera, Melaleuca systena and Diplolaena angustifolia over Low Shrubland of Banksia dallanneyi and Conostylis sp. with Banksia sessilis, Hakea lissocarpha and Jacksonia calcicola.	a patch of plants, ca. 60 in 0.6 ha.	Bush Forever Site 381. Plants occur adjacent to a TEC - Limestone Ridges 26a.	'Parrot RidgeÃ¢â‚¬â„¢. In State Forest 65, ca. 495 m S of Mistletoe and Obidos roads junction, then ca. 185 m W	GPS	1	6/02/2017
32054	2625598	49637	Hibbertia leptotheca	3		Limestone.	Heath.			Yanchep road	AUTO	3	/09/1937
32056	9039058	49637	Hibbertia leptotheca	3	Low shrub.	Dunes.	Xanthorrhoea preissii mid open shrubland over Melaleuca systena low open shrubland.	5 plants.		Alkimos, Perth	GPS	1	20/10/2016
32071	7520859	49637	Hibbertia leptotheca	3		Outcrop, slope. Dry, red-brown-white, limestone.	Mixed low scrub. Melaleuca cardiophylla, Mel. huegelii, Diplopeltis huegelii, Grevillea preissii, Trymalium ledifolium.	> 100 plants.		Alkimos - Eglinton proposed housing development	GPS	1	16/10/2005
32075	3096424	49637	Hibbertia leptotheca	3	Domed green shrub, to 30 cm x 40 cm. Flowers yellow, reflexed over sepals when in flower. In full flower.	Sea cliff. Grey-black sand over limestone.	Low Melaleuca cardiophylla closed heath.		Abundance: common.	Burns Beach; 26 km N of Perth	AUTO	3	21/09/1990

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32775	8836647	11074	Hydrocotyle striata	1	Spreading annual. Height: 5-10 cm.	Seasonally inundated depression within a Mound Spring. Moist, undulating slightly. Black peaty sand. Fire history: Autumn 1995.	Low Open forest of Melaleuca preissiana over Pteridium esculentum. With Cyathochaeta teretifolia (P3), Hibbertia perfoliata.	dense cover in localised ca 40 m x 30 m area. (Site not surveyed closely, plants maybe more widespread on Lot).	Collection made for identification as it had not been seen prior to removal of extremely dense cover of Blackberry initiated in 2012. Site is a Mound Spring of the Swan Coastal Plain threatened Ecological Community.	Lot 800, Pine Road, Bullsbrook. Land is vested within the Dept of Planning and Infrastructure and is adjoining Conservation Estate known as Neaves Road Nature Reserve	GPS	1	16/11/2016
33841	8755396	20462	Jacksonia gracillima	3	Perennial tufted herb with narrow leaves 10-40 cm long, with rose pink flowers.	Grey sand, on mid-slope with exposed limestone. Fire > 5 years.	Low open forest of Eucalyptus rudis and Melaleuca preissiana. Banksia attenuata shrubs. Tall shrubland of Gastrolobium ebracteolatum and Kunzea glabrescens. Sedgeland of Baumea preisii subsp. laxa.	1 mature plant.	Project: 3516.	The Roe Highway Extension area, ca 14 km S of Perth	GPS	1	9/10/2015
33963	1131192	4027	Jacksonia sericea	4	Prostrate shrub, 50 cm x 1.5 m diam. Flowers orange-yellow; eye yellow.	Hilltop, sand over limestone.	Banksia low woodland.		Abundance: common.	Ocean Reef Road, Wanneroo, 30 km N Perth	MAN	3	20/01/1988

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
33972	2171449	4027	Jacksonia sericea	4	Low spreading shrub to .3 m high. Brown pods.	In yellowish/brown sand on low ground.	In open woodland over low heath and disturbed areas, with Banksia attenuata, B. menziesii, Gomphlobium aristatum, Xanthorrhoea sp., Eucalyptus gomphocephalum.			NW corner of Ocean Reef road and Joondalup Drive, Woodvale	MAN	0	15/05/1990
33973	1131176	4027	Jacksonia sericea	4	Low spreading shrub 0.5 m high.	Highly disturbed.	Highly disturbed Tuart/Jarrah forest.			Lake Joondalup (Edgewater)	MAN	3	/11/1979
33981	6410731	4027	Jacksonia sericea	4		Slope/flat. Dry grey sand over limestone.	Eucalyptus marginata, Banksia attenuata, B. menziesii Woodland. Associated species: Banksia attenuata, B. grandis, Allocasuarina fraseriana, Dryandra sessilis, Calothamnus sp.		Condition of population: healthy.	Lot 21, Flynn Drive, Neerabup, Shire of Wanneroo	MAN	3	/07/2001
33983	6730620	4027	Jacksonia sericea	4	Shrub 30-60 cm high x 1 m wide. Perennial, prostrate, dense spreading. Flowers orange.	Hillside. Dry sand. Old soil disturbance.	Tuart, Banksia, Allocasuarina woodland.	over 50 plants, quite widespread.		Periwinkle Park, Periwinkle Road, Mullaloo	MAN	3	14/10/2002
33986	7400160	4027	Jacksonia sericea	4	Low shrub.					Small remnant of Wanneroo road near Lake Neerabup	GPS	1	24/04/2001
34005	8982643	4027	Jacksonia sericea	4	Shrub, 0.5 m high.	Gentle slope, slight ridge. Yellow brown loamy sand.	Tall open shrubland of Acacia rostellifera to 3 m over closed tall scrub of Banksia sessilis to 2.4 m over open shrubland of Xanthorrhoea preissii, Melaleuca systena and Hakea trifurcata to 2 m over low shrubland of Jacksonia sericea and Hibbertia hyperi	> 700 plants.		S of main track on ridge, mineral lease M70/013, Hopkins Road, Nowergup, City of Wanneroo	GPS	1	11/11/2010
34824	4158342	5038	Lasiopetalum membranaceum	3	Shrub to 1 m high, flowers purple.	Flat, gently undulating. Grey sand over ? limestone.	Under Jarrah tree in open woodland.	occasional.		Yeal Swamp road - Yanchep National Park	MAN	0	4/11/1987
35188	4877799	27793	Lecania sylvestris	2		Roadside.				Picnic area N of Yanchep National Park, N of Perth	AUTO	3	28/08/1988
35189	2973499	31312	Lecania turicensis var. turicensis	2		Coastal rocks, limestone.				Burns Beach, N of Perth	AUTO	3	28/08/1988

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35190	7446667	31312	Lecania turicensis var. turicensis	2		Coastal rocks, limestone.				Yanchep Beach, N of Perth	TOPO	3	28/08/1988
35509	1421468	3042	Lepidium pseudotasmanicum	4						Yanchep	AUTO	3	16/12/1953
35518	3455114	3042	Lepidium pseudotasmanicum	4	Erect ? slender perennial herb to 20 cm.	Valley, grey sand over limestone.	Eucalyptus gomphocephala open woodland.	uncommon.		Pipidinny Swamp, Yanchep National Park	AUTO	4	3/10/1991
35521	6209939	3042	Lepidium pseudotasmanicum	4					Field No. 99.	Wydgee - S of Yanchep Beach Road	MAN	3	14/04/1966
36515	8296340	40801	Leucopogon maritimus	1	Shrub 30-40 cm high with reddish brown stems. Flowers very open / splayed out; sepals green; very short corolla tube, long lobes with feathery hairs towards tips, white. Anthers yellow-brown. Buds pink. Young leaves light green, glossy, erect.	Sand dune.	Low shrubs and heath.	common.		Two Rocks area, 8.7 km N of Yanchep turnoff	UNK	3	30/08/1979
36516	5456169	40801	Leucopogon maritimus	1		On stable dune.	Coastal heath.			Yanchep Beach,	AUTO	3	9/08/1960
36517	9208038	40801	Leucopogon maritimus	1	Low shrub, 35 cm high.	Gentle, NW-facing lower slope of lower ridge. Grey calcareous sands. > 5 - 7 years since fire.	Melaleuca huegelii, M. cardiophylla, Acacia truncata closed low heath over Thomasia triphylla, Leucopogon insularis, Melaleuca systena, Lysinema ciliatum low shrubland over Desmocladus asper, Lepidosperma pubisquameum very open sedgeland with Lomandra ma			C. 2 km S of Yanchep, 6 km W of Yanchep Beach Road - Wanneroo Road intersection, which is 54 km N of Perth CBD	GPS	1	30/09/2007
36518	7835213	40801	Leucopogon maritimus	1		White sand, sand dune, slope, private property.	Melaleuca systena, Lomandria maritima Low Open Heath Melaleuca systena, Scaevola thesioides, Acacia rosterllifera and Herbland of Lomandra martima.		Healthy population with potential threat from clearing.	Eglinton, approximately 40 km N of the Perth CBD, W of Marmion Avenue, S of Pipindinny	GPS	1	20/10/2007
36520	6210082	40801	Leucopogon maritimus	1					Field No. 166.	Burns - Mullaloo	MAN	3	27/06/1966

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36522	7615345	40801	Leucopogon maritimus	1	Shrub 0.4 m high x 0.4 m wide. Flowers white.	Hillside in future residential area. Grey sand, limestone caprock visible nearby.	Low shrubland.	one plant.		On the Two Rocks side of the fence, ca halfway between Forest Grove and Breakwater drive	GPS	1	14/06/2007
36523	6053122	40801	Leucopogon maritimus	1	Compact shrub 0.2 m high x 0.3 m wide. Flowers white.	Dune - road verge. White, very thin sand on exposed limestone caprock.	Low shrubland. Wattles, grasses.	2-5 plants.		Coastal side of Two Rocks Road, under powerline, opposite Whitfield Park	GPS	1	8/03/2002
36525	7917201	40801	Leucopogon maritimus	1	Low spreading shrub to 30 cm high x 50 cm wide. Flowers white.	Quindalup dunes. Dry yellow sand over limestone at depth.	Mixed heath mostly <1 m. Melaleuca systena, Leucopogon parviflorus, Calothamnus quadrifidus.	c. 6 seen.		S side of Breakwater Drive, 5.2 km W of Wanneroo Road, E of Two Rocks	GPS	2	13/04/2008
36526	5536359	40801	Leucopogon maritimus	1	Low spreading shrub, 20 cm high x 20 cm wide. Flowers white, single stemmed at ground level. Ovary 3 celled glabrous.	Near coastal dunes ca 600 m from beach. Bare yellow sand over limestone.	Low Heath D (Muir 1977) with Acacia truncata, Melaleuca systena and Acanthocarpus preissii.	locally common.		Ca 200 m SW from the end of Pipidinny Road, S of Yanchep	GPS	1	10/05/1998
36529	7970900	40801	Leucopogon maritimus	1	Low spreading shrub to 30 cm high x 50 cm wide. Flowers white.	Coastal dune. Dry white sand.	Low heath mostly (< 0.5 m). Olearia axillaris, Spyridium globulosum, Acacia lasiocarpa, Lomandra maritima.	scattered.		Coastal dunes just N of The Spot, between Yanchep and Two Rocks	GPS	1	2/05/2008
36532	5127742	40801	Leucopogon maritimus	1	Erect to spreading shrub to 30 cm tall. Corolla white, flowers just beginning.	In sand among limestone rocks on small hill.	In low kwongan, Scaevola, Pimelea, Acacia.			4 km along Pippidinny Road from Yanchep Road,	MAN	0	27/11/1996
36819	8263329	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3						Yanchep	MAN	4	17/06/1965
36820	8263302	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3						Yanchep	MAN	4	17/06/1965
36821	8263310	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3						Yanchep	MAN	4	17/06/1965

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36822	8263337	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3						Yanchep	MAN	4	17/06/1965
36823	8263345	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	More or less spreading shrub to 70 cm; flowers white.	In sand.	In Banksia scrub.			Yanchep	MAN	4	21/05/1963
36824	8263353	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3						[? Yanchep]	MAN	4	17/06/1965
36827	8262926	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3						N end of Yanchep National Park	MAN	4	3/06/1965
36828	8262934	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3						Yanchep	MAN	4	17/06/1965
36831	3509311	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	Dwarf shrub 40 cm high, flowers white, mucronate leaves.	Undulating, grey sand over limestone.	Woodland, Banksia.	frequent.		Map.1:25,000 Sheet: Yanchep, Grid Ref. 767108	AUTO	3	29/05/1993
36832	1147773	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	Low twiggy woody shrub, 15-20 cm, flowers white, sweet honey scent.	Low hill, grey sand over limestone.	Limestone heath.	scattered in area.		Neerabup [Lake] National Park; 35 km N of Perth	AUTO	3	30/05/1990
36836	6154794	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	Erect shrub 30 - 35 cm high. Fruit green and red.	Sandplain.	Disturbed scrub and heath.	occasional.		4 km N of Yanchep turnoff on Wanneroo-Lancelin road. Rubbish tip entrance. Yanchep National Park	MAN	3	30/08/1979
36839	5918073	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	Erect shrub 40 cm high x 30 cm wide. Fruiting. Fruit probably immature.	Coastal plain. Dry, bare yellow sand over limestone.	Thicket. Dryandra sessilis, Spyridium globulosum, Hakea costata.		Taken from same population as flowering specimen MH 1986.	E-W track N of Minniew Grotto, Yanchep National Park,	GPS	1	16/09/2001
36845	7293178	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	Erect shrub to 60 cm high x 60 cm wide. Flowers white, strictly pendulous.	Coastal plain. Dry, yellow sand over limestone.	Heath (mostly 1-2 m). Dryandra sessilis, Jacksonia calcicola, Conostephium stoechadis.	locally common.		Yanchep National Park, Pigeon Road ca 1.8 km E of Wanneroo Road	GPS	1	19/05/2005

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36846	5556325	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	Low erect shrub, 40 cm high x 30 cm wide. Flowers white, pendulous. Single stemmed at ground level.	Coastal plain. Dry, bare yellow sand over limestone.	Thicket (Muir 1977) with Dryandra sessilis, Spyridium globulosum, Hakea costata. In limestone heath and Banksia woodland, sometimes growing with L. racemulosus.	locally common in N areas of park.		Yanchep National Park, EW track N of Minnies Grotto	GPS	1	16/04/2000
36847	5572223	19460	Leucopogon sp. Yanchep (M. Hislop 1986)	3	Erect open shrub, 70 cm high x 60 cm wide. Flowers white, pendulous. Plant single stemmed at ground level.	Coastal plain. Dry, littered, yellow sand.	Low Banksia Forest B (Muir 1977) with B. attenuata, B. menziesii, Hakea ruscifolia, Xanthorrhoea preissii.	occasional.		Off Bailey Road, ca 200 m E of Wanneroo Road, N of Yanchep	GPS	1	21/05/2000
36907	4302672	40804	Leucopogon squarrosus subsp. trigynus	2	Erect shrub 0.4m.	Soil: Grey sand. Topography/drainage: Well drained gentle W facing dune slope. Geomorphology: Bassendean sands.	Vegetation: Banksia menziesii, Banksia attenuata Low Woodland A over Verticordia nitens Low Scrub B over Beaufortia elegans, Conostephium pendulum Low Heath D.			Location: Along Muchea - Eneabba powerline 12 km SSE GinGin airfield (plot pline-1).	MAN	0	20/07/1993
37611	8386811	25819	Marianthus paralius	T		Well drained dry white sand. Limestone ridge. Fire history: long ago.	Melaleuca cardiophylla, Scaevola crassifolia, Olearia axillaris, Rhagodia baccata Closed Low Heath.		Condition of plants: moderate.	Dual use path & north of Silver Sands Drive, Joondalup	TOPO	3	29/12/2010
37614	7782144	25819	Marianthus paralius	T	Prostrate shrub with red flowers.	Limestone cliff with dry, brown sand. Exposed limestone outcropping.	Dense Heath B. Coastal heath vegetation including Spyridium sp., Thomasia sp., Melaleuca sp., Scaevola sp., Acanthocarpus sp.	9 plants recorded.		Iluka foreshore reserve, Iluka R47831, plants are located approx 575 m and 870 m S of Ocean Parade along the pedestrian path	GPS	1	26/10/2006
38143	9196951	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Slender erect open shrub, 2-3 m high x 1 m wide. In fruit, not in flower.	Limestone hill. Skeletal white loam over limestone.	Banksia sessilis / Melaleuca tall shrubland.	locally common.	Co-occurring with Melaleuca systena which is in full flower.	Wattle Avenue West, Wanneroo - Nowergup	GPS	1	28/08/2004

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38144	8815224	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Erect to spreading shrub to 1.5 m with yellow flowers.	Limestone ridge remnant within a mine pit.	Remnant.	occasional.		SF 65 670 m NE of the Hopkins and Wesco intersection on the 'island' of vegetation in the middle of the mine pit	GPS	1	6/12/2013
38145	8816476	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Erect shrub 1 - 2.5 m x 2 m.	On fine sand to sandy loam soils with 30-70% outcropping limestone.	Closed tall scrub of Melaleuca systena, M. sp. Wanneroo, M. sp. Wanneroo x systena and M. huegelii, over low shrubland of Calothamnus quadrifidus, Banksia sessilis var. cygnorum, Leucopogon parviflorus and Templetonia retusa.	locally common.	Co-occurs with Melaleuca systena and M. systena x M. sp. Wanneroo. Population 1.	One Tree Hill (CR 25253), Nowergup	GPS	1	7/08/2014
38146	6972942	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Slender erect single 2-3 m high and 1-2 m wide. Flowers pale yellow; in full flower.	Rugged limestone ridge. Mossy black sand.	Melaleuca cardiophylla, M. sp., M. systena tall closed shrubland.	dominant locally.		Wanneroo Shire Reserve, Wattle Avenue, Neerabup	GPS	1	23/12/2004
38147	8816522	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Erect shrub 1-2.5 m x 2 m. Flowers yellow.	On well drained grey sand with 30-70% outcropping limestone.	Tall open scrub of Melaleuca huegelii, M. sp. Wanneroo with occasional Eucalyptus petrensis and Melaleuca systena, over open low heath of Acacia alata var. tetrantha, Thomasia triphylla over open sedgeland/herbland.	locally common.		SE corner of Lot 7 Wesco Road, Nowergup	GPS	1	28/11/2014
38148	9041443	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Shrub to 2 m tall. Yellow flowers.	NE face of limestone hill. Soil: shallow yellow/brown sand.	Dense shrubland to 2 m. Associated species: Calothamnus sp., Hakea trifurcata, Grevillea preissii and Banksia sessilis.	>100.		W of Hopkins Road, NE of Wesco Road	GPS	1	17/01/2019
38149	9137459	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Tall shrub to 2 m tall. Yellow flowers.	Hilltop and upper slopes. Soil: shallow brown sand.	Shrubland. Associated species: Thomasia sp., sedges, Hakea trifurcata, Grevillea preissii, Melaleuca systena, Banksia sessilis.	>1000.		Lot 7, S of Wesco Road. N of mine area	GPS	1	17/01/2019

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38152	8982635	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T	Shrub, 2.5 m high. Flowers yellow.	Limestone ridge. Brown loamy sand.	Tall open scrub of Melaleuca huegelii and M. sp. Wanneroo (G.J. Keighery 16705) over open shrubland to 1.5 m of Melaleuca systena, Xanthorrhoea preissii and Acacia lasiocarpa over low open shrubland to 0.4 m of Grevillea preissii and Banksia nivea over v	40 plants.		Mineral lease M70/138, S of Wesco Road, Nowergup, City of Wanneroo	GPS	1	1/10/2009
38153	8997675	33022	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	T		Hill slope. Yellow/brown sand.	Melaleuca shrubland. Associated species: Acacia alata var. tetrantha, Banksia sessilis, Melaleuca huegelii and M. systena.	1000+.		Lot 7 (north) Wesco Road, Nowergup	GPS	1	10/05/2017
41070	9136924	5237	Pimelea calcicola	3		Brown sandy loam soil on plain over limestone.	Isolated low Banksia attenuata trees over tall closed Banksia sessilis, Hakea trifurcata and Leptospermum laevigatum shrubland over low open Hibbertia hypericoides and Xanthorrhoea preissii shrubland.	1 mature plant.		20 m E of Indian Ocean Drive, 5.12 km NE of Yanchep	GPS	1	22/11/2018
41072	3409325	5237	Pimelea calcicola	3						Yanchep National Park: Between N end of Loch and main road (2)	AUTO	4	17/10/1963
41075	3409171	5237	Pimelea calcicola	3	Shrub-like herb up to 18 inches high. Flowers pale mauve.		Heathland.			N of Wanneroo	AUTO	3	16/10/1962
41084	3409341	5237	Pimelea calcicola	3	Shrub to 2.5 ft. Flowers light pink-white.	Sand-limestone.				Burns Beach Road (Quarry)	AUTO	3	27/09/1968
41085	1812130	5237	Pimelea calcicola	3	Slender erect shrub, to 60 cm. Flowers deep pink to very pale pink. In full flower.	Low hill. Shallow grey sand over massive limestone.	Dryandra sessilis closed heath.		Abundance: Common in area.	Hepburn Heights; Wanneroo, 25 km N of Perth	AUTO	3	7/11/1990
41086	3409368	5237	Pimelea calcicola	3	Shrub, erect 3 ft. Reddish pink flowers.					24 mile peg on Yanchep road, just S of lime quarries [ca 15 km S of Yanchep]	MAN	3	4/11/1964

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41088	4948874	5237	Pimelea calcicola	3	Erect single stemmed shrub 1 m high x 1 m wide. Flowers grading from white through to pink.	Dry brown clayey sand over limestone.	Dense Low Forest A, Open Scrub, Heath A, Heath B, Low Heath C, Low Heath D, Very Open Herbs, Open Hummock Grass. Eucalyptus gomphocephala, Dryandra sessilis, Scaevola sp, purple Hemiandra and yellow flowered Melaleuca, Xanthorrhoea preissii.	frequent.		Yanchep National Park	GPS	1	13/10/1997
41097	9220828	5237	Pimelea calcicola	3	1.5 m high.	Undulating plain. Brown sandy loam over limestone.	Isolated low Banksia attenuata trees over tall closed Banksia sessilis, Hakea trifurcata and Leptospermum laevigatum shrubland over low open Hibbertia hypericoides and Xanthorrhoea preissii shrubland.			5.14 km NE of Yanchep, beside Indian Ocean Drive	GPS	1	12/11/2018
41233	6209874	8163	Pithocarpa corymbulosa	3					Field No. Y 64.	3 miles N of Pinjar Forestry Headquarters, Wanneroo	MAN	3	6/06/1963
41404	3803406	27986	Placynthium nigrum	3		Roadside.				Picnic area, N of Yanchep National Park, N of Perth	AUTO	4	28/08/1988
41704	8766185	42022	Poranthera moorokatta	2	Small herb, 1 cm high.	Crest of low dune with yellow sand (ant mounds). Greater than 10 years since a fire.	Banksia attenuata, Banksia menziesii, Allocasuarina fraseriana low woodland over Xanthorrhoea preissii open shrubland over Hibbertia hypericoides, Calothamnus sanguineus, Calytrix flavescens low shrubland over Mesomelaena pseudostygia scattered sedges.			Corner of Joseph Banks Boulevard and Woolly Drive, Banksia Grove, 33 km N of Perth CBD	GPS	1	25/10/2012
43088	3807401	28049	Rinodina bischoffii	2		Roadside.				Picnic area N of Yanchep National Park, N of Perth, Yanchep State Forest	AUTO	4	28/08/1988

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
43412	8039364	17543	Sarcozona bicarinata	3		Private property; limestone outcrops with dry white sand. Potential threat by urban development. Last burnt summer 2001.	Open Banksia sessilis heathland. Banksia sessilis, Opercularia vaginata, Scaevola crassifolia and Desmocladus flexuosus.	5 mature plants over 5 m squared.	Condition of population: Healthy.	Lot 17, Marmion Avenue Clarkson (NW corner of site near Marmion Avenue and Neerabup Road intersection) 34 km N of Perth CBD	GPS	1	12/01/2009
43414	4583744	17543	Sarcozona bicarinata	3	Herbaceous succulent 8 cm high and spreading to generally less than 30 cm across the ground. Leaves dull grey, green in colour; seeds brown and rough all over.	Grey sand over rocky limestone outcrops. Exposed sunny areas.	Edge of Dryandra sessilis (Parrot Bush) heathlands and cleared area for housing.		No evidence of recent fire but few plants (3 only) found on edge of bushland where the area has been cleared for housing development.	Iluka-Beaumaris Estate near Sales Office, 100 m N of Miami Beach Promenade, Location B (refer to map attached)	AUTO	3	2/03/1997

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
43415	4583736	17543	Sarcozona bicarinata	3	Herbaceous succulent 8 cm high and spreading to generally less than 30 cm across the ground. Leaves dull grey, green in colour; seeds brown and rough all over.	Grey sand over rocky limestone outcrops. Exposed sunny areas. Fire approximately 12 months prior to collection. The fire most probably stimulates seed germination and opens up the very dense Dryandra heath providing a sunny environment for this species t	Dryandra sessilis (Parrot Bush) heathlands.		Abundance: this species is common throughout the fire burnt area but did not occur outside where the Dryandra sessilis formed closed dense heath nor did it occur in adjacent unburnt Banksia bushland.	Iluka-Beaumaris Estate (near Burns Beach), track off Burns Beach Road, Location A (refer to map attached)	AUTO	3	2/03/1997
43687	4526422	17606	Schoenus griffinianus	4	Perennial sedge.	Soil: White sand. Topography/drainage: Well drained gentle SW facing slope. Geomorphology: Bassendean sands over guildford formation.	Vegetation: Banksia attenuata Open Low Woodland A over mixed Low Heath C over mixed Open Dwarf Scrub D over Lyginia barbata Very Open Low Sedges.			Melaleuca Park conservation area, N Cooper Rd, 12 km NE of Wanneroo (plot mela-8).	GPS	1	19/10/1993
44886	2922479	20348	Sphaerolobium calcicola	3						Yanchep National Park, near Golf Course	AUTO	3	18/11/1963

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
44889	6233090	20348	Sphaerolobium calcicola	3	Standard yellow, red around yellow eye. Red wings. Keel yellow with few red spots near apex. Ca 1 m tall.	Grey brown sand over limestone. Seasonally wet, fairly low lying area.	Shrubland with understorey of sedgeland. Associated species: Nuytsia and Acacia with Viminaria, Xanthorrhoea, Comesperma and Lepidospermum.	occasional.		375 m W of Wanneroo Road on Yanchep Road, S side of road	MAN	3	10/11/1997
45428	4916972	19704	Stenanthemum sublineare	2	Low erect shrub, 8 cm high x 4 cm wide. Flowers spent, few fruits evident.	Sand plain. Littered white sand.	Low Forest B (Muir 1977) with Banksia attenuata, Xanthorrhoea preissii, Calytrix flavescens, Patersonia occidentalis.	apparently quite common in relatively small area.		Melaleuca Park, W of Bullsbrook, ca 3 km N of Neaves Road along walk trail,	GPS	1	21/12/1997
45429	7526989	19704	Stenanthemum sublineare	2		Low rise on an undulating plain. Dry, grey sand. Unburnt for 20 + years.	Open Banksia attenuata/Banksia menziesii low woodland, over heath (Beaufortia elegans, Eremaea pauciflora subsp. pauciflora, Regelia inops) Caltyrix flavescens, Scholtzia involucrata, Bossiaea eriocarpa, Gompholobium tomentosum, Petrophile linearis, over	one plant.		Proposed Nerrabup Infilitration site, SE of Lake Pinjar, E of Wanneroo Golf Club, adjacent to Bush Forever site 398	GPS	1	17/11/2005
45431	4916964	19704	Stenanthemum sublineare	2	Low erect shrub, 10 cm high x 4 cm wide. Flowers greenish.	Sand plain. Littered white sand.	Low Forest B (Muir 1977) with Banksia attenuata, Xanthorrhoea preissii, Calytrix flavescens, Patersonia occidentalis.		Abundance: apparently quite common in relatively small area.	Melaleuca Park, W of Bullsbrook, ca 3 km N of Neaves Road along walk trail	GPS	1	27/10/1997

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
46166	6511546	7756	Stylidium longitubum	4	Flowers pink.	Seasonal Wetland, flat ground. Dark brown clay loam some peat, over ?clay. Poor drainage, wet during winter/spring.	Open Low Scrub A. Associated species: Astartea fascicularis.			SE end off Perry Road, Lake Pinjar Bushland (System 6 Area M8, Bush Forever 382). Lake Pinjar, in System 6 Update quadrat pinj 02	GPS	1	10/11/1994
46215	4430921	13127	Stylidium maritimum	3	Flowers pink-mauve, throat white, outer petal surface white to pale pink, upper winged throat appendages pink, lower throat appendages white-red tipped, leaves 3 per papery sheath.	On limestone outcrops in crater-like depressions filled with black sandy soil.	Area surrounded by low coastal heath and open Banksia menziesii woodland.			Just N of the tavern on Wanneroo Road, Carabooda,	MAN	0	22/10/1995
46224	4430913	13127	Stylidium maritimum	3	Flowers pink-mauve, throat white, outer petal surface white to pale pink, upper winged throat appendages pink, lower throat appendages white-red tipped, leaves 3 per papery-sheath.	On limestone outcrops in crater-like depressions filled with black sandy soil.	Area surrounded by low coastal heath and open Banksia menziesii woodland.			Limestone quarry on Yeal Swamp Road, c. 3 km E of Wanneroo-Lancelin road, Yanchep,	MAN	0	22/10/1995
46227	9139559	13127	Stylidium maritimum	3	Sedge-like herb to 0.4 m high. In fruit.	Limestone ridge with outcropping. Sandy soil.	Melaleuca huegelii and Melaleuca systena TEC.	ca. 35 plants.		City of Wanneroo. Ca. 700 m S of Carabooda Road and 200 m NE of Water Corporation's Carabooda tank	GPS	1	7/11/2017
46231	7520840	13127	Stylidium maritimum	3		Side of dune. Dry, white-grey sand.	Low heath. Lomandra maritima, Leptorhynchos scabrus, Melaleuca huegelii.	> 200 plants.		Alkimos - Eglinton proposed housing development	GPS	1	12/10/2005
46232	5982103	13127	Stylidium maritimum	3		Slope; on stable sand dunes; dry white sand; long unburnt.	Low heath 0.5 m tall, 70-100 % cover.	c. 10 mature plants in a 5 x 5 m area.		200 m from coast, Alkimos Estate,	MAN	3	25/10/1996
46235	6256252	13127	Stylidium maritimum	3	0.3 m high. Flowers pink.	Plain. White sand.	Low shrubland, Acacia, Quandong.	6-20 plants.		ca 50 m towards the beach from Two Rocks Road, at the base of the hill entering the township, Two Rocks	GPS	1	20/09/2002

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
46237	9207996	13127	Stylidium maritimum	3	Caespitose, perennial herb, 40 cm high. Flowers white/purple.	S-facing, midslope of low dune (ridge). Brown sand.	Olearia axillaris, Stylidium globulosum scattered shrubs over Melaleuca systena, Leucopogon parviflorus, Trymalium ledifolium var. ledifolium low shrubland over Austrostipa flavescens, Poa poiformis, Lomandra maritima herbland/grassland/sedgeland.			C. 2.5 km S of Yanchep, 6 km W of Yanchep Beach Road - Wannerroo Road intersection, which is 54 km N of Perth CBD	GPS	1	3/10/2007
46239	7836384	13127	Stylidium maritimum	3		Grey sand-loam, slope, ridge, limestone, private property.	Closed Tall Scrub of Melaleuca huegelii, Dryandra sessilis with occasional Spyridium globulosum.		Healthy population, in flower. Potential threat from clearing and weeds.	Lot 8 Butler Street, Butler, City of Wanneroo, Swan Coastal Plain	MAN	3	16/10/2007
46241	7836430	13127	Stylidium maritimum	3		Brown sand-loam over limestone, slope, private property.	Acacia rosteliifera Open Low Heath with Melaleuca huegelii, Acacia truncata and Melaleuca systena.		Healthy population with flowers. Potential threat from clearing and weeds.	Eglinton, W of Marmion Avenue, S of Pipindinny Road	TOPO	3	17/10/2007
46244	8755361	13127	Stylidium maritimum	3	Perennial tufted herb with narrow leaves 10-40 cm long, with rose pink flowers.	Grey sand, on mid-slope with exposed limestone.		1 mature plant.	Project: 3536.	2 Quinns Road, Mindarie, within Bush Forever No 397	GPS	1	4/11/2015
46250	9039066	13127	Stylidium maritimum	3	Herb.	Dune swale.	Banksia sessilis low open shrubland.	10 plants.		Alkimos, Perth	GPS	1	20/10/2016

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
46251	8982600	13127	Stylidium maritimum	3	Herb, 0.8 m high.	Limestone ridge. Brown loamy sand over limestone.	Tall shrubland of Melaleuca systena over open shrubland of Melaleuca huegelii and Acacia lasiocarpa over very open herbland of Desmocladus flexuosus. Associated species: Grevillea preissii.	15 plants.		Mineral lease M70/339, Nowergup, City of Wanneroo	GPS	1	2/10/2009
46331	8540942	25800	Stylidium paludicola	3		Sandy flats near winter-wet damplands.	Low woodland of marri and Banksia grandis over Baumea juncea sedgeland and mixed open heath adjacent to Melaleuca preissiana and Banksia littorea woodland.			Edith Cowan University campus, Joondalup, Perth	MAN	3	//2007
47183	8604223	48297	Styphelia filifolia	3		On brown sand on midslopes.	Woodland of Banksia attenuata, B. menziesii, B. ilicifolia over Heath dominated by Allocasuarina humilis.			Near Pinjar Powerstation	UNK	2	11/09/2007
47187	1016539	48297	Styphelia filifolia	3	Erect shrub to 50 cm.	Sandy soil.				8.38 km N along Galagher Road, Wanneroo	TOPO	3	7/02/1980
47190	6808468	48297	Styphelia filifolia	3	Shrub.		Open low woodland. Allocasuarina fraseriana, Banksia attenuata, B. menziesii, B. grandis, Xanthorrhoea preissii, Acacia pulchella, Hakea prostrata, Calytrix flavescens.			Gnangara Mound	MAN	3	3/12/2002
47192	5917905	48297	Styphelia filifolia	3	Erect shrub 60 cm high x 40 cm wide. Flowers white, strictly pendulous. Leaves patent. Plants single stemmed at ground level.	Coastal plain (Bassendean Sands). Dry, littered grey sand.	Banksia woodland with a few marri. Corymbia calophylla, Banksia attenuata, Regelia inops, Xanthorrhoea preissii.	very occasional (4-6).	Relatively low lying area.	Melaleuca Park, ca 4 km S of Wandoo Road on coastal plain track,	GPS	1	10/06/2001

FID	Sheet	NameID	Taxon	Cons_Code	Plant_Desc	Site	Vegetation	Frequency	Notes	Locality	Geo_Method	Precision	Date
47212	4453719	48297	Styphelia filifolia	3	Erect shrub 0.4m.	Soil: Brown sand. Topography/drainage: Well drained flat. Geomorphology: Lagoonal deposits - bassendean dunes.	Vegetation: Eucalyptus calophylla, E. marginata Woodland over Xanthorrhoea preissii Heath B over Conostephium pendulum Dwarf Scrub D over Phlebocarya ciliata Open Herbs.			On Wandoo Rd S of Muchea - Eneabba powerline 11 km S Gingin airfield (adj. to plot pline-3)	GPS	1	21/10/1993
48969	8755442	35581	Tetraria sp. Chandala (G.J. Keighery 17055)	2	Sedge c. 50 cm tall with very narrow leaves and culms. Inflorescence loose and branched, with dark brown florets.	Grey brown peaty soil in a swamp.	Low open forest of Eucalyptus rudis and Melaleuca preissiana. Tall open shrubland of Astartea fascicularis and Kunzea glabrescens. Pteridium esculentum mid ferns. Sedgeland of Lepidosperma.	100 mature plants.	Project: 3516.	The Roe Highway Extension area, ca 14 km S of Perth	GPS	1	8/10/2015
48970	4864743	35581	Tetraria sp. Chandala (G.J. Keighery 17055)	2	Rhizomatous herb 1.6 m high, 1 m wide; flowers brown; fruits brown.	Mound spring, black peat over clay & humic sand.	Assoc. vegn.: Melaleuca rhaphiophylla forest over sedges.		Abundance: very common.	Property on W side of Neaves Road, Wanneroo	TOPO	2	4/02/1997
49468	278696	1717	Thelymitra variegata	2	Petals purple, spotted. Sepals orange, purplish in the centre, with reddish-purple spots. Column purple with orange wings.	On limestone hills towards the coast.			'Leopard Orchid'	Wanneroo	AUTO	3	/09/1919
51096	6427405	44444	Tripterococcus sp. Brachylobus (A.S. George 14234)	4	Flowers yellow.	Seasonal Wetland, flat ground, black fine peaty clay loam sand, poor drainage, wet during winter/spring.	Open Herbs. Associated species: Lepyrodia muirii, Baumea articulata, Baumea vaginalis.			SE end off Perry Road, Lake Pinjar Bushland (System 6 Area M8, Bush Forever 382), Lake Pinjar, in System 6 Update quadrat pinj01	GPS	1	10/11/1994

APPENDIX 2

Naturemap Report

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 08/12/2020

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 45' 19" E,31° 36' 39" S
Buffer 10km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	949	6359
Other specially protected fauna	2	2
Presumed extinct	1	1
Priority 1	4	7
Priority 2	7	17
Priority 3	15	43
Priority 4	11	469
Protected under international agreement	12	17
Rare or likely to become extinct	20	489
TOTAL	**1021**	**7404**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24506	*Anous tenuirostris subsp. melanops (Australian Lesser Noddy)*		T	
2.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
3.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
4.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
5.	24790	*Calidris tenuirostris (Great Knot)*		T	
6.	24734	*Calyptorhynchus latirostris (Carnaby s Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
7.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
8.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
9.	25336	*Chelonia mydas (Green Turtle)*		T	
10.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
11.	25346	*Dermochelys coriacea (Leatherback Turtle)*		T	
12.	24043	*Eubalaena australis (Southern Right Whale)*		T	
13.	13091	*Eucalyptus argutifolia (Wabling Hill Mallee)*		T	
14.	33974	*Hesperocolletes douglasi (Douglas s Broad-headed Bee, Short-tongued Native Bee)*		T	
15.	48582	*Hurleya sp. (WAM C23193) (Crystal Cave Crangonyctoid, cave shrimp)*		T	Y
16.	25819	*Marianthus paralius*		T	
17.	33022	*Melaleuca sp. Wanneroo (G.J. Keighery 16705)*		T	
18.	24142	*Petrogale lateralis subsp. lateralis (Black-flanked Rock-wallaby, Black-footed Rock-wallaby)*		T	
19.	24073	*Physeter macrocephalus (Sperm Whale)*		T	
20.	34113	*Westralunio carteri (Carter s Freshwater Mussel)*		T	
Presumed extinct					
21.	24161	*Bettongia lesueur subsp. graii (Boodie (inland), Burrowing Bettong (inland))*		X	
Protected under international agreement					
22.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
23.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
24.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
25.	25738	*Calidris canutus (Red Knot, knot)*		IA	
26.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
27.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
28.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
29.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
30.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
31.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
32.	48597	*Thalasseus bergii (Crested Tern)*		IA	
33.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
Other specially protected fauna					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
34.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
35.	24051	*Megaptera novaeangliae (Humpback Whale)*		S	
Priority 1					
36.	34161	*Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)*		P1	
37.	31233	*Drosera patens*		P1	
38.	30712	*Drosera x sidjamesii*		P1	
39.	40801	*Leucopogon maritimus*		P1	
Priority 2					
40.	3237	*Acacia benthamii*		P2	
41.	33971	*Austroconops mcmillani (McMillan s biting midge (Swan Coastal Plain), biting midge (southwest))*		P2	
42.	33973	*Austrosaga spinifer (spiny katydid (Swan Coastal Plain), bush cricket (Swan Coastal Plain))*		P2	
43.	45757	*Calectasia elegans (Elegant Tinsel Lily)*		P2	
44.	48581	*Glossurocolletes bilobatus (a short-tongued bee (southwest), short-tongued bee)*		P2	
45.	19704	*Stenanthemum sublineare*		P2	
46.	35581	*Tetraria sp. Chandala (G.J. Keighery 17055)*		P2	
Priority 3					
47.	11336	*Adenanthos cygnorum subsp. chamaephyton*		P3	
48.	1425	*Conostylis bracteata*		P3	
49.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
50.	33977	*Hylaeus globuliferus (woolybush bee)*		P3	
51.	48935	*Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)*		P3	
52.	20462	*Jacksonia gracillima*		P3	
53.	5038	*Lasiopetalum membranaceum*		P3	
54.	19460	*Leucopogon sp. Yanchep (M. Hislop 1986)*		P3	
55.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
56.	5237	*Pimelea calcicola*		P3	
57.	8163	*Pithocarpa corymbulosa (Corymbose Pithocarpa)*		P3	
58.	17543	*Sarcozona bicarinata*		P3	
59.	20348	*Sphaerolobium calcicola*		P3	
60.	13127	*Stylidium maritimum*		P3	
61.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
Priority 4					
62.	11388	*Conostylis pauciflora subsp. euryrhipis*		P4	
63.	11657	*Conostylis pauciflora subsp. pauciflora*		P4	
64.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
65.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
66.	4027	*Jacksonia sericea (Waldjumi)*		P4	
67.	3042	*Lepidium pseudotasmanicum*		P4	
68.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
69.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
70.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
71.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
72.	44444	*Tripterococcus sp. Brachylobus (A.S. George 14234)*		P4	
Non-conservation taxon					
73.	15430	*Acacia alata var. tetrantha*			
74.	15466	*Acacia applanata*			
75.	15470	*Acacia barbinervis subsp. borealis*			
76.	3262	*Acacia cochlearis (Rigid Wattle)*			
77.	3282	*Acacia cyclops (Coastal Wattle)*			
78.	3374	*Acacia huegelii*			
79.	3409	*Acacia lasiocarpa (Panjang)*			
80.	11611	*Acacia lasiocarpa var. lasiocarpa*			
81.	3502	*Acacia pulchella (Prickly Moses)*			
82.	15481	*Acacia pulchella var. glaberrima*			
83.	15482	*Acacia pulchella var. goadbyi*			
84.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
85.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
86.	30032	*Acacia saligna subsp. saligna*			
87.	3541	*Acacia sessilis*			
88.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
89.	3584	*Acacia truncata*			
90.	3602	*Acacia willdenowiana (Grass Wattle)*			
91.	3604	*Acacia xanthina (White-stemmed Wattle)*			
92.	24559	*Acanthagenys rufogularis (Spiny-cheeked Honeyeater)*			
93.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
94.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			

	Name ID	Species Name	Naturalised	Conservation Code	†Endemic To Query Area
95.	24262	*Acanthiza inornata (Western Thornbill)*			
96.	1208	*Acanthocarpus preissii*			
97.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
98.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
99.	25536	*Accipiter fasciatus (Brown Goshawk)*			
100.	24282	*Accipiter fasciatus subsp. fasciatus (Brown Goshawk)*			
101.		*Acercella falcipes*			
102.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
103.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
104.	24831	*Acrocephalus australis subsp. gouldi (Australian Reed Warbler)*			
105.	6205	*Actinotus leucocephalus (Flannel Flower)*			
106.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
107.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
108.	185	*Aira cupaniana (Silvery Hairgrass)*	Y		
109.		*Akamptogonus novarae*			
110.	1056	*Alexgeorgea nitens*			
111.	1728	*Allocasuarina fraseriana (Sheoak, Kondil)*			
112.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
113.		*Alternaria alternata*			Y
114.	4906	*Alyogyne huegelii (Lilac Hibiscus)*			
115.	2668	*Amaranthus powellii (Powell s Amaranth)*	Y		
116.	2671	*Amaranthus viridis (Green Amaranth)*	Y		
117.		*Amblyomma triguttatum*			
118.	200	*Amphipogon turbinatus*			
119.		*Aname mainae*			
120.	24310	*Anas castanea (Chestnut Teal)*			
121.	24312	*Anas gracilis (Grey Teal)*			
122.	24313	*Anas platyrhynchos (Mallard)*			
123.	24315	*Anas rhynchotis (Australasian Shoveler)*			
124.	24316	*Anas superciliosa (Pacific Black Duck)*			
125.	6311	*Andersonia heterophylla*			
126.	6314	*Andersonia lehmanniana*			
127.	11471	*Andersonia lehmanniana subsp. lehmanniana*			
128.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
129.	1409	*Anigozanthos humilis (Catspaw)*			
130.	11434	*Anigozanthos humilis subsp. humilis*			
131.	1411	*Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)*			
132.	11261	*Anigozanthos manglesii subsp. manglesii*			
133.	44629	*Anilios australis*			
134.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson s Python)*			
135.	11725	*Anthocercis ilicifolia subsp. ilicifolia*			
136.	6949	*Anthocercis littorea (Yellow Tailflower)*			
137.	24561	*Anthochaera carunculata (Red Wattlebird)*			
138.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
139.	12724	*Anthotium junciforme*			
140.	24599	*Anthus australis subsp. australis (Australian Pipit)*			
141.	26471	*Antithamnion armatum*			
142.	26475	*Antithamnion hanovioides*			
143.	3692	*Aotus procumbens*			
144.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
145.	24285	*Aquila audax (Wedge-tailed Eagle)*			
146.		*Araneus cyphoxis*			
147.		*Araneus senicaudatus*			
148.	41324	*Ardea modesta (great egret, white egret)*			
149.	24340	*Ardea novaehollandiae (White-faced Heron)*			
150.	24341	*Ardea pacifica (White-necked Heron)*			
151.		*Arkys alticephala*			
152.		*Arkys walckenaeri*			
153.	1264	*Arnocrinum preissii*			
154.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
155.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
156.	226	*Arundo donax (Giant Reed)*	Y		
157.	26486	*Asparagopsis taxiformis*			
158.	1201	*Asparagus officinalis (Asparagus)*	Y		
159.	20283	*Astartea scoparia (Common Astartea)*			
160.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
161.	6323	*Astroloma ciliatum (Candle Cranberry)*			
162.	6331	*Astroloma microcalyx (Native Cranberry)*			
163.	6334	*Astroloma pallidum (Kick Bush)*			
164.		*Aurecocrypta lugubris*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
165.		*Austracantha minax*			
166.		*Australomimetus djuka*			
167.		*Austrochthonius australis*			
168.	17234	*Austrostipa compressa*			
169.	17237	*Austrostipa elegantissima*			
170.	17240	*Austrostipa flavescens*			
171.	231	*Avellinia michelii*	Y		
172.	233	*Avena barbata (Bearded Oat)*	Y		
173.	24318	*Aythya australis (Hardhead)*			
174.		*Baiami tegenarioides*			
175.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
176.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
177.	11386	*Banksia leptophylla var. melletica*			
178.	1834	*Banksia menziesii (Firewood Banksia)*			
179.	32076	*Banksia sessilis (Parrot Bush, Pudjak)*			
180.	32077	*Banksia sessilis var. cygnorum*			
181.		*Barnardius zonarius*			
182.	38765	*Battarrea stevenii*			
183.	740	*Baumea arthrophylla*			
184.	743	*Baumea juncea (Bare Twigrush)*			
185.	5382	*Beaufortia elegans (Elegant Beaufortia)*			
186.	7046	*Bellardia trixago (Bellardia)*	Y		
187.	25788	*Billardiera fraseri (Elegant Pronaya)*			
188.	24319	*Biziura lobata (Musk Duck)*			
189.	26511	*Bornetia binderiana*			
190.	17665	*Boronia purdieana subsp. purdieana*			
191.	24251	*Bos taurus (European Cattle)*	Y		
192.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
193.		*Bostockia porosa*			
194.	7867	*Brachyscome bellidioides*			
195.	7878	*Brachyscome iberidifolia*			
196.	42380	*Brachyurophis fasciolatus subsp. fasciolatus (Narrow-banded Shovel-nosed Snake)*			
197.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
198.	11187	*Brassica barrelieri subsp. oxyrrhina (Smooth-stem Turnip)*	Y		
199.	3000	*Brassica tournefortii (Mediterranean Turnip)*	Y		
200.	244	*Briza maxima (Blowfly Grass)*	Y		
201.	245	*Briza minor (Shivery Grass)*	Y		
202.	249	*Bromus diandrus (Great Brome)*	Y		
203.	253	*Bromus rubens (Red Brome)*	Y		
204.	27602	*Buellia georgei*			
205.	12770	*Burchardia congesta*			
206.		*Byssomerulius corium*			
207.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
208.	25715	*Cacatua roseicapilla (Galah)*			
209.	25716	*Cacatua sanguinea (Little Corella)*			
210.	24727	*Cacatua sanguinea subsp. westralensis (Little Corella)*			
211.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*	Y		
212.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
213.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
214.	1276	*Caesia micrantha (Pale Grass Lily)*			
215.	11038	*Caladenia bicalliata*			
216.	1592	*Caladenia flava (Cowslip Orchid)*			
217.	15348	*Caladenia flava subsp. flava*			
218.	15352	*Caladenia georgei*			
219.	1595	*Caladenia hirta (Sugar Candy Orchid)*			
220.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
221.	15361	*Caladenia longicauda subsp. calcigena*			
222.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
223.	2856	*Calandrinia liniflora (Parakeelya)*			
224.	19309	*Calectasia narragara*			
225.		*Calocera guepinioides*			
226.	5411	*Calothamnus hirsutus*			
227.	5415	*Calothamnus lateralis*			
228.	5426	*Calothamnus quadrifidus (One-sided Bottlebrush, Kwowdjard)*			
229.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			
230.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower, Pindak)*			
231.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
232.	5439	*Calytrix angulata (Yellow Starflower)*			
233.	5458	*Calytrix flavescens (Summer Starflower)*			
234.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			

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235.	5476	*Calytrix sapphirina*			
236.	5479	*Calytrix strigosa*			
237.	24254	*Camelus dromedarius (Dromedary, Camel)*	Y		
238.	48920	*Canis familiaris (Dog, Dingo)*	Y		
239.	7909	*Carduus pycnocephalus (Slender Thistle)*	Y		
240.	755	*Carex fascicularis (Tassel Sedge)*			
241.	43241	*Carex thecata*			
242.	2798	*Carpobrotus virescens (Coastal Pigface, Kolboko, Bain)*			
243.	2951	*Cassytha flava (Dodder Laurel)*			
244.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
245.	2957	*Cassytha racemosa (Dodder Laurel)*			
246.	11799	*Cassytha racemosa forma racemosa*			
247.	13685	*Catapodium rigidum (Rigid Fescue)*	Y		
248.	26570	*Caulerpa obscura*			
249.	760	*Caustis dioica*			
250.	6539	*Centaurium erythraea (Common Centaury)*	Y		
251.	1125	*Centrolepis drummondiana*			
252.	1132	*Centrolepis mutica*			
253.	1134	*Centrolepis polygyna (Wiry Centrolepis)*			
254.	26600	*Ceramium pusillum*			
255.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
256.	24086	*Cercartetus concinnus (Western Pygmy-possum, Mundarda)*			
257.		*Cercophonius granulosus*			
258.		*Cercophonius sulcatus*			
259.	24186	*Chalinolobus gouldii (Gould s Wattled Bat)*			
260.	24187	*Chalinolobus morio (Chocolate Wattled Bat)*			
261.	1280	*Chamaescilla corymbosa (Blue Squill)*			
262.	5498	*Chamelaucium uncinatum (Geraldton Wax)*			
263.	26621	*Champia zostericola*			
264.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
265.	43380	*Chelodina colliei (South-western Snake-necked Turtle)*			
266.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
267.	2483	*Chenopodium album (Fat Hen)*	Y		
268.	47909	*Cheramoeca leucosterna (White-backed Swallow)*			
269.		*Cherax quinquecarinatus*			
270.	17833	*Chordifex microcodon*			
271.	24980	*Christinus marmoratus (Marbled Gecko)*			
272.		*Chroicocephalus novaehollandiae*			
273.	24431	*Chrysococcyx basalis (Horsfield s Bronze Cuckoo)*			
274.	24288	*Circus approximans (Swamp Harrier)*			
275.	24289	*Circus assimilis (Spotted Harrier)*			
276.	7937	*Cirsium vulgare (Spear Thistle, Scotch Thistle)*	Y		
277.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
278.	26665	*Claviclonium ovatum*			
279.		*Cleidopus gloriamaris*			
280.	10804	*Clematis linearifolia*			
281.	2929	*Clematis pubescens (Common Clematis)*			
282.	26672	*Codium galeatum*			
283.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
284.	24613	*Colluricincla harmonica subsp. rufiventris (Grey Shrike-thrush)*			
285.		*Coltricia cinnamomea*			
286.	24399	*Columba livia (Domestic Pigeon)*	Y		
287.	4550	*Comesperma calymega (Blue-spike Milkwort)*			
288.	4552	*Comesperma confertum*			
289.	4554	*Comesperma flavum*			
290.	1857	*Conospermum acerosum (Needle-leaved Smokebush)*			
291.	15511	*Conospermum boreale*			
292.	15516	*Conospermum canaliculatum subsp. canaliculatum*			
293.	1876	*Conospermum incurvum (Plume Smokebush)*			
294.	1882	*Conospermum stoechadis (Common Smokebush)*			
295.	15611	*Conospermum stoechadis subsp. stoechadis (Common Smokebush)*			
296.	1885	*Conospermum triplinervium (Tree Smokebush)*			
297.	6347	*Conostephium minus (Pink-tipped Pearl flower)*			
298.	6348	*Conostephium pendulum (Pearl Flower)*			
299.	6349	*Conostephium preissii*			
300.	1418	*Conostylis aculeata (Prickly Conostylis)*			
301.	11826	*Conostylis aculeata subsp. aculeata*			
302.	1423	*Conostylis aurea (Golden Conostylis)*			
303.	1427	*Conostylis candicans (Grey Cottonhead)*			
304.	12027	*Conostylis candicans subsp. calcicola*			

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305.	11438	*Conostylis candicans subsp. candicans*			
306.	1436	*Conostylis juncea*			
307.	1443	*Conostylis pauciflora (Dawesville Conostylis)*			
308.	1454	*Conostylis setigera (Bristly Cottonhead)*			
309.	11597	*Conostylis setigera subsp. setigera*			
310.	20074	*Conyza sumatrensis*	Y		
311.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
312.		*Cormocephalus aurantiipes*			
313.		*Cormocephalus novaehollandiae*			
314.		*Cormocephalus rubriceps*			
315.		*Cormocephalus turneri*			
316.	24416	*Corvus bennetti (Little Crow)*			
317.	25592	*Corvus coronoides (Australian Raven)*			
318.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
319.	17104	*Corymbia calophylla (Marri)*			
320.	1285	*Corynotheca micrantha (Sand Lily)*			
321.	11283	*Corynotheca micrantha var. micrantha*			
322.	7943	*Cotula australis (Common Cotula)*			
323.	25701	*Coturnix ypsilophora (Brown Quail)*			
324.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
325.	25595	*Cracticus tibicen (Australian Magpie)*			
326.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
327.	25596	*Cracticus torquatus (Grey Butcherbird)*			
328.	24424	*Cracticus torquatus subsp. torquatus (Grey Butcherbird)*			
329.	42009	*Craspedia sp. Yalgorup National Park (G.J. Keighery 14449)*			
330.	3137	*Crassula colorata (Dense Stonecrop)*			
331.	11709	*Crassula colorata var. acuminata*			
332.	24918	*Crenadactylus ocellatus subsp. ocellatus (Clawless Gecko)*			
333.		*Crepidotus nephrodes*			
334.	25400	*Crinia insignifera (Squelching Froglet)*			
335.	4802	*Cryptandra mutila*			
336.	4809	*Cryptandra pungens*			
337.	4810	*Cryptandra scoparia*			
338.	30893	*Cryptoblepharus buchananii*			
339.	25020	*Cryptoblepharus plagiocephalus*			
340.	30899	*Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)*			
341.	25027	*Ctenotus australis*			
342.	25039	*Ctenotus fallens*			
343.	25825	*Cucurbita pepo*	Y		
344.	11021	*Cuscuta planiflora*	Y		
345.	25087	*Cyclodomorphus celatus (Western Slender Blue-tongue)*			
346.		*Cyclosa trilobata*			
347.	24322	*Cygnus atratus (Black Swan)*			
348.	783	*Cyperus congestus (Dense Flat-sedge)*	Y		
349.	816	*Cyperus tenuiflorus (Scaly Sedge)*	Y		
350.	10916	*Cyrtostylis huegelii*			
351.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
352.	7454	*Dampiera linearis (Common Dampiera)*			
353.		*Daphnia carinata*			
354.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
355.	26752	*Dasyclonium incisum*			
356.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
357.	6218	*Daucus glochidiatus (Australian Carrot)*			
358.	3793	*Daviesia angulata*			
359.	3805	*Daviesia decurrens (Prickly Bitter-pea)*			
360.	19747	*Daviesia decurrens subsp. decurrens*			
361.	3807	*Daviesia divaricata (Marno)*			
362.	18560	*Daviesia divaricata subsp. divaricata*			
363.	3824	*Daviesia nudiflora*			
364.	16585	*Daviesia nudiflora subsp. nudiflora*			
365.	3832	*Daviesia physodes*			
366.	3833	*Daviesia podophylla*			
367.	3845	*Daviesia triflora*			
368.	30906	*Delma concinna (Javelin Legless Lizard)*			
369.	30905	*Delma concinna subsp. concinna (Javelin Legless Lizard)*			
370.	25766	*Delma fraseri (Fraser s Legless Lizard)*			
371.	24999	*Delma grayii*			
372.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
373.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
374.	17663	*Desmocladus asper*			

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375.	16595	*Desmocladus flexuosus*			
376.	299	*Deyeuxia quadriseta (Reed Bentgrass)*			
377.	1259	*Dianella revoluta (Blueberry Lily)*			
378.	11636	*Dianella revoluta var. divaricata*			
379.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
380.	1287	*Dichopogon capillipes*			
381.	26761	*Dictyomenia harveyana*			
382.	26762	*Dictyomenia sonderi*			
383.	27392	*Dictyota dichotoma var. intricata*			
384.	32346	*Didymodon torquatus*			
385.		*Dingosa serrata*			
386.	24939	*Diplodactylus polyophthalmus*			
387.	4453	*Diplolaena angustifolia (Yanchep Rose)*			
388.	4746	*Diplopeltis huegelii*			
389.	19649	*Disa bracteata*	Y		
390.	7054	*Dischisma arenarium*	Y		
391.	11049	*Diuris corymbosa*			
392.	1635	*Diuris longifolia (Common Donkey Orchid)*			
393.	1640	*Drakaea glyptodon (King-in-his-carriage)*			
394.	24470	*Dromaius novaehollandiae (Emu)*			
395.	48751	*Drosera drummondii*			
396.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
397.	48769	*Drosera indumenta*			
398.	3106	*Drosera macrantha (Bridal Rainbow)*			
399.	3109	*Drosera menziesii (Pink Rainbow)*			
400.	48710	*Drosera micrantha*			
401.	3118	*Drosera pallida (Pale Rainbow)*			
402.	25251	*Echiopsis curta (Bardick)*			
403.		*Edelia vittata*			
404.	25096	*Egernia kingii (King's Skink)*			
405.	25100	*Egernia napoleonis*			
406.		*Egretta garzetta*			
407.		*Egretta novaehollandiae*			
408.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
409.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
410.		*Elanus axillaris*			
411.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
412.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
413.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
414.		*Eolophus roseicapillus*			
415.	24651	*Eopsaltria australis subsp. griseogularis (Western Yellow Robin)*			
416.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
417.	1645	*Epiblema grandiflorum (Babe-in-a-cradle)*			
418.	11570	*Epilobium billardiereanum subsp. billardiereanum (Smooth Willow Herb)*			
419.	11992	*Epilobium billardiereanum subsp. intermedium*			
420.	6132	*Epilobium ciliatum*	Y		
421.	6133	*Epilobium hirtigerum (Hairy Willow Herb)*			
422.	14289	*Epilobium tetragonum subsp. tetragonum*	Y		
423.	24567	*Epthianura albifrons (White-fronted Chat)*			
424.	376	*Eragrostis curvula (African Lovegrass)*	Y		
425.	13950	*Eremaea asterocarpa subsp. asterocarpa*			
426.	5540	*Eremaea fimbriata*			
427.	5541	*Eremaea pauciflora*			
428.	7215	*Eremophila glabra (Tar Bush)*			
429.	17175	*Eremophila glabra subsp. albicans*			
430.	1646	*Eriochilus dilatatus (White Bunny Orchid)*			
431.		*Eriophora biapicata*			
432.	4332	*Erodium botrys (Long Storksbill)*	Y		
433.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
434.	4336	*Erodium moschatum (Musky Crowfoot)*	Y		
435.	6219	*Eryngium pinnatifidum (Blue Devils)*			
436.	15446	*Eryngium pinnatifidum subsp. pinnatifidum*			
437.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
438.		*Ethmostigmus rubripes*			
439.	5615	*Eucalyptus decipiens (Limestone Marlock, Moit)*			
440.	5628	*Eucalyptus drummondii (Drummond's Gum)*			
441.	5649	*Eucalyptus foecunda (Narrow-leaved Red Mallee)*			
442.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
443.	5708	*Eucalyptus marginata (Jarrah, Djara)*			
444.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			

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445.	20808	*Eucalyptus petiolaris*	Y		
446.	13541	*Eucalyptus petrensis*			
447.	13511	*Eucalyptus rudis subsp. rudis*			
448.	5790	*Eucalyptus todtiana (Coastal Blackbutt)*			
449.	24818	*Eudyptula minor subsp. novaehollandiae (Little Penguin)*			
450.	24368	*Eurostopodus argus (Spotted Nightjar)*			
451.	25621	*Falco berigora (Brown Falcon)*			
452.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
453.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
454.	25623	*Falco longipennis (Australian Hobby)*			
455.	24041	*Felis catus (Cat)*	Y		
456.	20216	*Ficinia nodosa (Knotted Club Rush)*			
457.	1747	*Ficus carica (Common Fig)*	Y		
458.	25727	*Fulica atra (Eurasian Coot)*			
459.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
460.	907	*Gahnia trifida (Coast Saw-sedge)*			
461.	34028	*Galaxias occidentalis (Western Minnow)*			
462.	7976	*Galinsoga parviflora (Potato Weed)*	Y		
463.	7323	*Galium murale (Small Goosegrass)*	Y		
464.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
465.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
466.		*Gambusia affinis*			
467.	20473	*Gastrolobium ebracteolatum*			
468.	20483	*Gastrolobium linearifolium*			
469.	42314	*Gavicalis virescens (Singing Honeyeater)*			
470.	26850	*Gelinaria ulvoidea*			
471.	32380	*Gemmabryum pachythecum*			
472.	4339	*Geranium molle (Dove s Foot Cranesbill)*	Y		
473.	25530	*Gerygone fusca (Western Gerygone)*			
474.	24271	*Gerygone fusca subsp. fusca (Western Gerygone)*			
475.	32384	*Gigaspermum repens*			
476.		*Girella tephraeops*			
477.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
478.	33620	*Glischrocaryon angustifolium*			
479.	6143	*Glischrocaryon aureum (Common Popflower)*			
480.	47962	*Glyciphila melanops (Tawny-crowned Honeyeater)*			
481.	3945	*Gompholobium aristatum*			
482.	3950	*Gompholobium knightianum*			
483.	19295	*Gompholobium pungens*			
484.	11083	*Gompholobium scabrum*			
485.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
486.	6161	*Gonocarpus pithyoides*			
487.	19286	*Goodenia pulchella subsp. Coastal Plain A (M. Hislop 634)*			
488.	26876	*Gracilaria verrucosa*			
489.	24443	*Grallina cyanoleuca (Magpie-lark)*			
490.	15839	*Grevillea preissii subsp. preissii*			
491.	2119	*Grevillea vestita*			
492.	12824	*Grevillea vestita subsp. vestita*			
493.	26884	*Griffithsia ovalis*			
494.	2784	*Gyrostemon ramulosus (Corkybark)*			
495.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
496.	1468	*Haemodorum laxum*			
497.	1475	*Haemodorum spicatum (Mardja)*			
498.	2146	*Hakea costata (Ribbed Hakea)*			
499.	2175	*Hakea lissocarpha (Honey Bush)*			
500.	2197	*Hakea prostrata (Harsh Hakea)*			
501.	2203	*Hakea ruscifolia (Candle Hakea)*			
502.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
503.	2216	*Hakea varia (Variable-leaved Hakea)*			
504.	24295	*Haliastur sphenurus (Whistling Kite)*			
505.	24689	*Halobaena caerulea (Blue Petrel)*			
506.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
507.	25410	*Heleioporus eyrei (Moaning Frog)*			
508.	3016	*Heliophila pusilla*	Y		
509.	439	*Hemarthria uncinata (Matgrass)*			
510.	16933	*Hemiandra glabra*			
511.	6839	*Hemiandra pungens (Snakebush)*			
512.	25119	*Hemiergis quadrilineata*			
513.	6871	*Hemigenia sericea (Silky Hemigenia)*			
514.	41020	*Hemiphora bartlingii (Woolly Dragon)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
515.	1293	*Hensmania turbinata*			
516.	26919	*Herposiphonia rostrata*			
517.	26922	*Herposiphonia versicolor*			
518.		*Hexagonia vesparia*			
519.	5112	*Hibbertia aurea*			
520.	5134	*Hibbertia huegelii*			
521.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
522.	45534	*Hibbertia hypericoides subsp. hypericoides*			
523.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
524.	43280	*Hibbertia sericosepala*			
525.	48381	*Hibbertia striata*			
526.	5173	*Hibbertia subvaginata*			
527.	47965	*Hieraaetus morphnoides (Little Eagle)*			
528.	25734	*Himantopus himantopus (Black-winged Stilt)*			
529.	26942	*Hirsutithallia laricina*			
530.	24491	*Hirundo neoxena (Welcome Swallow)*			
531.	445	*Holcus setiger (Annual Fog)*	Y		
532.	6222	*Homalosciadium homalocarpum*			
533.	26946	*Hormophysa cuneiformis*			
534.	3966	*Hovea pungens (Devil s Pins, Puyenak)*			
535.	3968	*Hovea trisperma (Common Hovea)*			
536.	12859	*Hovea trisperma var. trisperma*			
537.	12741	*Hyalosperma cotula*			
538.	5216	*Hybanthus calycinus (Wild Violet)*			
539.	12007	*Hybanthus floribundus subsp. floribundus*			
540.	6224	*Hydrocotyle blepharocarpa*			
541.	6232	*Hydrocotyle hispidula*			
542.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
543.	26960	*Hymenocladia chondricola*			
544.	35898	*Hypnea musciformis*			
545.	26971	*Hypnea ramentacea*			
546.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
547.	9352	*Hypochaeris radicata (Flat Weed, Cats-ear)*	Y		
548.	1070	*Hypolaena exsulca*			
549.	17841	*Hypolaena pubescens*			
550.		*Idiommata blackwalli*			
551.	44926	*Ileodictyon gracile*			
552.		*Indolpium sp.*			
553.	910	*Isolepis cernua (Nodding Club-rush)*			
554.	917	*Isolepis marginata (Coarse Club-rush)*			
555.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
556.	19700	*Isotropis cuneifolia subsp. cuneifolia*			
557.	14783	*Jacksonia calcicola*			
558.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
559.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
560.	1188	*Juncus pallidus (Pale Rush)*			
561.	4044	*Kennedia prostrata (Scarlet Runner)*			
562.	15498	*Kunzea glabrescens (Spearwood)*			
563.	16091	*Lachenalia bulbifera*	Y		
564.	20019	*Lachnagrostis filiformis*			
565.	29046	*Lactuca serriola forma serriola*	Y		
566.	18585	*Lagenophora huegelii*			
567.	467	*Lagurus ovatus (Hare s Tail Grass)*	Y		
568.	24367	*Lalage tricolor (White-winged Triller)*			
569.		*Lampona cylindrata*			
570.		*Lampona yanchep*			
571.	28342	*Landoltia punctata (Thin Duckweed)*			
572.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
573.	25638	*Larus pacificus (Pacific Gull)*			
574.	11911	*Laxmannia ramosa subsp. ramosa*			
575.	11464	*Laxmannia sessiliflora subsp. australis*			
576.	7568	*Lechenaultia biloba (Blue Lechenaultia)*			
577.	7574	*Lechenaultia floribunda (Free-flowering Leschenaultia)*			
578.	7577	*Lechenaultia hirsuta (Hairy Leschenaultia)*			
579.	7580	*Lechenaultia linarioides (Yellow Leschenaultia)*			
580.	7586	*Lechenaultia stenosepala (Narrow-sepaled Leschenaultia)*			
581.	1051	*Lemna disperma (Duckweed)*			
582.	27011	*Lenormandia latifolia*			
583.	38805	*Lentinellus pulvinulus*			
584.	1075	*Lepidobolus preissianus*			

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585.	18074	*Lepidobolus preissianus subsp. preissianus*			
586.	925	*Lepidosperma angustatum*			
587.	42742	*Lepidosperma calcicola*			
588.	932	*Lepidosperma effusum (Spreading Sword-sedge)*			
589.	933	*Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)*			
590.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
591.	940	*Lepidosperma pubisquameum*			
592.	944	*Lepidosperma scabrum*			
593.	945	*Lepidosperma squamatum*			
594.	946	*Lepidosperma striatum*			
595.	1653	*Leporella fimbriata (Hare Orchid)*			
596.	1080	*Leptocarpus scariosus*			
597.	2344	*Leptomeria empetriformis*			
598.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
599.	2352	*Leptomeria preissiana*			
600.	17852	*Leptorhynchos scaber (Lanky Buttons)*			
601.	27015	*Leptosomia rosea*			
602.	5850	*Leptospermum laevigatum (Coast Teatree)*	Y		
603.	5857	*Leptospermum spinescens*			
604.	1090	*Lepyrodia muirii*			
605.	25131	*Lerista distinguenda*			
606.	25133	*Lerista elegans*			
607.	25148	*Lerista lineopunctulata*			
608.	25165	*Lerista praepedita*			
609.	6425	*Leucopogon oxycedrus*			
610.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
611.	6434	*Leucopogon polymorphus*			
612.	6436	*Leucopogon propinquus*			
613.	6440	*Leucopogon racemulosus*			
614.	40803	*Leucopogon squarrosus subsp. squarrosus*			
615.	7676	*Levenhookia pusilla (Midget Stylewort)*			
616.	7677	*Levenhookia stipitata (Common Stylewort)*			
617.	25005	*Lialis burtonis*			
618.	25661	*Lichmera indistincta (Brown Honeyeater)*			
619.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
620.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
621.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
622.	25388	*Litoria moorei (Motorbike Frog)*			
623.	7408	*Lobelia tenuior (Slender Lobelia)*			
624.	27044	*Lobospira bicuspidata*			
625.	6515	*Logania vaginalis (White Spray)*			
626.	476	*Lolium perenne (Perennial Ryegrass)*	Y		
627.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
628.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
629.	1228	*Lomandra hermaphrodita*			
630.	1231	*Lomandra maritima*			
631.	14542	*Lomandra micrantha subsp. micrantha*			
632.	1234	*Lomandra nigricans*			
633.	1239	*Lomandra preissii*			
634.	1243	*Lomandra sericea (Silky Mat Rush)*			
635.	1246	*Lomandra suaveolens*			
636.	4066	*Lupinus cosentinii*	Y		
637.		*Lycosa godeffroyi*			
638.	1097	*Lyginia barbata*			
639.	6456	*Lysinema ciliatum (Curry Flower)*			
640.	34736	*Lysinema pentapetalum*			
641.	2838	*Macarthuria apetala*			
642.	2839	*Macarthuria australis*			
643.	49003	*Macrolepiota turbinata*			
644.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
645.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
646.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
647.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
648.	24544	*Malurus lamberti subsp. assimilis (Variegated Fairy-wren)*			
649.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
650.	24549	*Malurus leucopterus subsp. leuconotus (White-winged Fairy-wren)*			
651.	25654	*Malurus splendens (Splendid Fairy-wren)*			
652.	24552	*Malurus splendens subsp. splendens (Splendid Fairy-wren)*			
653.	24583	*Manorina flavigula (Yellow-throated Miner)*			
654.		*Masasteron sampeyae*			

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655.	3049	*Matthiola incana (Common Stock)*	Y		
656.	25758	*Megalurus gramineus (Little Grassbird)*			
657.	24838	*Megalurus gramineus subsp. gramineus (Little Grassbird)*			
658.	5887	*Melaleuca cardiophylla (Tangling Melaleuca)*			
659.	5920	*Melaleuca huegelii (Chenille Honeymyrtle)*			
660.	13271	*Melaleuca huegelii subsp. huegelii*			
661.	5952	*Melaleuca preissiana (Moonah)*			
662.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
663.	5964	*Melaleuca seriata*			
664.	18598	*Melaleuca systena*			
665.	5978	*Melaleuca teretifolia (Banbar)*			
666.	5983	*Melaleuca trichophylla*			
667.	5986	*Melaleuca urceolaris*			
668.	4085	*Melilotus indicus*	Y		
669.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
670.	25184	*Menetia greyii*			
671.	15994	*Mentha x piperita var. citrata*	Y		
672.	24598	*Merops ornatus (Rainbow Bee-eater)*			
673.	955	*Mesomelaena pseudostygia*			
674.	24076	*Mesoplodon bowdoini (Andrew's Beaked Whale)*			
675.		*Microcarbo melanoleucos*			
676.	25693	*Microeca fascinans (Jacky Winter)*			
677.	485	*Microlaena stipoides (Weeping Grass)*			
678.	15419	*Microtis media subsp. media*			
679.	8106	*Millotia tenuifolia (Soft Millotia)*			
680.	16693	*Minuartia mediterranea*	Y		
681.		*Missulena granulosa*			
682.		*Missulena occatoria*			
683.	4666	*Monotaxis occidentalis*			
684.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
685.	25191	*Morethia lineoocellata*			
686.	25192	*Morethia obscura*			
687.	24223	*Mus musculus (House Mouse)*	Y		
688.	25420	*Myobatrachus gouldii (Turtle Frog)*			
689.	7289	*Myoporum caprariioides (Slender Myoporum)*			
690.	6192	*Myriophyllum drummondii*			
691.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
692.	24738	*Neophema elegans (Elegant Parrot)*			
693.	25252	*Notechis scutatus (Tiger Snake)*			
694.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
695.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
696.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
697.		*Occiperipatoides gilesii*			
698.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
699.		*Odax cyanomelas*			
700.	8127	*Olearia axillaris (Coastal Daisybush)*			
701.	8149	*Olearia rudis (Rough Daisybush)*			
702.		*Ommatoiulus moreletii*			
703.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
704.	18255	*Opercularia vaginata (Dog Weed)*			
705.		*Oratemnus curtus*			
706.	36177	*Ornduffia albiflora*			
707.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
708.	1537	*Orthrosanthus laxus (Morning Iris)*			
709.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
710.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
711.	34016	*Ovis aries (Sheep)*			
712.	4356	*Oxalis pes-caprae (Soursob)*	Y		
713.		*Oxidus gracilis*			
714.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
715.	24624	*Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)*			
716.	33988	*Pachysaga munggai (cricket)*			
717.	1667	*Paracaleana nigrita (Flying Duck Orchid)*			
718.		*Paraplectanoides crassipes*			
719.	25253	*Parasuta gouldii*			
720.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
721.	25682	*Pardalotus striatus (Striated Pardalote)*			
722.	24630	*Pardalotus striatus subsp. westraliensis (Striated Pardalote)*			
723.	7089	*Parentucellia latifolia (Common Bartsia)*	Y		
724.	12670	*Parietaria cardiostegia*			

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725.	1762	*Parietaria debilis (Pellitory)*			
726.	532	*Paspalum urvillei (Vasey Grass)*	Y		
727.	5225	*Passiflora filamentosa*	Y		
728.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
729.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
730.	4346	*Pelargonium littorale*			
731.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
732.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
733.	13911	*Persicaria decipiens*			
734.	2258	*Persoonia comata*			
735.	2273	*Persoonia saccata (Snottygobble)*			
736.	27126	*Petalonia fascia*			
737.	48060	*Petrochelidon ariel (Fairy Martin)*			
738.	48061	*Petrochelidon nigricans (Tree Martin)*			
739.	48066	*Petroica boodang (Scarlet Robin)*			
740.	24659	*Petroica goodenovii (Red-capped Robin)*			
741.	20368	*Petrophile axillaris*			
742.	2286	*Petrophile brevifolia*			
743.	2299	*Petrophile linearis (Pixie Mops)*			
744.	2301	*Petrophile macrostachya*			
745.	2309	*Petrophile serruriae*			
746.	19825	*Petrorhagia dubia*	Y		
747.	49073	*Peziza austrogeaster*			
748.		*Peziza badia*			
749.		*Peziza sp.*			
750.	38819	*Peziza vesiculosa*			
751.	48853	*Phaeotrametes decipiens*			
752.	25697	*Phalacrocorax carbo (Great Cormorant)*			
753.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
754.	24666	*Phalacrocorax melanoleucos subsp. melanoleucos (Little Pied Cormorant)*			
755.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
756.	25699	*Phalacrocorax varius (Pied Cormorant)*			
757.	24409	*Phaps chalcoptera (Common Bronzewing)*			
758.	25587	*Phaps elegans (Brush Bronzewing)*			
759.	20460	*Pheladenia deformis*			
760.	1478	*Phlebocarya ciliata*			
761.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
762.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
763.	16177	*Phyllangium paradoxum*			
764.	4675	*Phyllanthus calycinus (False Boronia)*			
765.	39061	*Physarum bitectum*			
766.	39063	*Physarum cinereum*			
767.	39079	*Physarum viride*			
768.	2793	*Phytolacca octandra (Red Ink Plant)*	Y		
769.		*Phytophthora cinnamomi*			
770.	5232	*Pimelea argentea (Silvery Leaved Pimelea)*			
771.	5243	*Pimelea ferruginea*			
772.	11402	*Pimelea imbricata var. piligera*			
773.	5254	*Pimelea leucantha*			
774.	18117	*Pimelea rosea subsp. rosea*			
775.	5268	*Pimelea sulphurea (Yellow Banjine)*			
776.		*Pinkfloydia harveii*			
777.	42281	*Pithocarpa cordata*			
778.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
779.	25720	*Platycercus icterotis (Western Rosella)*			
780.	24747	*Platycercus spurius (Red-capped Parrot)*			
781.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
782.	24750	*Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)*			
783.	27149	*Platysiphonia mutabilis*			
784.	4524	*Platytheca galioides*			
785.	27156	*Plocamium mertensii*			
786.	573	*Poa drummondiana (Knotted Poa)*			
787.	578	*Poa porphyroclados*			
788.	25703	*Podargus strigoides (Tawny Frogmouth)*			
789.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
790.	25704	*Podiceps cristatus (Great Crested Grebe)*			
791.	8175	*Podolepis gracilis (Slender Podolepis)*			
792.	8177	*Podolepis lessonii*			
793.	8182	*Podotheca angustifolia (Sticky Longheads)*			
794.	8183	*Podotheca chrysantha (Yellow Podotheca)*			

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795.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
796.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
797.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
798.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
799.	2905	*Polycarpon tetraphyllum (Fourleaf Allseed)*	Y		
800.	27173	*Polysiphonia decipiens*			
801.	25722	*Polytelis anthopeplus (Regent Parrot)*			
802.	4689	*Poranthera ericoides (Heath Poranthera)*			
803.	4691	*Poranthera microphylla (Small Poranthera)*			
804.		*Poronia erici*			
805.	44729	*Porostereum crassum*			
806.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
807.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
808.	24770	*Porzana pusilla subsp. palustris (Baillon s Crake)*			
809.	24771	*Porzana tabuensis (Spotless Crake)*			
810.	1672	*Prasophyllum fimbria (Fringed Leek Orchid)*			
811.		*Prionosternum scutatum*			
812.		*Protochelifer cavernarum*			
813.	27190	*Protokuetzingia australasica*			
814.	25261	*Pseudechis australis (Mulga Snake)*			
815.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
816.	25511	*Pseudonaja affinis (Dugite)*			
817.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
818.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
819.	45	*Pteris vittata (Chinese Brake)*			
820.	24702	*Pterodroma brevirostris (Kerguelen Petrel)*			
821.		*Pterostylis aff. nana*			
822.	15426	*Pterostylis aspera*			
823.	17267	*Pterostylis brevisepala*			
824.	1693	*Pterostylis recurva (Jug Orchid)*			
825.	12217	*Pterostylis sanguinea*			
826.	18645	*Pterostylis sp. limestone (B.J. Keighery & G.J. Keighery 65)*			
827.	1698	*Pterostylis vittata (Banded Greenhood)*			
828.	2718	*Ptilotus drummondii (Narrowleaf Mulla Mulla)*			
829.	11260	*Ptilotus drummondii var. drummondii (Pussytail)*			
830.	2742	*Ptilotus manglesii (Pom Poms, Mulamula)*			
831.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
832.	40841	*Ptilotus stirlingii subsp. stirlingii*			
833.	4181	*Pultenaea reticulata*			
834.		*Purpureicephalus spurius*			
835.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			
836.	8195	*Quinetia urvillei*			
837.	32480	*Racopilum cuspidigerum var. convolutaceum*			
838.	2932	*Ranunculus colonorum (Common Buttercup)*			
839.	2933	*Ranunculus muricatus (Sharp Buttercup)*	Y		
840.	24243	*Rattus fuscipes (Western Bush Rat)*			
841.	24245	*Rattus rattus (Black Rat)*	Y		
842.		*Raveniella cirrata*			
843.		*Raveniella peckorum*			
844.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
845.	6012	*Regelia ciliata*			
846.	6014	*Regelia inops*			
847.	18547	*Rhadinothamnus anceps*			
848.	2578	*Rhagodia baccata (Berry Saltbush)*			
849.	11341	*Rhagodia baccata subsp. baccata*			
850.	48096	*Rhipidura albiscapa (Grey Fantail)*			
851.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
852.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
853.	15035	*Rhodanthe corymbosa*			
854.	13312	*Rhodanthe pyrethrum*			
855.	2967	*Romneya coulteri (California Tree Poppy)*	Y		
856.	1556	*Romulea rosea (Guildford Grass)*	Y		
857.	2433	*Rumex crispus (Curled Dock)*	Y		
858.	2440	*Rumex pulcher (Fiddle Dock)*	Y		
859.	2906	*Sagina apetala (Annual Pearlwort)*	Y		
860.	2356	*Santalum acuminatum (Quandong, Warnga)*			
861.	27238	*Sargassum distichum*			
862.	7368	*Scabiosa atropurpurea (Purple Pincushion)*	Y		
863.	7603	*Scaevola canescens (Grey Scaevola)*			
864.	7606	*Scaevola crassifolia (Thick-leaved Fan-flower)*			

	Name ID	Species Name	Naturalised	Conservation Code	†Endemic To Query Area
865.	13181	*Scaevola repens var. angustifolia*			
866.	13182	*Scaevola repens var. repens*			
867.	13152	*Scaevola thesioides subsp. thesioides*			
868.	48356	*Schoenoplectus tabernaemontani*			
869.	973	*Schoenus asperocarpus (Poison Sedge)*			
870.	979	*Schoenus caespititius*			
871.	982	*Schoenus clandestinus*			
872.	984	*Schoenus curvifolius*			
873.	985	*Schoenus discifer*			
874.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
875.	997	*Schoenus lanatus (Woolly Bog-rush)*			
876.	1002	*Schoenus nanus (Tiny Bog Rush)*			
877.	1006	*Schoenus odontocarpus*			
878.	1018	*Schoenus subfascicularis*			
879.	1023	*Schoenus tenellus*			
880.	1026	*Schoenus unispiculatus*			
881.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
882.	35911	*Scytosiphon lomentaria*			
883.	25884	*Senecio pinnatifolius var. latilobus*			
884.	8218	*Senecio ramosissimus (Auricled Groundsel)*			
885.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
886.		*Seriola lalandi*			
887.	2909	*Silene gallica (French Catchfly)*	Y		
888.	2910	*Silene nocturna (Mediterranean Catchfly)*	Y		
889.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
890.	25266	*Simoselaps bertholdi (Jan s Banded Snake)*			
891.	42785	*Sirophysalis trinodis*			
892.	30948	*Smicrornis brevirostris (Weebill)*			
893.	24108	*Sminthopsis crassicaudata (Fat-tailed Dunnart)*			
894.	6988	*Solanum americanum (Glossy Nightshade)*	Y		
895.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
896.	8230	*Sonchus asper (Rough Sowthistle)*	Y		
897.	9367	*Sonchus hydrophilus (Native Sowthistle)*			
898.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
899.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
900.	1558	*Sparaxis bulbifera*	Y		
901.	4207	*Sphaerolobium medium*			
902.	4828	*Spyridium globulosum (Basket Bush)*			
903.	4713	*Stachystemon axillaris (Leafy Stachystemon)*			
904.	4733	*Stackhousia monogyna*			
905.	9070	*Stackhousia pubescens (Downy Stackhousia)*			
906.	2918	*Stellaria media (Chickweed)*	Y		
907.	15066	*Stenanthemum notiale subsp. chamelum*			
908.	3080	*Stenopetalum robustum*			
909.	24522	*Sterna bergii (Crested Tern)*			
910.	2316	*Stirlingia latifolia (Blueboy)*			
911.	25597	*Strepera versicolor (Grey Currawong)*			
912.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
913.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
914.	25518	*Strophurus spinigerus*			
915.	24943	*Strophurus spinigerus subsp. inornatus*			
916.	24942	*Strophurus spinigerus subsp. spinigerus*			
917.	30278	*Stylidium androsaceum*			
918.	25831	*Stylidium araeophyllum (Stilt Walker)*			
919.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
920.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
921.	7696	*Stylidium calcaratum (Book Triggerplant)*			
922.	7709	*Stylidium crossocephalum (Posy Triggerplant)*			
923.	7710	*Stylidium cygnorum*			
924.	7713	*Stylidium dichotomum (Pins-and-needles)*			
925.	12848	*Stylidium diuroides subsp. paucifoliatum*			
926.	7717	*Stylidium divaricatum (Daddy-long-legs)*			
927.	25801	*Stylidium hesperium*			
928.	7745	*Stylidium junceum (Reed Triggerplant)*			
929.	25829	*Stylidium neurophyllum (Coastal Plain Triggerplant)*			
930.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
931.	7785	*Stylidium repens (Matted Triggerplant)*			
932.	20521	*Stylidium rigidulum*			
933.	7798	*Stylidium schoenoides (Cow Kicks)*			
934.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
935.	1260	*Stypandra glauca (Blind Grass)*			
936.	2329	*Synaphea spinulosa*			
937.	15532	*Synaphea spinulosa subsp. spinulosa*			
938.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
939.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
940.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
941.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
942.		*Tamopsis perthensis*			
943.		*Taphiassa robertsi*			
944.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
945.	4256	*Templetonia retusa (Cockies Tongues)*			
946.	2791	*Tersonia cyathiflora (Button Creeper)*			
947.	1036	*Tetraria octandra*			
948.	1708	*Thelymitra fuscolutea (Chestnut Sun Orchid)*			
949.	5105	*Thomasia triphylla*			
950.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
951.	32486	*Thuidium sparsum var. hastatum*			
952.	1319	*Thysanotus arenarius*			
953.	1338	*Thysanotus manglesianus (Fringed Lily)*			
954.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
955.	1343	*Thysanotus patersonii*			
956.	1351	*Thysanotus sparteus*			
957.	1357	*Thysanotus thyrsoideus*			
958.	1358	*Thysanotus triandrus*			
959.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
960.	25519	*Tiliqua rugosa*			
961.	25204	*Tiliqua rugosa subsp. aspera*			
962.	25207	*Tiliqua rugosa subsp. rugosa*			
963.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
964.	19041	*Trachymene coerulea subsp. coerulea*			
965.	6280	*Trachymene pilosa (Native Parsnip)*			
966.		*Tremella mesenterica*			
967.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
968.	39094	*Trichia affinis*			
969.	39098	*Trichia favoginea*			
970.	39100	*Trichia persimilis*			
971.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
972.	25521	*Trichosurus vulpecula (Common Brushtail Possum)*			
973.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
974.	1363	*Tricoryne tenella*			
975.	1038	*Tricostularia neesii*			
976.	4292	*Trifolium campestre (Hop Clover)*	Y		
977.	4295	*Trifolium dubium (Suckling Clover)*	Y		
978.	4297	*Trifolium glomeratum (Cluster Clover)*	Y		
979.	4309	*Trifolium scabrum (Rough Clover)*	Y		
980.	4310	*Trifolium spumosum (Bladder Clover)*	Y		
981.	18587	*Triglochin nana*			
982.	152	*Triglochin trichophora*			
983.	4737	*Tripterococcus brunonis (Winged Stackhousia)*			
984.	1141	*Trithuria submersa*			
985.	708	*Triticum aestivum (Wheat)*	Y		
986.	11665	*Trymalium ledifolium var. ledifolium*			
987.	33418	*Trymalium odoratissimum subsp. odoratissimum*			
988.	25762	*Tyto alba (Barn Owl)*			
989.		*Urodacus novaehollandiae*			
990.	8254	*Urospermum picroides (False Hawkbit)*	Y		
991.	8255	*Ursinia anthemoides (Ursinia)*	Y		
992.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
993.	7125	*Utricularia australis*			
994.	25577	*Vanellus miles (Masked Lapwing)*			
995.	24386	*Vanellus tricolor (Banded Lapwing)*			
996.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
997.	25526	*Varanus tristis (Racehorse Monitor)*			
998.		*Venator immansueta*			
999.	15725	*Verbesina encelioides*	Y		
1000.	7110	*Veronica distans*			
1001.	12411	*Verticordia densiflora var. cespitosa*			
1002.	15432	*Verticordia densiflora var. densiflora*			
1003.	6101	*Verticordia nitens (Morrison Featherflower, Kodjeningara)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1004.	4322	*Vicia sativa (Common Vetch)*	Y		
1005.	11474	*Vicia sativa subsp. nigra*	Y		
1006.	4325	*Viminaria juncea (Swishbush, Koweda)*			
1007.	17042	*Vitis vinifera*	Y		
1008.	24040	*Vulpes vulpes (Red Fox)*	Y		
1009.	724	*Vulpia myuros (Rat s Tail Fescue)*	Y		
1010.	33101	*Vulpia myuros forma myuros*	Y		
1011.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
1012.	7389	*Wahlenbergia preissii*			
1013.	13328	*Waitzia nitida*			
1014.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
1015.		*Westrarchaea spinosa*			
1016.	6939	*Westringia dampieri*			
1017.	1398	*Wurmbea monantha*			
1018.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
1019.	6289	*Xanthosia huegelii*			
1020.	44861	*Xerochrysum macranthum*			
1021.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

APPENDIX 3

Protected Matters Search Tool Report

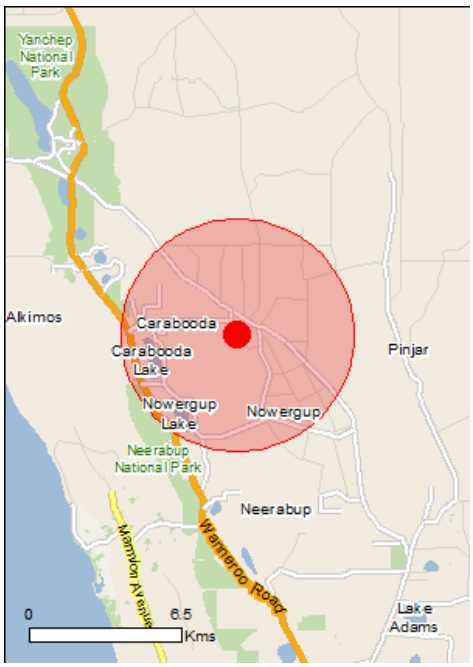
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

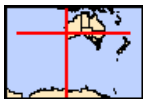
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 08/12/20 19:33:34



Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	21
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	35
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Fish		
Galaxiella nigrostriata Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat may occur within area
Insects		

Name	Status	Type of Presence
Hesperocolletes douglasi		
Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis		
Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Anigozanthos viridis subsp. terraspectans		
Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat likely to occur within area
Caladenia huegelii		
King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Diuris micrantha		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei		
Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
Drakaea elastica		
Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Eleocharis keigheryi		
Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
Eucalyptus argutifolia		
Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat known to occur within area
Melaleuca sp. Wanneroo (G.J. Keighery 16705) [89456]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat likely to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Neerabup	WA
Neerabup	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the loca ions of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolu ions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distribu ions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping me hods are used to update hese distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communi ies that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for he protection of the Commonwealth Marine environment.

Coordinates

-31.60795 115.75393

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX 4

Conservation Codes

Conservation Codes for Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such. Conservation codes have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018.*

T Threatened species – Schedules 1-4

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

- **Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.
- **Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife*

Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

EX Presumed extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that "*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Western Australian Ecological Communities

Threatened Ecological Communities

The BC Act provides for the statutory listing of threatened ecological communities (TECs) by the Minister.

Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities

Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha).

Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or;

(iii) munities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category.

(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Commonwealth of Australia Conservation Codes

Threatened Flora and Fauna

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following six categories:

Extinct

A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.

Extinct in the wild

A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time:

a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
b) 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.

Critically endangered

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered

A taxon is Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable

A taxon is Vulnerable when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a high risk of extinction in the wild.

Conservation dependent

A native species is eligible to be included in the conservation dependent category at a particular time if, at that time:

a) 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; or
b) the following subparagraphs are satisfied:
    i. the species is a species of fish;

ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;
iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory;
iv. cessation of the plan of management would adversely affect the conservation status of the species.

The EPBC Act does not provide for listing in a data deficient category. Where sufficient data (evidence) is unavailable to allow assessment by the Threatened Species Scientific Committee against the criteria for listing, the species are found to be ineligible. A recommendation is made to the Minister to not include the species in any category under the EPBC Act. For reasons of transparency and to inform future research, the Threatened Species Scientific Committee publishes the names of those species found to be data deficient. As data deficient is not a listing category under the EPBC Act, this has no statutory implications and the species is not considered to be listed under the EPBC Act.

Threatened Ecological Communities

Threatened Ecological communities under the EPBC Act are listed in three categories.

Critically endangered

If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).

Endangered

If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

Vulnerable

If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

APPENDIX 5

DBCA TEC/PEC Database Search

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
727	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	NEERABUP03		500	217	121
728	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	NEERABUP04		500	218	122
729	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	NEERABUP05		500	219	123
726	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	NEERABUP02		500	220	124
725	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	NEERABUP01		500	221	125
758	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	NEERABUP07		500	225	128
1838	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		4	DAYRELL01	DAYRELL04	500	226	129
1871	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	DAYRELL05		500	229	132
1898	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	CARABOODA01		500	572	440
1899	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	CARABOODA02		500	573	441
1893	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		2	WATTLE01	WATTLE03	500	574	442
1889	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		2	ONETREEHILL01	onetree01	500	575	443
1890	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	ONETREEHILL02		500	604	467
1933	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	ONETREEHILL03		500	605	468
191	CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered	1	CABAR01		5000	882	718
190	CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered	1	YN99		5000	883	719
192	CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered	1	WATER01		5000	884	720
187	CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered	1	CARPK01		5000	885	721
189	CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered	1	TWILGHT01		5000	886	722

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
188	CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered	1	GILGIE01		5000	887	723
1921	CAVES SCP01	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Critically Endangered	Endangered	1	YN555		5000	888	724
3615	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	Neer_East_03		500	1387	1111
3614	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	Neer_East_04		500	1388	1112
3616	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	Neer_East_02		500	1389	1113
3611	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	NEER07		500	1390	1114
2647	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	Neer_East_01		500	1391	1115
3612	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		2	NEER09	NEER10	500	1392	1116
3613	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	NEER11		500	1473	1189
4022	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		2	HOPKINSRD02	Hopkins02Photo	500	2070	1589
4025	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	HOPKINSRD01		500	2071	1590
4023	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	CUTLER02		500	2072	1591
4024	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	CUTLER06		500	2073	1592
4026	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	HOPKINSRD06		500	2074	1593
4066	SCP24	Northern Spearwood shrublands and woodlands	Priority 3		1	Neer_East_06		500	2357	1869
5112	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	Nowergup01		500	2877	2455
5113	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	Nowergup02		500	2878	2456
5114	SCP26a	Melaleuca huegelii - Melaleuca systena shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. (1994))	Endangered		1	Nowergup03		500	2879	2457
107341	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld01623		200	104340	16539
107690	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld01972		200	104689	16886
115709	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld09991		200	112708	24900
117563	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld11845		200	114562	26752
117680	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld11962		200	114679	26869
117696	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld11978		200	114695	26885
117697	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld11979		200	114696	26886
117698	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld11980		200	114697	26887
117803	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12085		200	114802	26991
117804	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12086		200	114803	26992
118167	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12449		200	115166	27355
118329	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12611		200	115328	27517
118339	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12621		200	115338	27527
118344	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12626		200	115343	27532
118345	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12627		200	115344	27533

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
118381	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12663		200	115380	27569
118382	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12664		200	115381	27570
122304	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16586		200	119303	31490
125119	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0018		500	122188	120437
125120	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0019		500	122189	120438
125304	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0203		500	122373	120622
125305	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0204		500	122374	120623
125313	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0212		500	122382	120631
125324	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0223		500	122393	120642
125421	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0320		500	122490	120739
125422	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0321		500	122491	120740
125433	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0332		500	122502	120751
125436	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0335		500	122505	120754
125437	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0336		500	122506	120755
125438	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0337		500	122507	120756
125439	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0338		500	122508	120757
125440	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0339		500	122509	120758
125441	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0340		500	122510	120759
125442	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0341		500	122511	120760
125443	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0342		500	122512	120761
125444	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0343		500	122513	120762

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
125445	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0344		500	122514	120763
125446	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0345		500	122515	120764
125447	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0346		500	122516	120765
125448	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0347		500	122517	120766
125449	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0348		500	122518	120767
125450	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0349		500	122519	120768
125451	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0350		500	122520	120769
125452	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0351		500	122521	120770
125453	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0352		500	122522	120771
125454	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0353		500	122523	120772
125455	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0354		500	122524	120773
125456	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0355		500	122525	120774
125457	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0356		500	122526	120775
125458	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0357		500	122527	120776
125459	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0358		500	122528	120777
125460	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0359		500	122529	120778
125461	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0360		500	122530	120779
125463	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0362		500	122532	120781
125464	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0363		500	122533	120782

OCC_UNIQUE	COM_ID	COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUNT	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID	ORIG_FID
125465	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0364		500	122534	120783
125466	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0365		500	122535	120784
125467	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0366		500	122536	120785
126034	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0933		500	123103	121352
126035	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld0934		500	123104	121353
126114	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1013		500	123183	121432
126115	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1014		500	123184	121433
126116	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1015		500	123185	121434
126117	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1016		500	123186	121435
126118	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1017		500	123187	121436
126119	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1018		500	123188	121437
126120	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1019		500	123189	121438
126638	Tuart woodlands	Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	1	TuartWld1537		500	123707	121956
107675	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld01957		200	104674	16871
107688	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld01970		200	104687	16884
115711	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld09993		200	112710	24902
117982	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12264		200	114981	27170
118194	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12476		200	115193	27382
118328	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld12610		200	115327	27516
122561	Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	1	BanksiaWld16843		200	119560	31747
3112	SCP23b	Swan Coastal Plain Banksia attenuata - Banksia menziesii woodlands	Priority 3	Endangered	1	SINT01		500	0	0
5020	SCP10a	Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. (1994))	Endangered	Critically Endangered	1	pinj10		500	0	707

APPENDIX 6

Flora Species List

Carabooda Limestone		**M70/341 and M70/345***	**M70/346 and M70/399**
		* from Coffey (2010)	
GYMNOSPERMS			
CYCADACEAE	*Macrozamia riedlei*	+	+
PINACEAE	**Pinus sp*	+	
MONOCOTYLEDONS			
ASPARAGACEAE	*Acanthocarpus preissii*	+	
	**Asparagus asparagoides*	+	+
	Lomandra caespitosa		+
	Lomandra maritima		
	Lomandra preissii	+	
	Lomandra sp	+	
	Sowerbaea laxiflora	+	+
	Thysanotus manglesianus	+	+
	Thysanotus sparteus	+	+
COLCHICACEAE	*Burchardia congesta*	+	+
CYPERACEAE	*Lepidoserpma leptostachyum*	+	
	Lepidosperma ? pubisquameum	+	
	Mesomelaena pseudostygia	+	+
	Schoenus latitans/clandestinus	+	
	Tetraria octandra	+	+
DASYPOGONACEAE	*Calectasia narragara*		+
HAEMODORACEAE	*Anigozanthos humilis*		+
	Conostylis aculeata subsp. *aculeata*	+	+
	Conostylis aurea		+
	Conostylis candicans	+	+
	Conostlyis setigera subsp. *setigera*	+	+
	Haemodorum laxum	+	+
	Haemodorum sp.	+	
HEMEROCALLIDACEAE	*Caesia micrantha*	+	+
	Corynotheca micrantha	+	
	Dianella revoluta var. *divaricata*	+	+
	Tricoryne elatior	+	+
IRIDACEAE	**Gladiolus caryophyllaceus*	+	+
	**Moraea flaccida*	+	
	Orthrosanthos laxus var. *laxus*	+	+
	Patersonia occidentalis	+	+
	**Romulea rosea*		+
ORCHIDACEAE	*Caladenia arenicola*	+	
	Caladenia latifolia		+
	Caladenia sp		+
	Diuris sp		+
	Microtis sp	+	
	Pterostylis sp		+

Carabooda Limestone		**M70/341 and M70/345***	**M70/346 and M70/399**
	Pterostylis ?vittata		+
	Thelymitra ?graminea	+	
POACEAE	**Aira caryophyllea*		+
	Austrostipa elegantissima	+	
	Austrostipa flavescens	+	+
	Austrostipa ?hemipogon	+	
	**Avena fatua/barbata*	+	+
	**Brachypodium distachyum*	+	
	**Briza maxima*	+	+
	**Briza minor*	+	+
	**Broums diandrus*	+	+
	**Catapodium rigidum*	+	
	**Cynodon dactylon*		+
	**Ehrharta calycina*	+	+
	**Ehrharta longiflora*	+	
	**Eragrostis curvula*		+
	**Lagurus ovatus*	+	+
	**Lolium perenne*	+	
	Poa drummondiana		+
	**Vulpia bromoides*	+	+
RESTIONACEAE	*Desmocladus flexuosus*	+	+
XANTHORRHOEACEAE	*Xanthorrhoea brunonis*		+
	Xanthorrhoea preissii	+	+
DICOTYLEDONS			
AIZOACEAE	**Carpobrotus edulis*	+	+
AMARANTHACEAE	*Ptilotus manglesii*	+	
	Ptilotus polystachyus	+	+
APIACEAE	*Daucus glochidiatus*	+	+
	**Foeniculum vulgare*		+
	Homalosciadium homalocarpum		+
	Xanthosia huegelii		+
ARALIACEAE	*Trachymene pilosa*	+	+
ASTERACEAE	**Carduus pycnocephalus*	+	
	Hyalosperma cotula		+
	**Hypochaeris glabra*	+	+
	Lagenophora huegelii	+	+
	Leptorhynchos scaber		+
	Millotia myosotidifolia	+	
	Olearia axillaris		+
	Podolepis lessonii	+	+
	Podotheca ganphalioides	+	+
	**Sonchus asper*	+	

Carabooda Limestone		**M70/341 and M70/345***	**M70/346 and M70/399**
	**Sonchus oleraceus*	+	+
	**Urospermum picroides*	+	+
	**Ursinia anthemoides*	+	+
	Waitzia suaveolens		+
BRASSICACEAE	**Heliophila pusilla*	+	+
CAMPANULACEAE	*Wahlenbergia preissii*		+
CARYOPHYLLACEAE	**Cerastium glomeratum*	+	+
	**Minuartia mediterranea*	+	+
	**Petrorhagia dubia*	+	+
	**Silene nocturna*	+	
CASUARINACEAE	*Allocasuarina fraseriana*	+	
	Allocasuarina humilis	+	+
CELASTRACEAE	*Tripterococcus brunonis*	+	
CHENOPODIACEAE	*Rhagodia baccata*	+	+
DILLENIACEAE	*Hibbertia acerosa*		+
	Hibbertia huegelii		+
	Hibbertia hypericoides	+	+
	Hibbertia racemosa	+	
DROSERACEAE	*Drosera erythrothiza*		+
	Drosera menziesii		+
	Drosera pallida	+	
ERICACEAE	*Conostephium pendulum*	+	
	Conostephium preissii		+
	Leucopogon polymorphus		+
	Leucopogon propinquus	+	+
EUPHORBIACEAE	**Euphorbia peplus*	+	
	**Euphorbia terracina*	+	+
FABACEAE	*Acacia applanata*	+	+
	Acacia benthamii **P2**	+	
	Acacia cochlearis		
	Acacia cyclops		+
	**Acacia longifolia*	+	
	Acacia pulchella	+	+
	Acacia rostellifera		+
	Acacia xanthina		+
	Bossiaea eriocarpa	+	+
	Daviesia decurrens	+	
	Daviesia divaricata	+	
	Gastrolobium capitatum	+	+
	Gastrolobium linearifolium	+	
	Gompholobium tomentosum		+

Carabooda Limestone		**M70/341 and M70/345***	**M70/346 and M70/399**
	Hardenbergia comptoniana	+	+
	Hovea trisperma var. *trisperma*		+
	Isotropis cuneifolia	+	+
	Jacksonia sericea **P4**	+	+
	Jacksonia sternbergiana	+	+
	Kennedia prostrata	+	
	**Trifolium arvense*	+	+
	**Trifolium campestre*		+
	**Trifolium dubium*	+	
FUMARIACEAE	**Fumaria capreolata*		+
GENTIANACEAE	**Centaurium erythraea*	+	
GERANIACEAE	**Pelargonium capitatum*	+	+
GOODENIACEAE	*Lechenaultia linarioides*	+	
	Scaevola canescens	+	
GYROSTEMONACEAE	*Tersonia cyathiflora*	+	
HALORAGACEAE	*Glischrocaryon aureum*		+
LAMIACEAE	**Rosmarinus officinalis*	+	
LAURACEAE	*Carrytha racemosa*	+	+
	Cassytha ?racemosa forma *pilosa*	+	
LOBELIACEAE	*Lobelia tenuior*	+	
MONTIACEAE	*Calandrinia liniflora*		+
	Calandrinia tholiformis (previously Calandrinia sp SW coastal (J. Dod 753))	+	
MYRTACEAE	*Baeckea sp Limestone* **P1**		+
	Calothamnus quadrifidus	+	+
	**Chamelaucium uncinatum*	+	+
	Eremaea asterocarpa subsp. *asterocarpa*	+	
	Eucalyptus gomphocephala	+	+
	Eucalyptus marginata	+	+
	Eucalyptus todtiana	+	
	**Leptospermum laevigatum*	+	
	Melaleuca systena	+	+
OROBANCHACEAE	**Bellardia trixago*		+
OXALIDACEAE	**Oxalis pes-caprae*		+
PHYLLANTHACEAE	*Phyllanthus calycinus*		+
	Poranthera microphylla		+

Carabooda Limestone		**M70/341 and M70/345***	**M70/346 and M70/399**	
POLYGALACEAE	*Comesperma integerrimum*	+		
PRIMULACEAE	**Lysimachia arvensis*	+	+	
PROTEACEAE	*Banksia attenuata*	+	+	
	Banksia dallanneyi		+	
	Banksia grandis	+	+	
	Banksia menziesii	+	+	
	Banksia sessilis	+	+	
	Conosperumum triplinervium		+	
	Grevillea vestita	+		
	Hakea costata		+	
	Hakea lissocarpha	+	+	
	Hakea prostrata	+	+	
	Hakea trifurcata	+	+	
	Persoonia comata	+		
	Petrophile axillaris	+	+	
	Petrophile brevifolia	+		
	Petrophile linearis	+	+	
	Petrophile macrostachya	+	+	
	Stirlingia latifolia	+	+	
RHAMNACEAE	*Spyridium globulosum*	+		
	Trymalium ledifolium		+	
RUBIACEAE	**Galium murale - Galium divaricatum* in Coffey incorrect as habitat not suitable (*G. divaricatum* prefers winter-wet depressions)	+	+	
RUTACEAE	*Philotheca spicata*	+	+	
SAPINDACEAE	*Diplopeltis huegelii*		+	
	Dodonaea aptera	+		
SCROPHULARIACEAE	*Eremophila glabra*		+	
STYLIDIACEAE	*Stylidium brunonianum*	+	+	
	Stylidium calcaratum	+	+	
	Stylidium scariosum		+	
	Stylidium schoenoides	+	+	
VIOLACEAE	*Hybanthus calycinus*	+		
				combined tenements
	Total Native	97	99	140
	Total Introduced	38	32	48
	Total	**135**	**131**	**188**

APPENDIX 7

Quadrat Data

QUADRAT CL1

50 382218 E 6502637 N

Vegetation: *Eucalyptus gomphocephala* Low Open Woodland over *Banksia attenuata/B. grandis* Low Open Woodland over *Xanthorrhoea preissii/Hibbertia hypericoides/Mesomelaena pseudostygia* Open Low Heath

Condition: Good

Soil Type: Orange-brown sand

Landform: Gentle slope

Date: 8.10.20

Recorder: [redacted]

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Banksia grandis	2.2	1
Xanthorrhoea preissii	2	15
Banksia attenuata	1.8	1
Spyridium globulosum	1.8	1
Hakea prostrata	1.5	1
Daviesia divaricata	1.1	1
Dodonaea aptera	0.6	1
Xanthorrhoea brunonis	0.6	1
Mesomelaena pseudostygia	0.5	10
Jacksonia sericea	0.5	1
Acacia pulchella	0.5	<1
Hibbertia hypericoides	0.4	15
Acanthocarpus preissii	0.4	5
Corynotheca micrantha	0.4	2
Hybanthus calycinus	0.4	1
**Avena fatua*	0.4	<1

SPECIES	**HEIGHT (m)**	**COVER (%)**
Dianella revoluta var. *divaricata*	0.4	<1
Caesia micrantha	0.4	<1
Leucopogon propinquus	0.4	<1
Tetraria octandra	0.3	5
Conostylis aurea	0.3	<1
Gastrolobium capitatum	0.3	<1
Ptilotus sericostachyus	0.3	<1
**Gladiolus caryophyllaceus*	0.3	<1
**Vulpia myuros*	0.2	1
Daucus glochidiatus	0.2	1
Desmocladus flexuosus	0.2	1
Podotheca gnaphalioides	0.2	<1
**Lysimachia arvensis*	0.1	2
**Urospermum picroides*	0.1	1
Kennedia prostrata	0.1	<1
**Briza maxima*	0.1	<1
Scaevola canescens	0.1	<1
**Sonchus oleraceus*	0.1	<1
Trachymene pilosa	<0.1	2
Schoenus latitans	<0.1	<1
**Hypochaeris glabra*	Flat	1
**Asparagus asparagoides*	Climber	<1

* introduced species

QUADRAT CL2

50 382313 E 6502607 N

Vegetation: *Eucalyptus gomphocephala* Low Open Woodland over *Xanthorrhoea preissii* Shrubland over *Jacksonia sericea/Mesomelaena pseudostygia* Open Low Heath

Condition: Good

Soil Type: Orange sand

Landform: Gentle slope

Date: 8.10.20

Recorder: [redacted]

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	6	5
Xanthorrhoea preissii	2	15
Acacia cyclops	1.5	2
**Avena fatua*	0.8	1
Xanthorrhoea brunonis	0.6	1
Daviesia decurrens	0.6	1
**Gladiolus caryophyllaceus*	0.6	<1
Hibbertia hypericoides	0.5	1
Tetraria octandra	0.5	1
Acacia cochlearis	0.5	<1
Jacksonia sericea	0.4	15
Mesomelaena pseudostygia	0.4	15
Hakea prostrata	0.4	1
**Euphorbia terracina*	0.4	1
Caesia micrantha	0.4	<1
Ptilotus polystachyus	0.4	<1

SPECIES	HEIGHT (m)	COVER (%)
Austrostipa flavescens	0.4	<1
Lepidosperma leptostachyum	0.4	<1
Conostylis aurea	0.3	<1
Lomandra maritima	0.3	<1
**Urospermum picroides*	0.2	2
**Lagurus ovatus*	0.2	<1
**Vulpia myuros*	0.1	5
**Lysimachia arvensis*	0.1	1
Scaevola canescens	0.1	1
Desmocladus flexuosus	0.1	1
**Carpobrotus edulis*	0.1	1
**Briza maxima*	0.1	<1
Ptilotus manglesii	0.1	<1
Daucus glochidiatus	0.1	<1
**Sonchus oleraceus*	0.1	<1
Trachymene pilosa	<0.1	2
**Galium murale*	<0.1	<1
**Hypochaeris glabra*	Flat	2
**Asparagus asparagoides*	Climber	5
Thysanotus manglesianus	Climber	<1
Hardenbergia comptoniana	Climber	<1

* introduced species

QUADRAT CLS1

50 381628 E 6502011 N

Vegetation: *Eucalyptus marginata* Low Open Woodland over *Xanthorrhoea preissii/Hibbertia hypericoides/Mesomelaena pseudostygia* Open Heath

Condition: Very Good

Soil Type: Orange-brown sand

Landform: Flat

Date: 8.10.20

Recorder: [redacted]

Quadrat (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus marginata	4	10
Macrozamia riedlei	1.2	4
Xanthorrhoea preissii	1.1	10
Acacia pulchella	1.1	2
Xanthorrhoea brunonis	0.8	1
Thysanotus sparteus	0.8	<1
**Gladiolus caryophyllaceus*	0.8	<1
**Ehrharta calycina*	0.8	<1
Haemodorum laxum	0.6	<1
Hibbertia hypericoides	0.5	20
Mesomelaena pseudostygia	0.5	5
Petrophile macrostachya	0.5	2
Leucopogon polymorphus	0.5	2
Gompholobium tomentosum	0.5	1
Conostephium preissii	0.5	<1
Patersonia occidentalis	0.5	<1

SPECIES	HEIGHT (m)	COVER (%)
Gastrolobium capitatum	0.4	2
Phyllanthus calycinus	0.4	1
Tetraria octandra	0.4	1
Stylidium schoenoides	0.4	<1
Caesia micrantha	0.4	<1
**Sonchus oleraceus*	0.4	<1
Burchardia congesta	0.4	<1
Orthrosanthus laxus	0.4	<1
**Ursinia anthemoides*	0.3	2
**Bromus diandrus*	0.3	2
**Briza maxima*	0.3	1
Bossiaea eriocarpa	0.3	<1
Conostylis aurea	0.3	<1
Anigozanthos humilis	0.3	<1
**Urospermum picroides*	0.3	<1
**Bellardia trixago*	0.2	<1
Isotropis cuneifolia	0.2	<1
**Petrorhagia dubia*	0.2	<1
**Trifolium campestre*	0.1	1
Stylidium calcaratum	0.1	<1
Lagenophora huegelii	0.1	<1
Conostylis setigera	0.1	<1
**Trifolium arvense*	0.1	<1
Desmocladus flexuosus	0.1	<1
**Aira caryophyllea*	0.1	<1
Homalosciadium homalocarpum	<0.1	<1
**Lysimachia arvensis*	<0.1	<1
**Galium murale*	<0.1	<1
Drosera erythrorhiza	Flat	<1
**Hypochaeris glabra*	Flat	<1
Thysanotus manglesianus	Climber	<1
Hardenbergia comptoniana	Climber	<1
Cassytha racemosa	Climber	<1

* introduced species

QUADRAT CLS2

50 381755 E 6502002 N

Vegetation: *Eucalyptus marginata* Low Open Woodland over *Xanthorrhoea preissii/Macrozamia riedlei/Hibbertia hypericoides/Mesomelaena pseudostygia* Open Heath

Condition: Very Good

Soil Type: Orange-brown sand

Landform: Flat

Date: 8.10.20

Recorder: [redacted]

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus marginata	4	5
Hakea lissocarpha	1.2	10
Macrozamia riedlei	1	5
Xanthorrhoea preissii	0.8	5
Phyllanthus calycinus	0.7	1
Haemodorum laxum	0.7	<1
Acacia pulchella	0.6	1
**Gladiolus caryophyllaceus*	0.6	<1
Hibbertia hypericoides	0.5	25
Stirlingia latifolia	0.5	<1
**Avena fatua*	0.5	<1
Dianella revoluta var. *divaricata*	0.5	<1
Mesomelaena pseudostygia	0.4	5
Gompholobium tomentosum	0.4	1
Stylidium brunonianum	0.4	<1
Burchardia congesta	0.4	<1
**Briza maxima*	0.3	5

SPECIES	HEIGHT (m)	COVER (%)
Petrophile macrostachya	0.3	4
**Bromus diandrus*	0.3	2
**Urospermum picroides*	0.3	1
Caesia micrantha	0.3	<1
Conostylis aurea	0.3	<1
Tetraria octandra	0.3	<1
**Ursinia anthemoides*	0.2	4
Desmocladus flexuosus	0.2	<1
Isotropis cuneifolia	0.2	<1
**Lysimachia arvensis*	0.1	2
**Trifolium arvense*	0.1	1
Trachymene pilosa	0.1	1
Conostylis setigera	0.1	<1
Lagenophora huegelii	0.1	<1
Stylidium calcaratum	0.1	<1
**Briza minor*	0.1	<1
**Carpobrotus edulis*	0.1	<1
**Cerastium glomeratum*	0.1	<1
**Petrorhagia dubia*	0.1	<1
**Trifolium campestre*	<0.1	2
Homalosciadium homalocarpum	<0.1	<1
**Galium murale*	<0.1	<1
**Hypochaeris glabra*	Flat	1
Cassytha racemosa	Climber	2
Hardenbergia comptoniana	Climber	<1

* introduced species

QUADRAT CLS3

50 381898 E 6501971 N

Vegetation: *Eucalyptus gomphocephala/E. marginata* Low Woodland over *Jacksonia sternbergiana/Macrozamia riedlei* Shrubland over *Hibbertia hypericoides/Mesomelaena pseudostygia* Open Low Heath

Condition: Very Good

Soil Type: Orange-brown sand

Landform: Flat

Date: 8.10.20

Recorder: [redacted]

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	6	10
Eucalyptus marginata	3	10
Jacksonia sternbergiana	2	10
Macrozamia riedlei	0.8	5
Xanthorrhoea brunonis	0.8	1
**Gladiolus caryophyllaceus*	0.8	<1
Xanthorrhoea preissii	0.7	2
Calothamnus quadrifidus	0.6	<1
Podotheca gnaphalioides	0.6	<1
Hibbertia hypericoides	0.5	20
Leucopogon propinquus	0.5	1
Phyllanthus calycinus	0.5	<1
Burchardia congesta	0.5	<1
Jacksonia sericea	0.4	2
**Avena fatua*	0.4	1
Tetraria octandra	0.4	1
**Bromus diandrus*	0.4	<1

SPECIES	HEIGHT (m)	COVER (%)
Hovea trisperma	0.4	<1
Desmocladus flexuosus	0.4	<1
**Ursinia anthemoides*	0.3	1
Hakea lissocarpha	0.3	1
Conostylis aurea	0.3	<1
Bossiaea eriocarpa	0.3	<1
Stylidium brunonianum	0.3	<1
Conostephium preissii	0.3	<1
**Bellardia trixago*	0.3	<1
Daucus glochidiatus	0.2	<1
**Heliophila pusilla*	0.2	<1
**Trifolium campestre*	0.1	5
**Briza maxima*	0.1	2
**Urospermum picroides*	0.1	2
**Carpobrotus edulis*	0.1	1
Banksia dallanneyi	0.1	1
Trachymene pilosa	0.1	1
**Lysimachia arvensis*	0.1	<1
Hyalosperma cotula	0.1	<1
**Aira caryophyllea*	0.1	<1
Xanthosia huegelii	0.1	<1
Lagenophora huegelii	0.1	<1
**Petrorhagia dubia*	0.1	<1
Calandrinia sp	<0.1	<1
**Galium murale*	<0.1	<1
**Hypochaeris glabra*	Flat	<1
Cassytha racemosa	Climber	2
Hardenbergia comptoniana	Climber	1
Thysanotus manglesianus	Climber	<2

* introduced species

QUADRAT CLS4

50 382008 E 6502063 N

Vegetation: *Eucalyptus gomphocephala* Low Open Woodland over *Xanthorrhoea preissii/Hibbertia hypericoides/Jacksonia sericea/Mesomelaena pseudostygia* Closed Low Heath

Condition: Good

Soil Type: Orange-brown sand, some surface limestone

Landform: Gentle slope

Date: 8.10.20

Recorder: [redacted]

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	8	5
Banksia sessilis	1.9	4
**Ehrharta calycina*	1.2	<1
Xanthorrhoea preissii	1	10
**Gladiolus caryophyllaceus*	0.8	<1
Hibbertia hypericoides	0.5	20
Phyllanthus calycinus	0.5	2
Austrostipa flavescens	0.5	<1
**Bromus diandrus*	0.4	1
**Sonchus oleraceus*	0.4	<1
Ptilotus polystachyus	0.4	<1
Jacksonia sericea	0.3	25
Conostylis candicans	0.3	1
**Avena fatua*	0.3	<1
Sowerbaea laxiflora	0.3	<1
Desmocladus flexuosus	0.2	15
**Briza maxima*	0.2	5

SPECIES	HEIGHT (m)	COVER (%)
**Vulpia myuros*	0.2	<1
Podolepis gracilis	0.2	<1
Daucus glochidiatus	0.2	<1
**Urospermum picroides*	0.1	2
**Trifolium campestre*	0.1	2
**Lysimachia arvensis*	0.1	1
Banksia dallanneyi	0.1	1
**Petrorhagia dubia*	0.1	<1
**Briza minor*	0.1	<1
Trachymene pilosa	0.1	<1
**Heliophila pusilla*	0.1	<1
**Trifolium arvense*	0.1	<1
Podotheca gnaphalioides	0.1	<1
**Minuartia mediterranea*	<0.1	<1
**Aira caryophyllea*	<0.1	<1
**Hypochaeris glabra*	Flat	1
Hardenbergia comptoniana	Climber	<1
Drosera menziesii	Climber	<1

* introduced species

QUADRAT CLS5

50 381761 E 6502109 N

Vegetation: *Eucalyptus gomphocephala* Low Open Woodland over *Banksia sessilis* Open Shrubland over *Xanthorrhoea preissii/Hibbertia hypericoides* Open Low Heath

Condition: Degraded

Soil Type: Orange-brown sand

Landform: Flat

Date: 8.10.20

Recorder: [redacted]

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	8	10
Acacia xanthina	2.5	2
Banksia sessilis	2	5
**Foeniculum vulgare*	0.6	4
**Ehrharta calycina*	0.6	<1
Phyllanthus calycinus	0.5	2
**Avena fatua*	0.5	1
Austrostipa flavescens	0.5	<1
Tetraria octandra	0.4	<1
Tricoryne elatior	0.4	<1
**Pelargonium capitatum*	0.4	<1
Hibbertia hypericoides	0.3	5
**Bromus diandrus*	0.3	5
Jacksonia sericea	0.3	1
Leucopogon propinquus	0.3	1
Conostylis candicans	0.3	1
**Euphorbia terracina*	0.3	1

SPECIES	HEIGHT (m)	COVER (%)
**Romulea rosea*	0.3	1
Acacia pulchella	0.3	<1
**Oxalis pes-caprae*	0.2	10
**Briza maxima*	0.2	1
**Carpobrotus edulis*	0.1	4
Desmocladus flexuosus	0.1	2
Hakea prostrata	0.1	<1
Banksia dallanneyi	0.1	<1
**Urospermum picroides*	0.1	<1
**Lysimachia arvensis*	<0.1	<1
**Asparagus asparagoides*	Climber	2
Cassytha racemosa	Climber	<1
Hardenbergia comptoniana	Climber	<1

* introduced species

APPENDIX 8

Coffey Environments (2010) Flora and Vegetation survey tenements M70/341 and M70/345

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

50 YEARS AN EXTRAORDINARY JOURNEY

FLORA AND VEGETATION ASSESSMENT M70/341 & M70/345 CUTLER ROAD, CARABOODA

Prepared for:

Limestone Resources Australia Pty Ltd
25-29 Frobisher Road
OSBORNE PARK WA 6017

Report Date: 18 February 2010
Project Ref: EP2010/015 - V1
ENVIPERT00893AA

Written/Submitted by:

[redacted]

Senior Environmental Scientist - Botany

Reviewed/Approved by:

[redacted]

Principal

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ENVIPERT00893AA_flora and vegetation assessment_001_bl_V1

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

50 YEARS AN EXTRAORDINARY JOURNEY

18 February 2010

Limestone Resources Australia Pty Ltd
25-29 Frobisher Road
OSBORNE PARK WA 6017

Attention: [redacted]

Dear [redacted]

RE: Flora and Vegetation Assessment, M70/341 & M70/345 Cutler Road, Carabooda

Please find enclosed Coffey Environments Report No. EP 2010/15, V1, *M70/341 & M70/345 Cutler Road, Carabooda*.

If you have any queries, please do not hesitate to contact either myself or Mr Paul van der Moezel on 9355 7100.

For and on behalf of Coffey Environments Pty Ltd

[redacted]

[redacted]
Senior Environmental Scientist - Botany

cc [redacted] Landform Research

Attachment A: Coffey Environments Report No. EP 2009/15, V1

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1	ENVIPERT00893AA_flora and vegetation assessment_001_bl_V1.docx	V1	18 February 2010	Coffey Environments Pty Ltd	BL

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ABBREVIATIONS

°C	Degrees Celsius
AHD	Australian Height Datum
APB	Agriculture Protection Board
DEC	Department of Environment and Conservation
DoE	Department of Environment
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
FCT	Floristic Community Type
Govt	Government
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometres
m	Metres
MGA	Map Grid of Australia
mm	Millimetres
PATN	Pattern analysis
PEC	Priority Ecological Community
PF	Priority Flora
PMR	Perth Metropolitan Region
PTY LTD	Proprietary Limited
SCP	Swan Coastal Plain
TEC	Threatened Ecological Community
WA	Western Australia
WAH	Western Australian Herbarium
WAPC	Western Australian Planning Commission
WGS84	World Geodetic System 1984

EXECUTIVE SUMMARY

Introduction/Background

Coffey Environments was commissioned by Landform Research on behalf of Limestone Resources Australia Pty Ltd to undertake *a* detailed flora and vegetation assessment of the un-mined, vegetated portion of Mineral Lease M70/341 and M70/345, Nowergup, to satisfy the requirements of the Department of Environment and Conservation. Further information was required by way of a Level 2 early and late Spring assessment with numerical (computer) analysis of the floristic data. The study area is located in the City of Wanneroo, approximately 40 kilometres (km) north-northwest of the Perth Central Business District and 15km north of Joondalup. The study area covers approximately 16 hectares consisting of bushland and is proposed for limestone extraction.

Ms Bethea Loudon, a botanist from Coffey Environments, conducted a flora and vegetation assessment of the study area over two phases in early Spring (i.e. September/October 2009) and again (Phase 2) in late Spring (i.e. November 2009). This was in accordance with Environmental Protection Authority (EPA) guidance statement recommendations to enable the capture of ephemeral and late flowering species. The assessment was undertaken to provide a description of the dominant vegetation types, vegetation condition and flora species present, including any significant species. Floristic data collected were analysed by PATN computer analysis to determine the Floristic Community Types on the subject land and whether any of these were a Threatened Ecological Community.

Results

The vegetation occurring within the study area is mapped as consisting of the *Cottesloe – Central and South* vegetation complex of which 36% remains in the Perth Metropolitan Region of the Swan Coastal Plain. This complex is not considered to be regionally significant as it is above the recommended minimum 10% retention threshold.

Six vegetation types were identified within the study area. In general the vegetation types represented *Banksia* Low Open Forest to Low Woodland on deep sand and *Banksia sessilis* Tall Open Scrub with *Xanthorrhoea preissii* on limestone substrate. The vegetation condition ranged from Excellent-Very Good to Good-Degraded with only minor weed invasion.

Based on the PATN analysis, the vegetation was considered to represent Floristic Community Types FCT 24 'Northern Spearwood shrublands and woodlands', a Priority 3 Priority Ecological Community, and FCT 28 'Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands', a common floristic community type considered to be well reserved and at low risk of extinction. The vegetation types of the study area were not considered to represent any known Threatened Ecological Communities based on PATN analysis of the quadrat data.

A total of 135 flora species were recorded from the study area. This included 98 native and 37 non-native, introduced (weed) species.

Two Priority species (*Acacia benthamii* – Priority 2 and *Jacksonia sericea* – Priority 4) were recorded from the study area during the flora and vegetation assessment along with two other species, possibly a third, that have been identified as significant flora of the Spearwood dunes under Bush Forever (*Petrophile axillaris, Lechenaultia linarioides* and *Conostylis aculeata* subsp. *cygnorum*, the latter of which identification to subspecies level is not certain). All significant flora species identified in the DEC database searches would have been identifiable during the dual-phased assessment if present.

A registered Bush Forever Site (No. 290 - 'Hopkins Road Bushland, Nowergup') occurs over the entire study area.

EXECUTIVE SUMMARY

Discussions with the Department of Environment and Conservation and the Department of Planning are required in regards to potential impacts on the conservation significant flora and vegetation, and the Bush Forever site. It is unlikely that the Commonwealth *Environment Protection and Biodiversity Conservation Act (EPBC) 1999* will have effect on the proposed development of the study area with regard to flora or vegetation. Impacts on fauna species protected under the *EPBC Act 1999* have not been addressed in this report.

1 INTRODUCTION

1.1 Background

Coffey Environments was commissioned by Landform Research on behalf of Limestone Resources Australia Pty Ltd to undertake a detailed flora and vegetation assessment of the un-mined, vegetated portion of Mineral Lease M70/341 and M70/345, Nowergup. The study area covers approximately 16 hectares (ha) and is proposed for limestone extraction.

A previous Level 1 flora and vegetation investigation of the study area was undertaken by Landform Research in November 2007 as part of a mining proposal (Landform Research, 2008). The current assessment was undertaken to satisfy the requirements of the Department of Environment and Conservation (DEC) to provide further information by way of a Level 2 early and late Spring assessment with numerical (computer) analysis of the floristic data.

1.2 Scope of Works

The scope of works for the vegetation assessment was as follows:

- Sample permanent 10 metres x 10 metres (m) quadrats located within representative vegetation types on two occasions, one (Phase 1) in early Spring (i.e. September/October) and again (Phase 2) in late Spring (i.e. November) to record late flowering species
- Map and describe the vegetation types based on Muir (1977) and Aplin's (1979) classification for structural units in Government of Western Australia (Govt of WA) (2000b), using a combination of recent aerial photography and field survey to ground-truth;
- Map vegetation condition using the Bush Forever condition rating;
- Provide a list of all native and non-native plant species recorded within the study area;
- Conduct a site walkover to search for conservation significant species and record any other species not found within quadrats;
- Review the DEC's threatened species (i.e. Declared Rare Flora (DRF) and Priority Flora (PF) and Threatened Ecological Communities (TEC) database, incorporating a list of significant species and communities recorded on the databases as occurring in the vicinity of the study area;
- Identify and record the location of any significant plant species or ecological communities recorded within the study area during the survey;
- Undertake PATN analysis of floristic data recorded to determine the presence of any TECs or Priority Threatened Ecological Communities (PECs);
- Discuss the conservation significance of flora and vegetation identified within the study area in a local, regional context and national context; and
- Discuss the potential flora and vegetation constraints associated with the development of the site and implications of the Commonwealth's *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

2 EXISTING INFORMATION

2.1 Location

The study area is located in the City of Wanneroo within the suburb of Nowergup (Cutler Road is situated within the suburb of Carabooda), approximately 40 kilometres (km) north-northwest of the Perth Central Business District (Figure 1) and 15km north of Joondalup. The study area is bounded by Cutler Road to the west, Hopkins Road to the east, Old Yanchep Road to the north and Limestone Resources' existing quarry to the south.

2.2 Existing Land Use

The study area is currently vegetated crown land covered by two existing mineral leases (M70/341 and M70/345), abutting an existing limestone quarry (M70/341 and M70/109) managed by Limestone Resources Australia Pty Ltd. The southern portion and a section in the western portion of the study area are comprised of limestone substrate with vegetation typical of limestone formations (vegetation type TOSBsOSXp and TOSBsXp, see Figure 2). The southern portion has been ripped in the past but has since regenerated. Overhead powerlines run along the northern boundary of the study area. The site is prone to dumping of household refuse and recreational vehicle activity.

2.3 Geological and Physiographic Context of the Subject Land

2.3.1 Climate

The study area is located on the Swan Coastal Plain (SCP) which experiences a Mediterranean climate with cool wet winters and warm dry summers.

The annual mean daily minimum and maximum temperatures for nearby Beenyup (approximately 16km from Nowergup) are 12.3°C and 24.1°C respectively. The annual mean rainfall for Beenyup is approximately 760 millimetres (mm) per year with the majority of precipitation falling between April/May and September/October. Rainfall data for Beenyup was incomplete for 200, however Tamala Park (Mindarie), situated approximately 8km from Nowergup, received approximately 550mm of rainfall during 2009 (Bureau of Meteorology, 2010).

2.3.2 Topography

The topography of the study area ranges from 68m Australian Height Datum (AHD) in the south, in association with the edge of a remnant limestone ridge, to 54m AHD in the northeast. Apart from the moderate slope of the limestone ridge (ranging from approximately 68m AHD to 60m AHD over 150m), the remainder of the study area consists of gentle slopes (66m AHD to 56m AHD over 560m) with a relatively flat area in the northeast in conjunction with the lowest point (Department of Environment (DoE), 2004).

2.3.3 Hydrology

No surface water or natural drainage lines occur within the study area. The depth to groundwater ranges from 44m in the west and south of the study area, to 28m in the east (DoE, 2004).

There are no wetlands within the immediate vicinity of the study area however Carabooda Lake, a Resource Enhancement sumpland, is situated 2.9km to the southwest of the study area, Nowergup Lake is approximately 3km to the south-southwest, a Resource Enhancement dampland 3.5km to the south-southeast and a Multiple Use sumpland 2km to the east (northern part of Lake Pinjar) (Landgate, 2010).

2.3.4 Landform, Soils and Geology

Landform and Soils

The study area consists of the *Cottesloe* landform and soil unit, comprised of a low hilly landscape with shallow brown sands over limestone with exposed limestone (Churchward and McArthur, 1980). This unit occurs across the entire study area.

Geology

The geology of the study area is mainly comprised of Limestone (*Ls* – light yellowish brown, fine to coarse-grained, sub-angular to well rounded quartz, a trace of feldspar, shell debris, variably lithified. Surface kankar of eolion origin), with a narrow section along the northern side of the study area consisting of Sand (S_7 – pale and olive yellow, medium to coarse-grained, sub-angular quartz and a trace of feldspar, moderately sorted, of residual origin) (Gozzard, 1982).

The study area is situated on the Spearwood Dunes geomorphological unit (Gozzard, 1982).

2.4 Biological Context of the Subject Land

2.4.1 Bioregional Data

The Australian environment has been categorised into biogeographic regions (based on geology, landform, vegetation, fauna and climate) known as IBRA (Interim Biogeographic Regionalisation for Australia) regions.

Based on IBRA mapping, the study area lies within the Perth Sub-region of the Swan Coastal Plain Bioregion. The Swan Coastal Plain Bioregion is comprised mainly of woodlands dominated by *Banksia* species or *Eucalyptus gomphocephala* (Tuart) on low-lying sandy soils, with *Casuarina obesa* (Swamp Sheoak) on outwash plains and *Melaleuca* species (Paperbarks) in swampy areas. The eastern side is dominated by *Eucalyptus marginata* (Jarrah) woodlands on higher elevations of duricrusted Mesozoic sediments, while three sets of dune formations line the coastal area (Thackway and Cresswell, 1995).

The Perth Sub-region is composed of heath and/or *Eucalyptus gomphocephala* (Tuart) woodlands on limestone or younger sands, *Banksia* and *Banksia-Eucalyptus marginata* (Jarrah) woodlands on older dune systems and *Corymbia calophylla* (Marri) on colluvial and alluvial soils. The Perth Sub-region includes a complex series of seasonal wetlands (DEC, 2002).

2.4.2 Beard's Vegetation Mapping

According to Beard (1990) the vegetation of the study area is located within the Drummond Botanical Sub-district of the Swan Coastal Plain Sub-region. The Drummond Botanical Sub-district is mainly comprised of *Banksia* low woodland on leached sands with *Melaleuca* swamps where ill-drained; woodland of *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) on less leached soils.

Beard (1981) maps the vegetation type of the study area as consisting of *Banksia* (*attenuata* and *menziesii*) Low Woodland on Limestone.

Beard's mapping of phytogeographic regions are based on natural delineations in vegetation and landscape, divisible in to regions and further broken down in to Botanical districts - the boundaries of Western Australia's IBRA regions are broadly compatible with those of Beard's phytogeographic regions (DEC, 2010).

2.4.3 Vegetation Complexes

According to mapping of the Swan Coastal Plain by Heddle *et al.* (1980), the study area falls within the *Cottesloe – Central and South* Vegetation Complex. The pre-European structure of this complex is described as consisting of a mosaic of *Eucalyptus gomphocephala* (Tuart) – *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri) woodland, with closed heath on limestone outcrops.

2.4.4 Previous Biological Assessments

A previous Level 1 flora and vegetation investigation of the study area was undertaken by Landform Research in November 2007 as part of a mining proposal.

Landform Research reported that the study area contained the Priority 4 species *Jacksonia sericea* and the conservation significant species *Lechenaultia linarioides* and *Petrophile serruriae* subsp. nov (GJ Keighery 11421) [now known as *Petrophile axillaris*] as listed in Bush Forever (Govt of WA, 2000b). Two vegetation types were recorded:

- Limestone Closed Shrubland – predominantly a shrubland consisting of *Dryandra [Banksia] sessilis, Dryandra lindleyana* var. *lindleyana [Banksia dallanneyi* var. *dallanneyi], Hakea trifurcata, Acacia pulchella, Hibbertia hypericoides, Acacia lasiocarpa* var. *lasiocarpa, Hardenbergia comptoniana, Xanthorrhoea preissii, Phyllanthus calycinus* and *Melaleuca systena* in Degraded to Good condition; and
- Banksia Eucalypt Woodland – *Banksia attenuata* and *Eucalyptus marginata* with occasional *Acacia rostellifera* and *Acacia saligna* over low shrub of *Hibbertia hypericoides, Petrophile serruriae, Patersonia occidentalis* and *Xanthorrhoea preissii* in Good to Excellent condition.

Floristic Community Type (FCT) 26b (Woodlands and Mallees on Limestone) and FCT 28 (Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* Woodlands), both common vegetation communities were noted as occurring within the study area based on comparison to species composition and FCT descriptions in Gibson *et al.* (1984) (Landform Research, 2008).

2.4.5 Bush Forever

The Bush Forever Strategy is a ten year strategic plan which formally commenced in 2000 to protect approximately 51,200ha of regionally significant bushland within approximately 290 Bush Forever Sites, representing where achievable, a target of at least 10 percent of each of the original 26 vegetation complexes of the Swan Coastal Plain portion of the Perth Metropolitan Region (Govt of WA, 2000a).

The *Directory of Bush Forever Sites* (Bush Forever Volume 2, Government of Western Australia) indicates that part of Bush Forever Site 290 'Hopkins Road Bushland, Nowergup' covers the entire study area (Figure 3). Site 290 in its entirety covers 406.9ha of bushland, providing a linkage to bushland to the south (including Bush Forever Site 293) and to the west. It was selected for its representation of ecological communities and rarity (the DRF taxon *Eucalyptus argutifolia* occurs elsewhere in Site 290), and is subject to protection under the *EPBC Act 1999*. Bush Forever Site 290 contains vegetation representing the *Karrakatta – Central and South* and the *Cottesloe - Central and South* vegetation complexes. Quenda (*Isoodon obesulus fusciventer*), also known as the Southern Brown Bandicoot, is a significant mammal species listed as occurring in Site 290 (Govt of WA, 2000b). Quenda are listed under the DEC's Priority Fauna List as *Priority 5 – taxa in need of monitoring*.

The Department of Environmental Protection (1999 - edge inspection), Mattiske Consulting Pty Ltd (1997) and Water Authority of Western Australian (1995) conducted limited flora and vegetation surveys for Bush Forever Site 290 (Govt of WA, 2000b). Structural units were described as:

- Sands derived from Tamala Limestone -
    - Woodlands dominated by *Eucalyptus marginata, Banksia attenuata* and *B. grandis*;
    - Banksia species Woodland with emergent *Eucalyptus gomphocephala*;

  - Banksia species Woodland with scattered *Eucalyptus todtiana* and *E. marginata.*

- Tamala Limestone –
  - Closed Heath dominated by *Xanthorrhoea preissii, Dryandra [Banksia] sessilis* var. *cygnorum, Melaleuca huegelii* and *M. systena.*

Vegetation condition was considered to be Excellent by Mattiske Consulting Pty Ltd (1997). FCT 26b and FCT 28 were inferred as occurring within Bush Forever Site 290. No sampling was undertaken and the site was not assessed for the occurrence of TECs, however the site was listed as a Bush Forever site for its 'Representation of ecological communities, Rarity'. Significant flora included *Eucalyptus argutifolia,* a rare species, and typical Tamala Limestone taxa – *Melaleuca huegelii* (Govt of WA, 2000b).

3 FLORA AND VEGETATION SURVEY METHODOLOGY

3.1 Survey Methodology

Ms Bethea Loudon, an experienced botanist from Coffey Environments, conducted a Level 2 flora and vegetation assessment of the study area in early Spring (12 and 15 October 2009) and late Spring (24 November 2009). The assessment was undertaken to provide a description of the dominant vegetation types, vegetation condition and flora species present, including any significant species. Floristic data collected were analysed by PATN computer analysis to determine the Floristic Community Types (FCTs) on the subject land and whether any of these were a Threatened Ecological Community (TEC).

The field assessment involved sampling from permanent quadrats of 10m x 10m dimension within representative vegetation types. A site walkover was also undertaken to record all plant species present at the time of the assessment (i.e. those species not recorded from within quadrats) and to search for significant flora (i.e. DRF and Priority taxa, significant flora of the Spearwood Dunes as identified in Bush Forever (Govt of WA, 2000b)). This method complies with Coffey Environments' interpretation of the Environmental Protection Authority (EPA) guidelines for flora surveys as outlined in Guidance Statement No. 51 - *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection Position Statement No. 3* (EPA, 2002). The timing of the surveys in the two-phased assessment was considered optimal for the region for the identification of annual and ephemeral species occurring within the study area.

The study area was accessed by vehicle along existing tracks and on foot. The major vegetation types and associated flora were surveyed and delineated using a combination of colour aerial photography and ground-truthing, with quadrats recorded in areas of representative vegetation types. Two quadrats were placed in each vegetation type that was intact, in good condition and covered a large area. Where these factors were less, only one quadrat was placed in that vegetation type.

Common species that were well known to the botanist were identified in the field. Specimens of all unknown species were collected, assigned a unique number to facilitate tracking and pressed that day. These specimens were then identified using various taxonomic identification resources on return from the field and by comparing against specimens held at the Western Australian Herbarium where required.

The following data were collected from permanent 10m x 10m quadrats:

Location – Map Grid of Australia (MGA) coordinates (equivalent of World Geodetic System (WGS) 84) were taken from the northwest corner of each quadrat using a hand-held Magellan Global Positioning System (GPS) to an accuracy of 5m;

Vegetation Description - Vegetation was described and mapped according to the structure and species composition of the dominant stratum using the system adapted from Muir (1977) and Aplin (1979) in Govt of WA (2000b);

Disturbance Details - Vegetation condition was assessed using the condition rating scale adapted from Bush Forever (Govt of WA, 2000b);

Habitat - Habitat was described based on landform, aspect and slope;

Percentage Foliage Cover and Height - Cover and height were estimated visually for each species recorded within a quadrat. Estimates were made to the nearest percentage and height where possible; and

Soil - Colour and soil texture within each quadrat was recorded.

3.1.1 Floristic Community Types

Floristic analysis (i.e. the analysis of variation in vegetation based on the species present, rather than a description of structural variation and dominance) as a significant component of the understanding of the variation present in the native vegetation of the Swan Coastal Plain relates to Gibson *et al.* (1994), the survey and publication that documents the floristic and vegetation composition of the southern Swan Coastal Plain.

The species composition of each quadrat sampled during a survey are be compared against the results of Gibson *et al.,* (1994) (on a presence/absence basis) to determine FCTs occurring in a study area. Alternatively PATN analysis of quadrat data can also be conducted in an attempt to more definitively define the FCTs present. The PATN analysis involves four modules of classification. These are:

- ASO (calculation of similarity matrix);
- FUSE (classification based on the results on the results of ASO);
- DEND (Dendrogram - representation of classification); and
- NNB (Nearest Neighbour – determination of sites most similar to each site).

In this case, PATN analysis of the quadrat data collected from the Limestone Resources Pty Ltd Carabooda study area was conducted independently by E.A. Griffin and Associates.

3.2 Database Searches

Prior to conducting the field survey, a desktop search for significant flora and vegetation communities was undertaken to identify significant flora or TEC that could potentially occur in the study area. This investigation encompassed a review of the following databases:

- The DEC 'Threatened Flora' database;
- The DEC 'Declared Rare and Priority Flora List' which contains species that are Declared Rare (Conservation code R or X for those presumed to be extinct), poorly known (Conservation codes 1, 2 or 3) or require monitoring (Conservation code 4);
- The Western Australian Herbarium (WAH) specimen database; and
- The DEC 'Threatened Ecological Community' database.

3.2.1 Vegetation

The results of the TEC database search are presented in Table 1 (DEC, 2009b). Several occurrences of one TEC and three PECs are recorded as occurring in the vicinity of the study area, however there are no known occurrences of TECs or PECs recorded within the study area.

TABLE 1

THREATENED & PRIORITY ECOLOGICAL COMMUNITIES RECORDED IN THE VICINITY OF THE STUDY AREA (DEC, 2009b)

TEC Id	Description	DEC Conservation Category	Commonwealth Conservation Category*
SCP 22#	*Banksia ilicifolia* woodlands	Priority 2	n/a

TEC Id	Description	DEC Conservation Category	Commonwealth Conservation Category*
SCP 23b#	Northern *Banksia attenuata - Banksia menziesii* woodlands	Priority 3	n/a
SCP 24	Northern Spearwood shrublands and woodlands	Priority 3	n/a
SCP 26a	Limestone ridges: *Melaleuca huegelii - Melaleuca acerosa* (currently *M. systena*) shrublands on limestone ridges	Endangered	n/a

**Category under the Commonwealth EPBC Act 1999 (DEWHA, 2010a)*
 # Occur within approximately 5km of the study area (other TECs/PECs listed were beyond this range)

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English and Blythe, 1997). TECs are communities that have been assessed and assigned one of three categories under the *EPBC Act 1999* - Critically Endangered, Endangered and Vulnerable (DEWHA, 2010), or a fourth category as classified by English and Blyth (1997) - Presumed Totally Destroyed. PECs are possible threatened ecological communities that have been assessed but do not meet survey criteria or are not adequately defined are listed as Priority 1, 2 or 3; communities that are adequately known, are rare but not threatened, meet criteria for Near Threatened, or have been removed from the threatened list are listed as Priority 4; and Conservation Dependent communities as Priority 5 (DEC, 2007). TECs may be recognised at both the State and Commonwealth level however PECs are only recognized at the State level.

Commonwealth legislation protects native vegetation communities classified as Threatened under Schedule 2 of the *EPBC Act 1999*, while TECs at the State level have no statutory protection under the *Environmental Protection Act 1980* or the *Wildlife Conservation Act 1950*.

3.2.2 Flora

The results of the flora database search are presented below in Table 2 (DEC, 2009a). Based on the database results, no significant flora is recorded as occurring within the study area.

TABLE 2

DEC LISTED DECLARED RARE AND PRIORITY FLORA PREVIOUSLY RECORDED IN THE VICINITY OF THE STUDY AREA (DEC, 2009a)

Species	DEC Status	EPBC Act Status	Preferred Habitat	Flowering Period
Acacia benthamii	P2	-	Sand, typically on ironstone breakaways	Aug-Sep
Eucalyptus argutifolia	R - Vulnerable	Vulnerable	Shallow soils over limestone, slopes or gullies of limestone ridges, outcrops	Mar-Apr
Jacksonia sericea	P4	-	Calcareous and sandy soils	Dec-Feb
Leucopogon sp. Yanchep (M. Hislop 1986)	P3	-	Light grey-yellow sand, brown loam, limestone, laterite, granite, coastal plain, breakaways, valley slopes, low hills	Apr-Jun/Sep
Melaleuca sp. Wanneroo	P1	-	Limestone ridges, Melaleuca	Dec

Species	DEC Status	EPBC Act Status	Preferred Habitat	Flowering Period
(G.J. Keighery 16705)			thickets	
Stylidium maritimum	P3	-	Sand over limestone, dune slopes and flats, coastal heath and shrubland, open Banksia woodland	Sep-Nov

Note: (Conservation codes as defined by the DEC)

R Declared Rare Flora - extant, 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.

P1 Priority One - Poorly known taxa, which are known from one or a few (<5) populations which are under threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need for further survey.

P2 Priority Two - Poorly known taxa, which are known from one or a few (<5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

P3 Priority Three - Poorly known taxa, which are known from several populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.

P4 Priority Four - Rare 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.

3.3 Limitations

The potential limitations of the Spring 2009 flora and vegetation assessment within the study area are presented below in Table 3. Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey.

TABLE 3

STATEMENT OF BOTANICAL SURVEY LIMITATIONS

POTENTIAL LIMITATIONS	CONSTRAINTS (YES/NO); SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
Competency/experience of the consultant conducting the survey	No constraints	Botanist with extensive survey experience and taxonomic skills.
Proportion of the flora identified	No constraints	Approximately one and a half days spent in study area.
Sources of information (historic/recent or new data)	No constraints	Relatively well documented.
Proportion of the task achieved and further work that may need to be undertaken	No constraints	All objectives of the task achieved.
Timing/weather/season/cycle	No constraint	The timing was considered optimal, with adequate seasonal rainfall preceding the

POTENTIAL LIMITATIONS	CONSTRAINTS (YES/NO); SIGNIFICANT, MODERATE OR NEGLIGIBLE	COMMENT
		survey.
Intensity of survey (e.g. In retrospect was the intensity adequate)	No constraints	The vegetation of the entire study area was mapped and comprehensively surveyed.
Completeness (e.g. was relevant area fully surveyed)	No constraints	
Resources (e.g. degree of expertise available for plant identification)	No constraints	An experienced botanist undertook plant identifications using relevant plant identification resources, including the WAH reference collection.
Remoteness and/or access problems	No constraints	Site accessible by vehicle and on foot.
Availability of contextual (e.g. bioregional) information for the survey area.	No constraints	Beard (1981, 1990), Churchward and McArthur (1980), DoE (2004), Gozzard (1982), Heddle *et al.* (1980).

4 FLORA AND VEGETATION RESULTS

4.1 Vegetation

4.1.1 Vegetation Types

Vegetation types were described using the species composition, density and structure of the dominant stratum. The structure was classified according to the system based on Muir (1977) and Aplin (1979) (Table 4) in Govt of WA (2000b).

TABLE 4

VEGETATION STRUCTURAL CLASSES

Life Form/Height Class	Canopy Cover (percentage)			
	70-100%	**30-70%**	**10-30%**	**2-10%**
Trees over 30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees under 10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Tree Mallee	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs over 2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs under 1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

Five vegetation types were identified within the study area during the 2009 survey. These vegetation types are described below and mapped in Figure 2:

LOFBa - Low Open Forest of *Banksia attenuata, Allocasuarina fraseriana* and *Banksia menziesii* to 8m over Tall Open Shrubland of *Xanthorrhoea preissii* to 2.5m over Open Low Heath of *Hibbertia hypericoides* and *Allocasuarina humilis* to 0.8m over Very Open Grassland of **Avena barbata* and **Briza maxima* to 0.9m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.6m. This vegetation type occurred along the western side of the study area in yellow-brown sand and was in Very Good condition with higher occurrences of weed species along the western boundary. Occasional trees of *Eucalyptus todtiana* (Coastal Blackbutt) were observed in the northern portion of this vegetation

type. Floristic data representative of this vegetation type was collected from Quadrat 1 (see Appendix C).

LWBa - Low Woodland of *Banksia attenuata* and *Allocasuarina fraseriana* to 6.5m over Tall Shrubland of *Xanthorrhoea preissii* and *Hakea prostrata* to 3.5m over Low Open Shrubland of *Hibbertia hypericoides* to 0.9m over Very Open Sedgeland of *Tetraria octandra* and *Mesomelaena pseudostygia* to 0.8m over Open Grassland of **Briza maxima* and **Brachypodium distachyon* to 0.4m over Very Open Herbland of *Desmocladus flexuosus* to 0.2m. Vegetation type LWBa occurred in a narrow strip from the southwest corner of the study area through the middle of the site to the northern boundary in yellow-brown sand. This area was in Good condition having a higher density of weed species with a sparser understorey of native species. Floristic data representative of this vegetation type was collected from Quadrat 3 (see Appendix C).

TOSBsOSXp - Tall Open Scrub of *Banksia sessilis* to 2.4m over Open Shrubland of *Xanthorrhoea preissii*, *Melaleuca systena* and *Hakea lissocarpha* to 1.1.6m over Low Open Shrubland of *Jacksonia sericea* and *Hibbertia hypericoides* to 0.9m over Very Open Grassland of **Brachypodium distachyon* to 0.4m over Very Open Herbland of **Anagallis arvensis* var. *caerulea*, **Hypochaeris glabra* and **Urospermum picroides* to 0.25m. This vegetation type occurred on the limestone hill slope in light brown sandy loam, along the southern boundary of the study area. The majority of this area has been ripped in the past with good regeneration and moderate weed levels resulting in a Good condition for most parts. However some areas (i.e. the northern limit of the vegetation type) were highly infested with weeds resulting in a Good-Degraded condition. Floristic data representative of this vegetation type was collected from Quadrat 6 (see Appendix C).

TOSBsXp - Tall Open Scrub of *Banksia sessilis* and *Xanthorrhoea preissii* to 3.5m over Low Shrubland of *Hibbertia hypericoides* and *Jacksonia sericea* to 0.9m over Very Open Grassland of **Brachypodium distachyon* to 0.22m and Very Open Herbland of *Desmocladus flexuosa* to 0.11m. This vegetation type occurred towards the western side of the study area extending from the northern boundary in association with yellow-brown sand over subsurface limestone pinnacles. Although native species composition was diverse and relatively well structured, weed invasion, rabbit activity and open, bare areas resulted in a lesser condition of Very Good-Good. Occasional trees of *Banksia attenuata* and *Eucalyptus todtiana* were scattered through the northern portion of the vegetation type. Floristic data representative of this vegetation type was collected from Quadrat 2 (see Appendix C).

WEmLWBa - Woodland of *Eucalyptus marginata* to 14m over Low Woodland of *Banksia attenuata* to 5.5m over Open Shrubland of *Xanthorrhoea preissii* to 2m over Low Shrubland of *Hibbertia hypericoides* to 0.4m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.5m over Very Open Herbland of **Urospermum picroides* to 0.2m over Very Open Grassland of **Brachypodium distachyon* to 0.15m. Vegetation type WEmLWBa occurred in the eastern corner of the study area over yellow-brown sand. Good native species cover and low weed densities resulted in a vegetation condition of Excellent-Very Good. Floristic data representative of this vegetation type was collected from Quadrat 5 (see Appendix C).

WEmOWBa - Woodland of *Eucalyptus marginata* to 10m over Open Woodland of *Banksia attenuata* to 7m over Tall Open Shrubland of *Xanthorrhoea preissii* to 2.3m over Closed Low Heath of *Hibbertia hypericoides* to 0.7m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.8m over Very Open Herbland of **Urospermum picroides* to 0.2m. This vegetation type occurred in the eastern portion of the study area extending from the northern boundary on yellow-brown sand. Good native species cover and low weed densities resulted in a vegetation condition of Excellent-Very Good. Trees of *Banksia grandis* were scattered throughout the vegetation type with very occasional trees of *Eucalyptus gomphocephala* (Tuart) occurring in the south of the vegetation type. Floristic data representative of this vegetation type was collected from Quadrat 4 (see Appendix C).

4.1.2 Vegetation Condition

The condition of the vegetation was assessed using the vegetation condition rating scale of Keighery as published in Bush Forever (Govt of WA, 2000b) and is mapped in Figure 2. Keighery's condition rating scale ranges from Pristine (where the vegetation exhibits no visible signs of disturbance) to Completely Degraded (where the vegetation structure is no longer intact and without native plant species). A description of the vegetation condition ratings applicable to the study area are outlined below in Table 5.

TABLE 5

VEGETATION CONDITION RATING SCALE

EX = Excellent Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species
VG = Very Good Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing
G = Good Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by frequent very fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing
Deg = Degraded Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing

The vegetation condition within the study area ranged from Excellent-Very Good to Good-Degraded. The majority of the study area was in a Very Good condition with minor weed invasion and slightly sparser understorey contributing to lower condition scores. The southern portion of the study area (vegetation type TOSBsOSXp) was in poorer condition having been ripped in the past (Good and Good-Degraded). This area has since regenerated with native species, with higher levels of weed invasion in the more degraded area (Good-Degraded).

There was no conclusive evidence of the presence of Jarrah Dieback (*Phytophthora cinnamomi*) in the study area, although some *Banksia* deaths (old and new) were noted in vegetation type LWBa. There were no dead plants of *Xanthorrhoea preissii* or trees of *Eucalyptus marginata*. The site is prone to dumping of household refuse and recreational vehicle activity along existing tracks, particularly on the northern boundary.

Evidence of rabbit activity (faecal matter and ground scratching) was noted particularly in the areas of Quadrat 2 and Quadrat 6.

4.1.3 Floristic Community Types and Threatened Ecological Communities

Computer floristic analysis (PATN) was undertaken by E.A. Griffin and Associates using the quadrat data to determine the presence of FCTs within the study area. Appendix A provides the results of the

analysis (quadrats relating to this study area are represented by 'AA1' through 'AA6' in Figure 1 and Table 1 and 2 in the report).

Based on the PATN analysis, the vegetation was considered to represent the following FCTs:

- FCT 24 - 'Northern Spearwood shrublands and woodlands' with characteristic species including *Desmocladus flexuosus, Melaleuca systena, Xanthorrhoea preissii, Phyllanthus calycinus, Hardenbergia comptoniana, Conostylis aculeata, Lomandra maritima* and *Austrostipa flavescens*; and
- FCT 28 - 'Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands' with characteristic species including *Banksia attenuata, Xanthorrhoea preissii, Hibbertia hypericoides, Mesomelaena pseudostygia, Burchardia congesta, Desmocladus flexuosus, Gompholobium tomentosum, Petrophile linearis, Acacia pulchella* and *Conostephium pendulum*.

FCT 24 is a recognised PEC at the State level (SCP **24**, Priority 3), represented by Quadrats 2 and 6 and vegetation types TOSBsXp and TOSBsOSXp respectively, within the study area. The vegetation of the remainder of the study area is represented by FCT 28, a common FCT (Quadrats 1, 3, 4 and 5) (see Figure 2). The quadrat data did not match the composition of any known TECs.

A search of the DEC TEC database was undertaken by Coffey Environments prior to the site visit. Several occurrences of one TEC and three PECs (two of which occur within 5km), including SCP 24, were listed by the DEC as occurring in the vicinity of the study area (see Table 1). The search results indicated that there were no previously known occurrences recorded within the boundaries of the study area.

4.1.4 Conservation Significance of Vegetation

Vegetation Complex

Bush Forever recommends a minimum retention and protection of at least 10% of the pre-European extent of vegetation complexes within the Perth Metropolitan Region in at least five geographically separated areas and a minimum of 400ha. The percentage remaining of the *Cottesloe – Central and South* vegetation complex within the Perth Metropolitan Region portion of the Swan Coastal Plain is 36% (Govt of WA, 2000a). Thus the vegetation complex mapped as occurring over the study area is reasonably well represented. As the level remaining is above the 10% threshold, the vegetation complex of the study area is therefore considered not to be regionally significant.

Floristic Community Types

The majority of the study area is represented by the well reserved FCT 28, which is considered to be at low risk of extinction (Gibson *et al.*, 1994). However, the study area contains two areas of the Priority 3 PEC SCP 24 in association with a limestone substrate and is therefore at risk from potential development of the site for limestone extraction. SCP 24 (FCT 24) is considered to be well reserved in the Perth Metropolitan Region (PMR) of the SCP but susceptible to modification or destruction by human activities, or vulnerable to new threatening processes (Gibson *et al.*, 1994). Therefore these two areas within the study area are of low to moderate conservation significance, although PECs are not protected by State or Commonwealth legislation. The vegetation of the study area is not of national significance. Any potential impacts of the development on SCP 24 within the study area will require discussion with DEC.

Bush Forever

The entire study area is located within Bush Forever Site 290 – 'Hopkins Road Bushland, Nowergup'. Bush Forever Site 290 is 406.9ha in size and supports *Karrakatta Complex – Central* and South and *Cottesloe Complex – Central and South* vegetation complexes. Any potential impacts of the development on the Bush Forever Site will require discussion with the Department of Planning (DoP).

4.2 Flora

4.2.1 General

A total of 135 flora species were recorded from the study area during the two-phased flora assessment. This included 98 native species and 37 non-native (introduced) species including two Declared Weeds. The dominant families represented were the Poaceae (Grass family - three native and 11 introduced species), Proteaceae (Banksia family – 14 native species), Papilionaceae (Pea family - 10 native and two introduced species), Asteraceae (Daisy family - four native and six introduced species) and Myrtaceae (Myrtle family - seven native and one introduced species).

A complete list of the flora species recorded within the study area during the survey is provided in Appendix B. The floristic data collected from each quadrat, including photographs of the representative vegetation types, are provided in Appendix C.

Two species declared as weeds under the *Agriculture and Related Resources Protection Act 1976* were recorded within the study area during the Spring 2009 survey. Bridal Creeper (*Asparagus asparagoides*) is listed as P1 under the Act and Cape Tulip (*Moraea flaccida*) as P1 for the whole of that State (P3 and P4 for particular municipal districts not including the City of Wanneroo) (Agriculture Protection Board of WA (APB), 2008).

P1 prohibits the movement of plants or their seeds within the State via contaminated machinery and produce that may contain parts of the plants (including livestock). The guideline for the control for P1 species aims to prevent infestation spreading beyond the existing boundaries of infestation. The movement of plants or their seeds, contaminated machinery, produce, livestock and fodder is prohibited within the State (APB, 2008).

4.2.2 Conservation Significance of Flora

Two Priority flora species, *Acacia benthamii* (Priority 2) and *Jacksonia sericea* (Priority 4) were recorded from the study area during the Spring 2009 survey. The location of these species is shown in Figure 3.

Over 200 plants (203+) of *Acacia benthamii* were observed in clusters across the study area. A small number of plants occurred in vegetation type LOFBa on the western side of the study area; scattered throughout vegetation type TOSBsXp with a much higher density near the northern boundary of the study area; and in a degraded section in TOSBsOSXp along the boundary of WEmLWBa particularly near the southern boundary of the study area (see Figures 2 and 3). *Acacia benthamii* is also a significant species of the Spearwood dunes under the Bush Forever program, considered to be poorly reserved, a significant population and taxa endemic to the SCP in the PMR (Govt of WA, 2000b). The identification of *Acacia benthamii* was confirmed by Bruce Maslin, an Acacia expert from the WAH, due to its similarity in appearance and habitat to *Acacia cochlearis* (a common species).

Over 700 plants (735+) of *Jacksonia sericea* were observed scattered or in dense patches across the study in all vegetation types except WEmOWBa and WEmLWBa (though several plants occur along the track through these vegetation types, likely as a result of disturbance/past track maintenance) (see Figures 2 and 3). It is possible that further in-depth traversing of the study area would locate more plants of *Jacksonia sericea*. This species appears to be a disturbance opportunist. *Jacksonia sericea* is also a significant species of the Spearwood dunes under the Bush Forever program, considered to be poorly reserved, a significant population and taxa endemic to the SCP in the PMR (Govt of WA, 2000b).

Two other species listed as Bush Forever significant flora species of the Spearwood Dunes, *Petrophile axillaris* and *Lechenaultia linarioides* (Govt of WA, 2000b), were also recorded from the study area both from Quadrat 2. A third significant Bush Forever species, *Conostylis aculeata* subsp. *cygnorum*,

possibly occurs within the study area (recorded in Quadrat 1 and 5). However the plant's identity as subsp. *cygnorum* is not definitive due to difficulty in correctly identifying to subspecies level.

No DRF was recorded during the survey.

All significant flora species identified in the DEC database searches would have been identifiable during the survey if present. Table 6 provides a summary of the conservation significant flora recorded from the study area, with information including a map of distribution (collection records) in Western Australia and photographs in Appendix D.

TABLE 6

SIGNIFICANT FLORA RECORDED FROM THE STUDY AREA BY COFFEY ENVIRONMENTS

Species	DEC Status	EPBC Act Status	Bush Forever Status	Identification Confirmed / Determined By	Voucher Specimen*	Places of Known Occurrence	Preferred Habitat
Acacia benthamii	P2	-	Poorly reserved Significant population Endemic to SCP in PMR	Bruce Maslin WAH	Yes Coffey Environments	Cataby Gnangara Karnup Nth Dandalup Pinjarra Stake Hill Waneroo Yanchep	Sand, typically on ironstone breakaways
Jacksonia sericea	P4	-	Poorly reserved Significant population Endemic to SCP in PMR	B Loudon Coffey Environments	Yes Coffey Environments	Gnangara Karnup Koondoola Landsdale Malaga Mandurah Mullaloo Neerabup Wanneroo	Calcareous and sandy soils
Petrophile axillaris	-	-	Poorly reserved Significant population At limit of known geographical range	B Loudon Coffey Environments	-	Cervantes Coogee Gingin Jurien Bay Lancelin Mindarie Stake Hill Yalgorup Wanneroo	Red, yellow or grey sand over limestone, sandy loams and gravel, sandplains, gentle slopes, ridges
Conostylis aculeata subsp. *cygnorum*	-	-	Endemic to SCP	B Loudon Coffey Environments	-	Alexander Hts Bayswater Burns beach Ellenbrook Girrawheen Gnangara Henley Brook Koondoola Lake Pinjar South Perth Swan View	White-grey sand, limestone

Species	DEC Status	EPBC Act Status	Bush Forever Status	Identification Confirmed / Determined By	Voucher Specimen*	Places of Known Occurrence	Preferred Habitat
						Warrick	
Lechenaultia linarioides	-	-	Poorly reserved	B Loudon Coffey Environments	-	Ajana City Beach Geraldton Gingin Guilderton Kalbarri Jurien Bay Moora North Beach Northampton Shark Bay Two Rocks	Brown, grey, yellow or white sand, sometimes over limestone, red sandy clay, sandplains, low dunes, ridges, hillsides, winter-wet flats, roadverges

5 POTENTIAL IMPACTS

The two areas within the study area that are associated with a limestone substrate contain vegetation representing a Priority 3 PEC (SCP 24 'Northern Spearwood shrublands and woodlands'). PECs are not protected under State or Commonwealth law however any potential impact on these areas of vegetation requires discussion with DEC.

The entire study area is covered by Bush Forever Site 290 'Hopkins Road Bushland, Nowergup', a regionally significant area. *Bush Forever* is a non-statutory regional policy under the Western Australian Planning Commission's (WAPC) policy framework and is endorsed by the Western Australian Government, the WAPC, the EPA and other key environmental agencies (WAPC, 2004a). However the *Draft Statement of Planning Policy No. 2.8: Bushland Policy for the Perth Metropolitan Region* and the *Metropolitan Region Scheme Amendment No. 1082/33 Bush Forever and Related Lands* give statutory effect to *Bush Forever* (WAPC, 2004b) to ensure bushland protection and appropriate address of management issues (WAPC, 2004a). The draft Policy states that further development or land use proposals should be consistent with the policy measures in Section 5.1 and 5.2 of the Policy to ensure all reasonable steps are taken to avoid, minimise or mitigate any likely adverse impacts (direct or indirect) on the regionally significant bushland. Policy measures apply to any proposal that is likely to have an adverse impact, direct or indirect, on a regionally significant bushland within a Bush Forever Protection Area (WAPC, 2004b). If the study area comes under the *Bush Forever Protection Area* implementation category of *Urban, Industrial or Resource Development* (Section 5.2.2 of the draft Policy), a balance between conservation and development or resource extraction, having regard for the specific conservation values involved, will be sought and may involve a Negotiated Planning Solution with strategic outcomes that will facilitate bushland protection and development requirements (WAPC, 2000a).

Govt of WA (2000b) also states that Bush Forever Site 290 is subject to protection under the Commonwealth *EPBC Act 1999*. As the DEC and Commonwealth listed *Eucalyptus argutifolia* is not present within the study area, the *EPBC Act 1999* may not apply to this section of Site 290. Any potential impacts on the Bush Forever site will require discussion with DoP, particularly as Site 290 is considered as a site with some existing protection under the proposed 'Gnangara Park' with the existing care, control and management of the Site endorsed (Govt of WA, 2000b).

Two Priority flora species, *Acacia benthamii* (Priority 2) and *Jacksonia sericea* (Priority 4), were recorded from the study area along with two, possibly three, Bush Forever significant species - *Petrophile axillaris*, *Lechenaultia linarioides* and *Conostylis aculeata* subsp. *cygnorum* (?subsp. *cygnorum*). Although these species are not protected by State or Commonwealth law, with the latter three species being common, any potential impact on these species requires discussion with DEC.

The vegetation of the study area is mapped as the *Cottesloe – Central and South* vegetation complex. As 36% of this vegetation complex remains in the PMR of the SCP, it is not to be regionally significant. Based on this fact, any development of the study area will have minimal impact on the *Cottesloe – Central and South* vegetation complex as a whole.

As there is no Commonwealth listed conservation significant flora or ecological communities present within the study area, referral under the *EPBC Act 1999* is not required with regard to flora and vegetation impacts. Impacts on fauna species protected under the *EPBC Act 1999* have not been addressed in this report.

6 CONCLUSIONS

Based on the results of the flora and vegetation assessment of the study area, the following conclusions have been made:

- The vegetation occurring within the study area is mapped as consisting of the *Cottesloe – Central and South* vegetation complex, of which 36% remains within the Perth Metropolitan Region of the Swan Coastal Plain (Govt of WA, 2000). This vegetation complex is not considered to be regionally significant as it is above the minimum 10% retention threshold;
- A section of a registered Bush Forever Site (No. 290 - 'Hopkins Road Bushland, Nowergup') occurs over the entire study area. Site 290 in its entirety covers 406.9ha of bushland and is a regionally significant bushland having particular conservation value for its representation of ecological communities and rarity (the DRF taxon *Eucalyptus argutifolia* occur and the Priority 5 Southern Brown Bandicoot occur within Site 290) and in providing linkage to bushland to the south (including Bush Forever Site 293) and to the west (Govt of WA, 2000b);
- Six vegetation types were identified within the study area. In general the vegetation types represented *Banksia* Low Open Forest to Low Woodland on deep sand and *Banksia sessilis* Tall Open Scrub with *Xanthorrhoea preissii* on limestone substrate;
- Based on the PATN analysis, the vegetation was considered to represent the following FCTs:
    - FTC 24 - 'Northern Spearwood shrublands and woodlands'; and
    - FCT 28 - 'Spearwood *Banksia attenuata* or *Banksia attenuata-Eucalyptus* woodlands'
- The vegetation types were not considered to represent any known TECs as defined by the *EPBC Act 1999* or the DEC;
- The vegetation represented by Quadrats 2 and 6 represents the Priority 3 PEC, SCP 24 (FCT 24) 'Northern Spearwood shrublands and woodlands' which is considered to be well reserved but susceptible to threatening processes (Gibson *et al.*, 1994);
- FCT 28 is not listed as a TEC or PEC by the DEC and is considered to be well reserved on the Swan Coastal Plain and at low conservation status risk (Gibson *et al.*, 1994);
- The vegetation condition within the study area ranged from Excellent-Very Good to Good-Degraded;
- A total of 135 flora species were recorded from the study area of which 37 were non-native, introduced (weed) species;
- The following conservation significant species were recorded from the study area:
    - *Acacia benthamii* - Priority 2, Bush Forever significant flora;
    - *Jacksonia sericea* - Priority 4, Bush Forever significant flora;
    - *Petrophile axillaris* - Bush Forever significant flora;
    - *Lechenaultia linarioides* - Bush Forever significant flora; and
    - Possibly *Conostylis aculeata* subsp. *cygnorum* - Bush Forever significant flora.
- No conservation significant flora as defined by the *EPBC Act 1999* or the DEC (i.e. DRF) were recorded from the study area;
- Two declared weeds under the *ARRP Act 1976*, *Moraea flaccida* (Cape Tulip) and *Asparagus asparagoides* (Bridal Creeper), were recorded within the study area; and
- Discussions are required with DEC and DoP due to the presence of the Bush Forever site, the PEC and conservation significant flora.

7 REFERENCES

APB, Agricultural Protection Board of WA (2008). *List of Declared Plants.* http://www.agric.wa.gov.au/PC_93088.html?s=1318510830

Aplin, T.E.H. (1979). *The Flora.* In: O'Brien B.J. (Ed.). Environment and Science. University of Western Australia Press: Western Australia.

Beard, J.S. (1981). *The Vegetation of the Swan Area, Western Australia.* Map and Explanatory Notes, Sheet 7, 1:1 000 000 Vegetation Series. University of Western Australia Press, Perth.

Beard, J.S., (1990). *Plant Life of Western Australia.* Kangaroo Press, Perth.

Bureau of Meteorology (2010). *Climate Data Online.* Commonwealth of Australia. http://www.bom.gov.au/climate/averages/

Churchward, H.M and McArthur, W.M., 1980. Landforms and Soils of the Darling System **IN:** *Atlas of Natural Resources, Darling System, Western Australia Perth, Perth Sheet.* Department of Conservation and Environment, Western Australia.

English, V. and J. Blyth (1997). *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province.* ANCA National Reserves System Cooperative Programme: Project Number N702. Final Report, May 1997.

EPA, Environmental Protection Authority (2002). *Terrestrial Biological Surveys as an Element of Biodiversity Protection: Position Statement No. 3.* Perth, Western Australia.

EPA, Environmental Protection Authority (2004). *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.* Perth, Western Australia.

DEC, Department of Environment and Conservation (2002). *A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002.* (pages 606-623: Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion). Perth, Western Australia. http://www.dec.wa.gov.au/pdf/science/bio_audit/swan_coastal_plain02_p606-623.pdf

DEC, Department of Environment and Conservation (2007). Definition of Threatened Ecological Communities. Perth, Western Australia. http://www.dec.wa.gov.au/management-and-protection/threatened-species/wa-s-threatened-ecological-communities.html

DEC, Department of Environment and Conservation (2009a). *Database search results.* Email communications from Jessica Donaldson, Threatened Flora Database Technical Officer, Species and Communities Branch. Perth, Western Australia.

DEC, Department of Environment and Conservation (2009b). *Database search results.* Email communications from Monica Hunter, Ecologist - Threatened Ecological Community Database, Species and Communities Branch. Perth, Western Australia.

DEC, Department of Environment and Conservation (2010). *FloraBase.* Western Australian Herbarium. Perth, Western Australia. http://florabase.dec.wa.gov.au/help/ibra/

Department of Environmental Protection (1999). *System 6 and Part System 1 Update Programme.* Unpublished bushland area records. Perth, Western Australia.

DEWHA, Department of Environment, Water, Heritage and the Arts (2010). *Environment Protection and Biodiversity Act 1999 List of Threatened Ecological Communities.* http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl

DEWHA, Department of Environment, Water, Heritage and the Arts (2010b). *Environment Protection and Biodiversity Act 1999 List of Threatened Flora*. http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora

DoE, Department of Environment (2004). *Perth Groundwater Atlas,* 2nd Ed. Perth, Western Australia.

Gibson, N., Keighery, B.J, Keighery, G.J, Burbidge, A.H. and Lyons, M.N., (1994). *A Floristic Survey of the Swan Coastal Plain*. Unpublished Report for the Australian Heritage Commission. Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.), Perth, Western Australia.

Government of Western Australia (2000a). *Bush Forever – Keeping the Bush in the City: Volume 1: Policies, Principles and Processes.* Western Australian Planning Commission, Perth.

Government of Western Australia (2000b). *Bush Forever – Keeping the Bush in the City: Volume 2: A Directory of Bush Forever Sites.* Western Australian Planning Commission, Perth.

Gozzard, J.R. (1982). *Muchea* Sheet 2034 I and Part of 2134 IV, Perth Metropolitan Region Environmental Geology Series 1:50 000, Geological Survey of Western Australian.

Heddle, E.M., Loneragan, O.W., Havel, J.J., (1980). *Vegetation Complexes of the Darling System Western Australia*, **IN**: Atlas of Natural Resources, Darling System, Western Australia. Department of Conservation and Environment, Perth, Western Australia.

Landform Research (2008). *Updated Vegetation Assessment M70/341 and M70/345, Cutler Road, Carabooda, Limestone Resources Australia Pty Ltd.* Unpublished report by Lindsay Stephens.

Landgate (2010). *WA Atlas - Shared Land Information Platform*. https://www2.landgate.wa.gov.au/mapviewer/bmvf/app/waatlas/

Mattiske Consulting Pty Ltd (1997). *Assessment of Bushland Patches in the Perth Metropolitan Area.* Unpublished report for the Ministry for Planning, Perth, Western Australia.

Muir, B.G. (1977). *Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve.* Records of the Western Australian Museum, Supplement No. 3.

Thackway, R. and Cresswell, I.D., (1995). *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0.* Australian Nature Conservancy Agency, Canberra.

Water Authority of Western Australian (1995). *Review of Proposed Changes to Environmental Conditions. Gnangara Mound Groundwater Resources(Section 46)*. Perth, Western Australia.

Western Australian Planning Commission (WAPC), (2004a). *Bushland Policy for the Perth Metropolitan Region Statement of Planning Policy 2.8.* Draft report for public comment. State of Western Australia, Perth.

Western Australian Planning Commission (WAPC), (2004b). *Bush Forever Protection Areas Community Guide*. State of Western Australia, Perth.

8 DISCLAIMER

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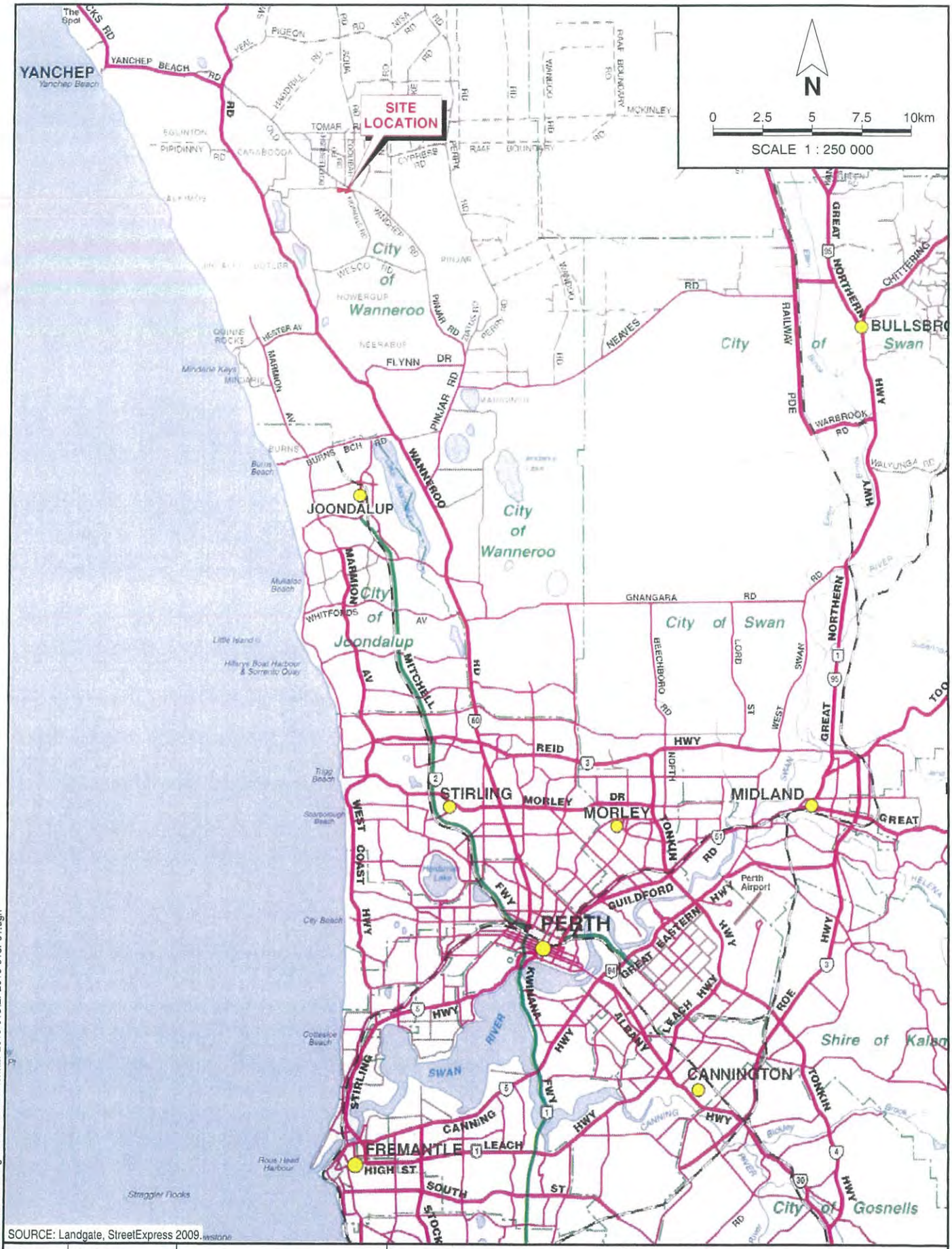
Figures

Flora and Vegetation Assessment
M70/341 & M70/345 Cutler Road, Carabooda



SOURCE: Landgate, StreetExpress 2009.

Drawn:	C. Reeves
Checked:	B. Loudon
Date:	4 Feb 2010
Projection:	MGA zn50
Scale:	1 : 250 000 at A4

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REGIONAL LOCATION

Figure 1

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Quadrat 6

Described: BL **Date:** 15/10/2009 **Type:** Quadrat (10m x10m) **Season:** Excellent

Location: Limestone ridge, southern side of site

MGA Zone: 50 382052mE, 6502549mN
Habitat: Slope, northerly aspect
Soil: Light brown sandy loam
Rock Type: Limestone
Vegetation: Tall Open Scrub of *Banksia sessilis* to 2.4m over Open Shrubland of *Xanthorrhoea preissii*, *Melaleuca systena* and *Hakea lissocarpha* to 1.1.6m over Low Open Shrubland of *Jacksonia sericea* and *Hibbertia hypericoides* to 0.9m over Very Open Grassland of **Brachypodium distachyon* to 0.4m over Very Open Herbland of **Anagallis arvensis* var. *caerulea*, **Hypochaeris glabra* and **Urospermum picroides* to 0.25m
Condition: Good
Notes: Area has been ripped a long time ago but there has been good regrowth; rabbit activity

Species List:

Name	Cover(%)	Height (m)	
Acacia pulchella	1	1.3	
**Anagallis arvensis* var. *caerulea*	3	0.15	
**Asparagus asparagoides*	<1	Climber	***Declared Weed***
Austrostipa flavescens	<1	0.25	
**Avena barbata*	<1	1.1	
Banksia sessilis	55	2.4	
Bossiaea eriocarpa	1	0.6	
**Brachypodium distachyon*	3	0.4	
**Briza maxima*	1	0.4	
**Briza minor*	<1	0.2	
**Bromus diandrus*	<1	0.4	
Caesia micrantha	<1	0.6	
Cassytha ?racemosa forma *pilosa*	<1	Climber	
**Centaurium erythraea*	<1	0.2	
Conostephium pendulum	<1	0.4	
Conostylis candicans	1	0.3	

Daucus glochidiatus	<1	0.12	
Desmocladus flexuosus	1	0.12	
Dianella revoluta	<1	0.25	
Drosera pallida	<1	Climber	
**Ehrharta longiflora*	1	0.6	
**Galium divaricatum*	<1	0.08	
**Gladiolus caryophyllaceus*	<1	1	
Hakea lissocarpha	3	1.5	
Hardenbergia comptoniana	<1	Climber	
Hibbertia hypericoides	6	0.9	
Hibbertia racemosa	<1	0.2	
Hybanthus calycinus	1	0.35	
**Hypochaeris glabra*	3	0.1	
Jacksonia sericea	3	0.9	***Priority 4***
Lepidosperma?pubisquameum	1	0.35	
Melaleuca systena	5	1.4	
Mesomelaena pseudostygia	1	0.7	
Millotia myosotidifolia	<1	0.05	
**Pelargonium capitatum*	<1	1	
Phyllanthus calycinus	1	0.7	
Podotheca gnaphalioides	<1	0.06	
**Sonchus asper*	<1	0.3	
**Sonchus oleraceus*	<1	0.15	
Sowerbaea laxiflora	<1	0.45	
Tricoryne elatior	<1	0.5	
**Trifolium dubium*	<1	0.15	
**Urospermum picroides*	2	0.25	
**Vulpia bromoides*	1	0.25	
Xanthorrhoea preissii	2	1.6	

Opportunistic Records

Described: BL **Date:** 12/10/09, 15/10/09, 24/11/09 **Type:** Opportunistic **Season:** Excellent

Species List:

Austrostipa elegantissima
Banksia grandis
Calothamnus quadrifidus
**Carpobrotus ?edulis*
Chamelaucium uncinatum
Corynotheca micrantha
**Ehrharta calycina*
Eremaea asterocarpa subsp. *asterocarpa*
Eucalyptus gomphocephala
Eucalyptus todtiana
Grevillea vestita
Hakea trifurcata
**Leptospermum laevigatum*
Microtis sp.
Moraea flaccida* ***Declared Weed*
**Pinus* sp.
Ptilotus polystachyus
**Rosmarinus officinalis*
Stirlingia latifolia
Stylidium calcaratum
Stylidium schoenoides
Tersonia cyathiflora
Thysanotus sparteus
Tripterococcus brunonis

Appendix D
Species Descriptions and Photographs

Flora and Vegetation Assessment
M70/341 & M70/345 Cutler Road, Carabooda

FloraBase
the Western Australian Flora

Plants → Fabaceae → *Acacia*

Acacia benthamii Meisn.

Pl.Preiss. 1:11 (1844)

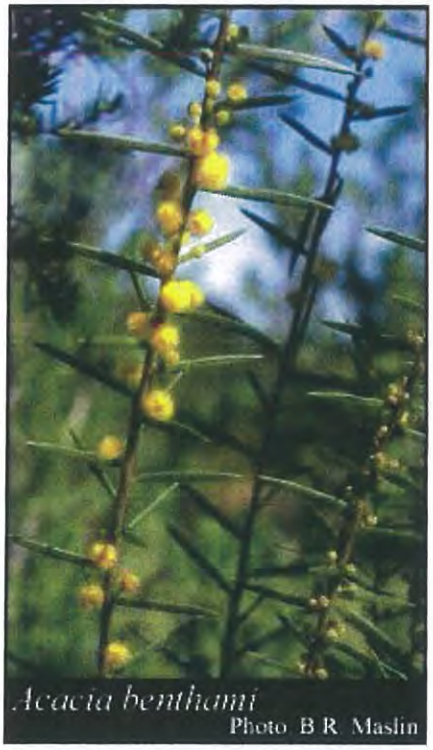
← Take me back to my last search

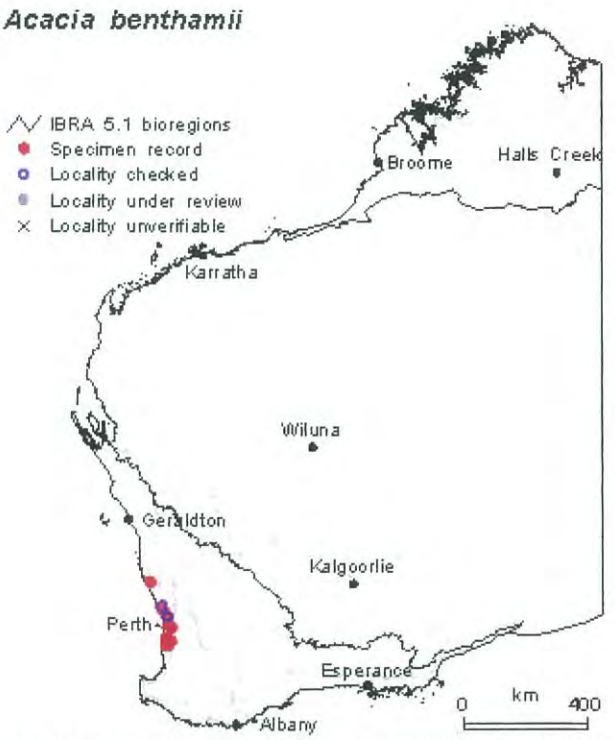
Conservation Status: Priority Two
Name Status: Current

Brief Description

Amanda Spooner, Tuesday 15 July 1997

Shrub, ca 1 m high. Fl. yellow, Aug–Sep. Sand. Typically on limestone breakaways.
Distribution: SW: SWA.





Map by Paul Gioia, WA Herbarium. Current at January 29, 2010

Department of
Environment and Conservation
Western Australian Herbarium

FloraBase
the Western Australian Flora

Plants → Haemodoraceae → *Conostylis*

Conostylis aculeata subsp. *cygnorum* Hopper

Fl Australia 45:457 (1987)

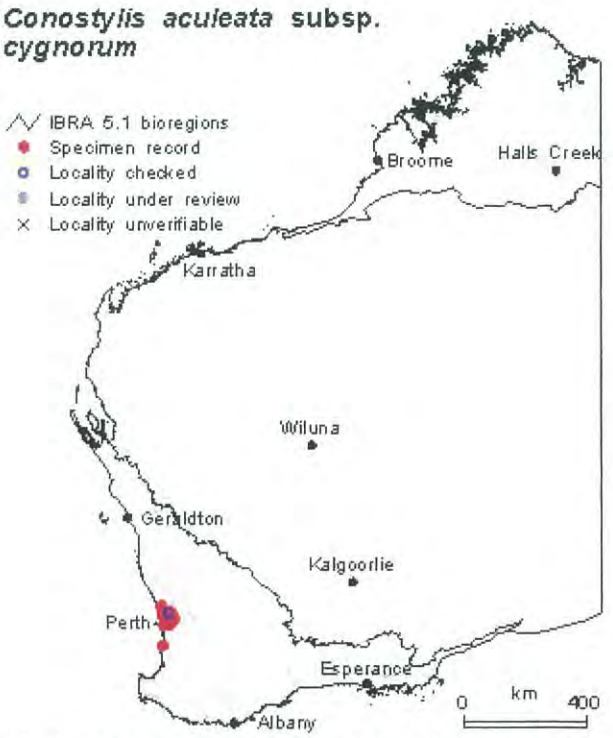
← Take me back to my last search

Conservation Status: Not threatened
Name Status: Current

Brief Description

Grazyna Paczkowska, Friday 10 June 1994

Rhizomatous, tufted or shortly proliferous perennial, grass-like or herb, 0.2–0.45 m high. Fl. yellow, Sep–Nov. White-grey sand, limestone. Distribution: SW: SWA.



Map by Paul Gioia, WA Herbarium. Current at January 29, 2010

FloraBase
the Western Australian Flora

Plants → Fabaceae → *Jacksonia*

Jacksonia sericea Benth.

Waldjumi

Endl., Fenzl, Benth. & Schott: Enum.Pl. 31 (1837)

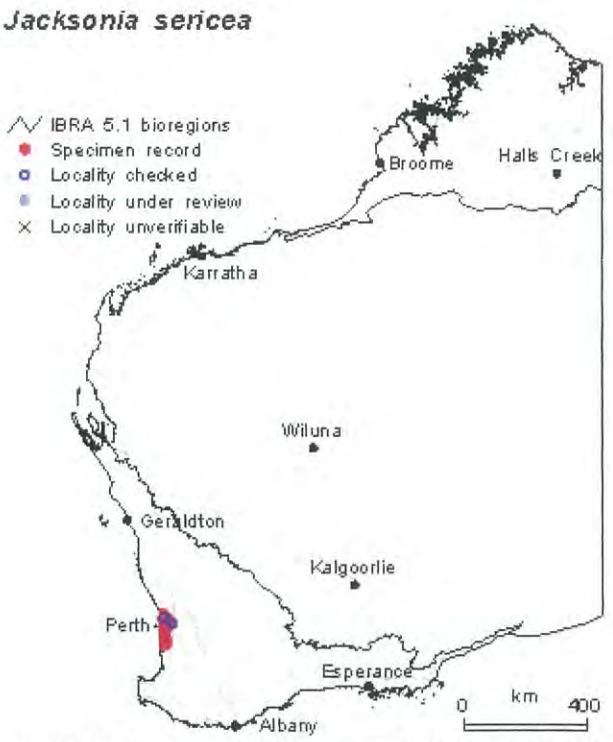
← Take me back to my last search

Conservation Status: Priority Four
Name Status: Current

Brief Description

Grazyna Paczkowska, Tuesday 25 June 1996

Low spreading shrub, to 0.6 m high. Fl. orange, Dec–Feb. Calcareous & sandy soils.
Distribution: SW: SWA.



Map by Paul Gioia, WA Herbarium. Current at January 29, 2010

Jacksonia sericea Photo I R Dixon

FloraBase
the Western Australian Flora

Plants → Goodeniaceae → *Lechenaultia*

Lechenaultia linarioides DC.

Yellow Leschenaultia

Prod. 7:519 (1839)

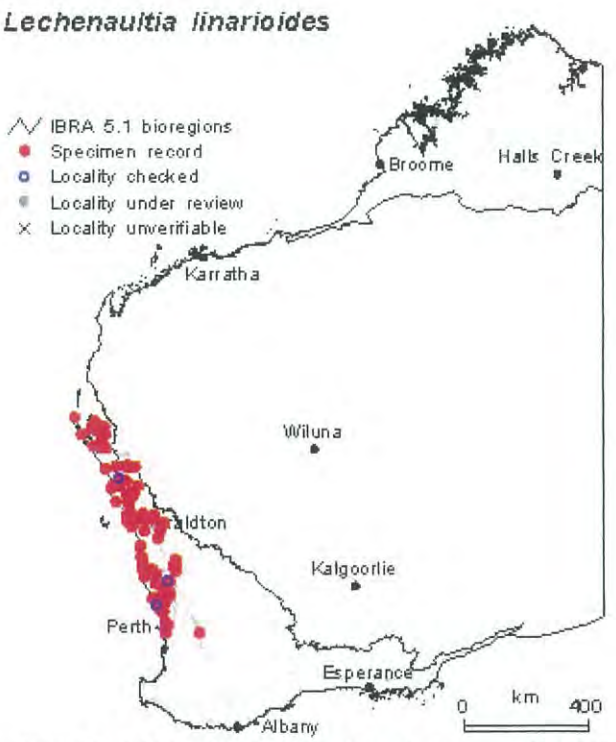
← Take me back to my last search

Conservation Status: Not threatened
Name Status: Current

Brief Description

Amanda Spooner, Wednesday 28 June 2006

Sprawling, open shrub, to 1.5 m high. Fl. red, pink, cream, yellow, Jan–Dec. Brown, grey, yellow or white sand, sometimes over limestone, red sandy clay. Sandplains, low dunes, ridges, hillsides, winter-wet flats, roadverges. Distribution: ER: CAR, YAL; SW: AW, GS, SWA.



Map by Paul Gioia, WA Herbarium. Current at January 29, 2010

Plants → Proteaceae → *Petrophile*

Petrophile axillaris Meisn.

Hooker's J.Bot.Kew Gard.Misc. 7:68 (1855)

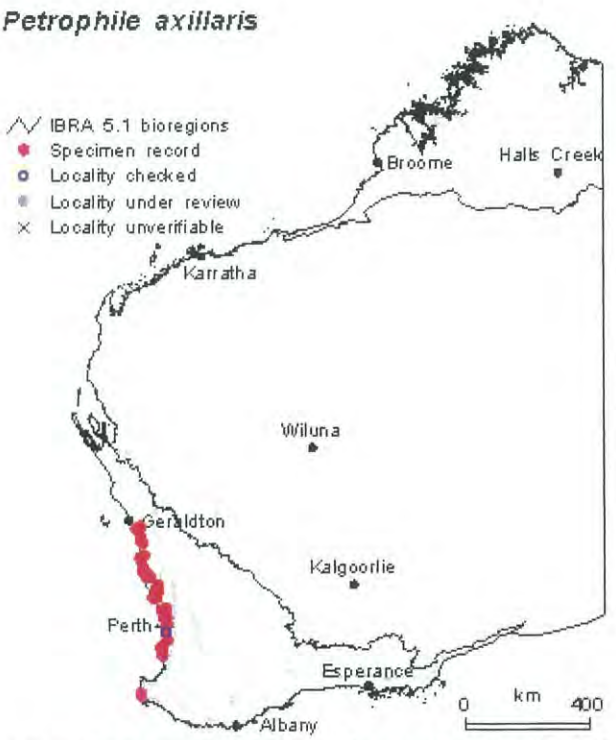
← Take me back to my last search

Conservation Status: Not threatened
Name Status: Current

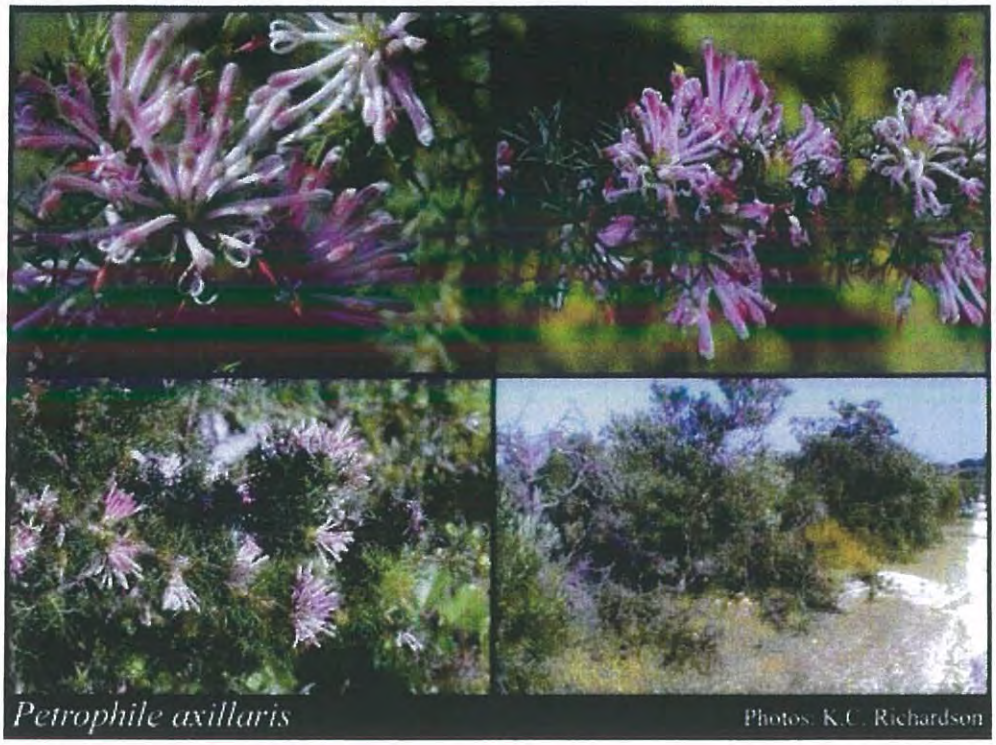
Brief Description

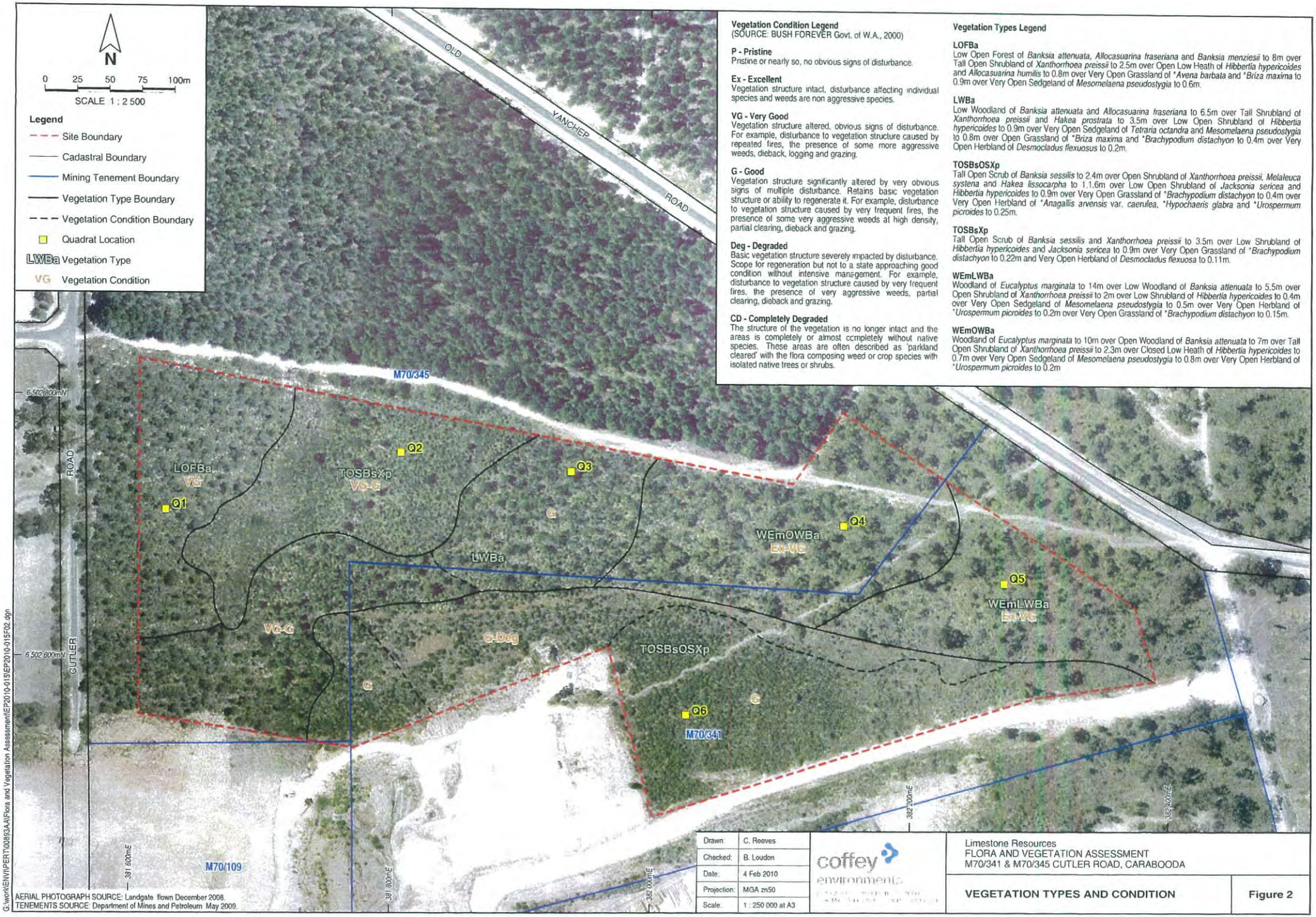
Amanda Spooner, Thursday 9 October 2003

Erect, multi-stemmed shrub, to 3 m high. Fl. pink, purple, grey, Sep–Nov. Red, yellow or grey sand over limestone, sandy loams & gravel. Sandplains, gentle slopes, ridges. Distribution: SW: GS, SWA, WAR.



Map by Paul Gioia, WA Herbarium. Current at January 29, 2010





Vegetation Condition Legend
(SOURCE: BUSH FOREVER Govt. of W.A., 2000)

P - Pristine
Pristine or nearly so, no obvious signs of disturbance.

Ex - Excellent
Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species.

VG - Very Good
Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

G - Good
Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Deg - Degraded
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

CD - Completely Degraded
The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

Vegetation Types Legend

LOFBa
Low Open Forest of *Banksia attenuata, Allocasuarina fraseriana* and *Banksia menziesii* to 8m over Tall Open Shrubland of *Xanthorrhoea preissii* to 2.5m over Open Low Heath of *Hibbertia hypericoides* and *Allocasuarina humilis* to 0.8m over Very Open Grassland of **Avena barbata* and **Briza maxima* to 0.9m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.6m.

LWBa
Low Woodland of *Banksia attenuata* and *Allocasuarina fraseriana* to 6.5m over Tall Shrubland of *Xanthorrhoea preissii* and *Hakea prostrata* to 3.5m over Low Open Shrubland of *Hibbertia hypericoides* to 0.9m over Very Open Sedgeland of *Tetraria octandra* and *Mesomelaena pseudostygia* to 0.8m over Open Grassland of **Briza maxima* and **Brachypodium distachyon* to 0.4m over Very Open Herbland of *Desmocladus flexuosus* to 0.2m.

TOSBsOSXp
Tall Open Scrub of *Banksia sessilis* to 2.4m over Open Shrubland of *Xanthorrhoea preissii, Melaleuca systena* and *Hakea lissocarpha* to 1.1.6m over Low Open Shrubland of *Jacksonia sericea* and *Hibbertia hypericoides* to 0.9m over Very Open Grassland of **Brachypodium distachyon* to 0.4m over Very Open Herbland of **Anagallis arvensis* var. *caerulea*, **Hypochaeris glabra* and **Urospermum picroides* to 0.25m.

TOSBsXp
Tall Open Scrub of *Banksia sessilis* and *Xanthorrhoea preissii* to 3.5m over Low Shrubland of *Hibbertia hypericoides* and *Jacksonia sericea* to 0.9m over Very Open Grassland of **Brachypodium distachyon* to 0.22m and Very Open Herbland of *Desmocladus flexuosa* to 0.11m.

WEmLWBa
Woodland of *Eucalyptus marginata* to 14m over Low Woodland of *Banksia attenuata* to 5.5m over Open Shrubland of *Xanthorrhoea preissii* to 2m over Low Shrubland of *Hibbertia hypericoides* to 0.4m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.5m over Very Open Herbland of **Urospermum picroides* to 0.2m over Very Open Grassland of **Brachypodium distachyon* to 0.15m.

WEmOWBa
Woodland of *Eucalyptus marginata* to 10m over Open Woodland of *Banksia attenuata* to 7m over Tall Open Shrubland of *Xanthorrhoea preissii* to 2.3m over Closed Low Heath of *Hibbertia hypericoides* to 0.7m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.8m over Very Open Herbland of **Urospermum picroides* to 0.2m

AERIAL PHOTOGRAPH SOURCE: Landgate flown December 2008.
TENEMENTS SOURCE: Department of Mines and Petroleum May 2009.

Drawn:	C. Reeves
Checked:	B. Loudon
Date:	4 Feb 2010
Projection:	MGA zn50
Scale:	1 : 250 000 at A3

coffey environments

Limestone Resources
FLORA AND VEGETATION ASSESSMENT
M70/341 & M70/345 CUTLER ROAD, CARABOODA

VEGETATION TYPES AND CONDITION

Figure 2

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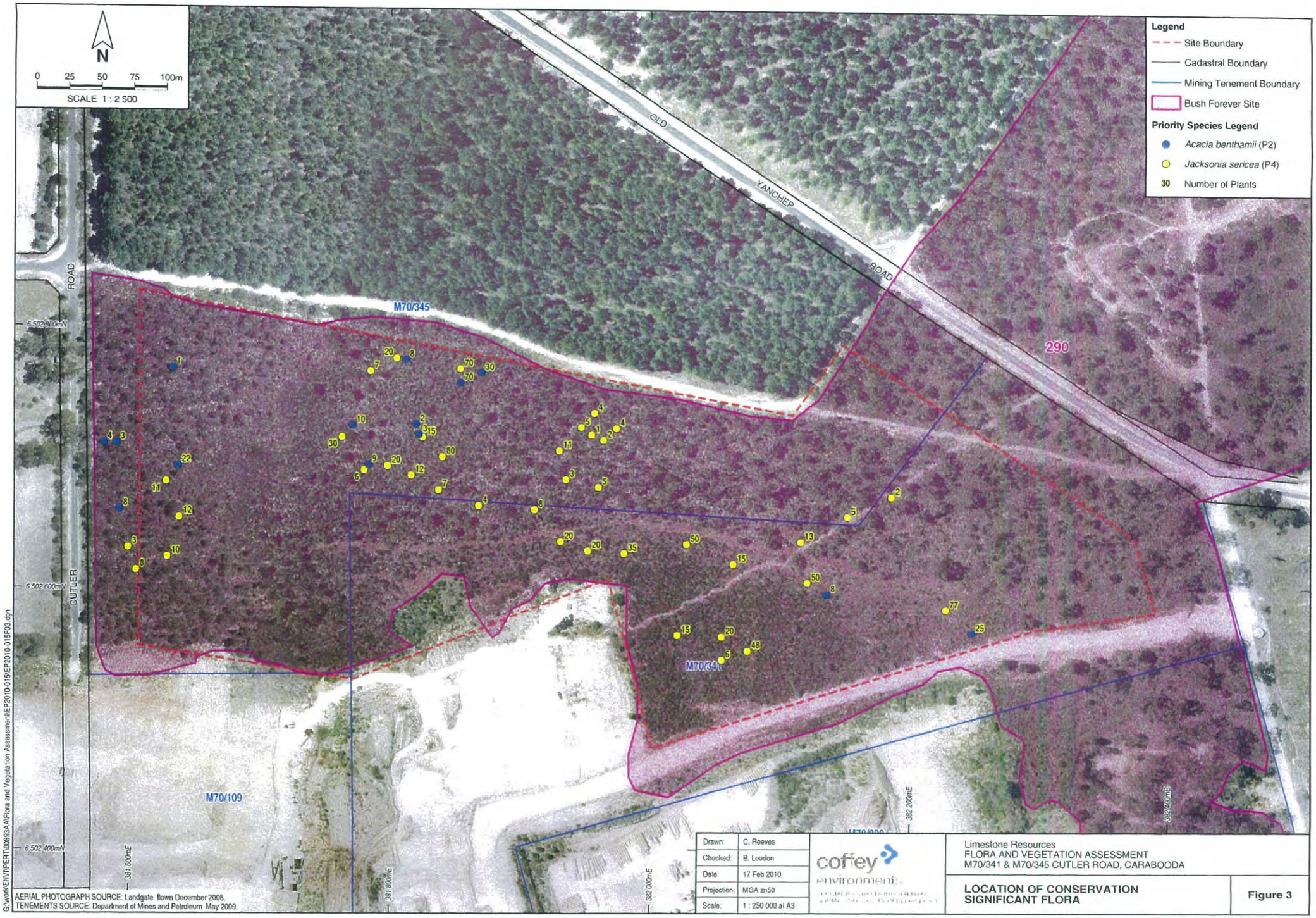

N
0 25 50 75 100m
SCALE 1 : 2 500
Legend
Site Boundary
Cadastral Boundary
Mining Tenement Boundary
Bush Forever Site
Priority Species Legend
Acacia benthamii (P2)
Jacksonia sericea (P4)
30 Number of Plants
OLD YANCHEP ROAD
CUTLER ROAD
M70/345
M70/341
M70/109
290
6 502 800mN
6 502 600mN
6 502 400mN
381 600mE
381 800mE
382 000mE
382 200mE
382 400mE
Drawn: C. Reeves
Checked: B. Loudon
Date: 17 Feb 2010
Projection: MGA zn50
Scale: 1 : 250 000 at A3
coffey environments
Limestone Resources
FLORA AND VEGETATION ASSESSMENT
M70/341 & M70/345 CUTLER ROAD, CARABOODA
LOCATION OF CONSERVATION SIGNIFICANT FLORA
Figure 3
AERIAL PHOTOGRAPH SOURCE: Landgate flown December 2008.
TENEMENTS SOURCE: Department of Mines and Petroleum May 2009.
G:\work\ENV\PERT00893AA\Flora and Vegetation Assessment\EP2010-015\EP2010-015F03.dgn

Appendix A
PATN Analysis Report

Flora and Vegetation Assessment
M70/341 & M70/345 Cutler Road, Carabooda

1.0 INTRODUCTION

1.1 Purpose of this report

The current report is intended to help clarify the assignment of Floristic Community type (FCT) designation to vegetation community (site) data. FCTs were defined by Gibson et al (1994) based on site data collected from vegetation on the Swan Coastal Plain. In particular, the potential that a Threatened Ecological Community (English and Blyth 1997) is represented by the data collected needs to be clarified.

1.2 Location of Nowergup Sites

The sites were from mining leases on Cuter Road, Carabooda and Hopkins Road, Nowergup.

1.3 Brief background to floristic analysis of vegetation on the Swan Coastal Plain

Floristic analysis (ie., analysis of variation in vegetation based on the species present, rather than description of structural variation and dominance) as a significant component of the understanding of the variation present in the native vegetation of the Swan Coastal Plain dates to Gibson *et al* (1994 – all references to the SCP survey in the current report refer to this publication), the first publication to document the floristics of the vegetation of a large part of the Swan Coastal Plain. While the SCP survey is based on a very significant amount of work, it must be viewed as a "first pass" survey, limited, in the context of the great variety of vegetation present in the very large area surveyed, by the relatively limited number (509) of sites (quadrats) it is based on. To a limited degree, this limitation has subsequently been addressed in an "update" to the work of the SCP survey (which describes additional units). However, there is no detailed publication of the results of this update available and the additional data used are not readily available in an appropriate form (ie., one that would enable ready comparison of new data to the overall data set).

The units described by the SCP survey are a series of "floristic community types", a "unit" whose rank is defined by the use within a study. The SCP survey surveyed a very large survey area and defined a relatively small number of floristic community types. Consequently, the floristic community types they have described are of a very high order (see Trudgen 1999, volume 1, for further discussion of this point). This is an extremely important point to fully grasp in interpreting the analysis presented by the SCP survey and in understanding the meaning of analysis of other data sets when they are compared to the floristic community types of the SCP survey.

The important effects of the limited size data set used by the SCP survey and of the relatively small number of floristic community types defined by them, can be summarised by the following points:

1. the definition of all but two of the Threatened Ecological Communities for vegetation on the Swan Coastal Plain (English and Blyth 1997) has been based on the floristic community types of the SCP survey. It therefore follows, that with two exceptions, only vegetation units from one study that are different at a very high order of floristics are treated as rare by Government. No account is taken of other important differences, such as differences in structure and dominance;

2. for the definition of floristic community types to be robust, a sufficient sized database is needed to give adequate precision in their definition. About half of the floristics community types (or sub types) of the SCP survey are based on less than 10 sites. It is likely that with a larger data set there would be significant alteration in the classification of those floristic community types from the SCP survey based on small numbers of sites.

3. as noted above, many (if not most) of the floristic community types defined by the SCP survey are very broad. They contain very significant variation in floristics, structure and dominance. Some (or in more highly cleared parts of the Swan Coastal Plain much) of this variation may be rare by any reasonable definition, but it is currently "buried" within larger groups;
4. there is likely to be significant variation not sampled by the SCP survey. This includes some variation at a high level of floristic difference (see Trudgen 1999, volume 1, for an example of this) and undoubtedly quite significant (large!) amounts of variation at "medium" and "low" levels.

5. the document, and its use by Government, has focussed attention in the environmental impact assessment process on the high level of units described, deflecting attention from the layers of variation beneath these units that also have significant conservation value.

From these points it is obvious that there is a need for a major "upgrade" to the floristic analysis of the vegetation of the Swan Coastal Plain to provide a more detailed floristic classification that considers not only more of the variation present, but explicitly recognises more of the variation present in formally described units.

Obviously, such a reworking would have some effect on what vegetation is considered rare on the Swan Coastal Plain. It needs to be stressed that it would be very unlikely to find that any of the vegetation currently considered to be rare on the basis of the SCP survey*'s* classification was not rare. On the other hand, it is likely that such a review would very probably consider to be rare some vegetation which is not currently considered rare.

1.4 Data provided

It is very important in comparing different sets of floristic data that they are comparable in the application of names, in the intensity of the survey (ie., the effort of searching resulting in similar proportion of the flora at sites being recorded) and in the size of the site recorded. If the data from different data sets is not comparable in these ways, it reduces the clarity of the results of the analyses carried out. If the discrepancy in the comparability of the data sets is large, the results may become meaningless.

It was noted that the sites were recorded in summer and the likely under representation of some species because of that. Some differences in representation is shown in Appendix 2 for comparison.

2.0 METHODS

2.1 Data Preparation

The data from the Nowergup sites were provided in a spreadsheet. These were incorporated into a standard MS Access based database designed for this type of data. One virtue of the database is that the species recorded at each site are stored against standard codes (numbers, those used by the Western Australian Herbarium) for each species. This facilitates ready comparison of data from different surveys stored in the same system.

After the data were incorporated into the database, a process of reconciliation of flora species names with those used in the SCP survey was undertaken. This step was necessary at least because of changes in nomenclature over the last ten years and the potential of survey specific variations in the application of names. The reconciliation involved:

- reducing some infra-specific names to the relevant species name, and
- combining some taxa where confusion is known to have occurred in field observations and identifications.

The reconciliation process was relatively straightforward as most of the names had already been standardised. Most reconciliation was to conform with the methods that the SCP survey used to manage confusing taxa plus some nomenclatural changes.

2.2 Comparability of datasets

It was concluded that the quadrat datasets were probably reasonably compatible in nomenclature. The richness of sites are moderate in some quadrats given most were dampland related (see extract of dendrogram in results.) The number of species from families often overlooked (eg Orchidaceae) tended to be somewhat similar to that of quadrats in SCP dataset for similar vegetation (Appendix 2).

2.3 Comparisons made

The data therefore from the 20 quadrats plus the 509 sites from the SCP survey of the southern part of the Swan Coastal Plain (south of Gingin) were combined. This enabled various analyses to be performed.

The main purpose was intended to assign the individual sites to the Floristic Community Types (FCTs) defined in the SCP survey. These data are provided in Nowergup.mdb.)

2.4 Analyses carried out

The approach was the use of numerical classification techniques (PATN) based on the similarity of the floristic composition of the Nowergup quadrats to sites in the SCP survey data set.

2.4.1 PATN

Several modules of the numerical classification package PATN (Belbin 1987) were used for the analyses. The parameter values were the same as used by the SCP survey to ensure consistency of analysis with that study.

The PATN modules used were ASO (calculation of similarity matrix), FUSE (classification based on the results of ASO), DEND (representation of classification) and NNB (determination of sites most similar to each site – nearest neighbours). The results of the analyses were imported into a database (Nowergup.mdb) so that site characteristics and previous classifications (eg., Floristic Community Types derived in earlier classifications) could be associated and various analyses based on these data could be performed.

The assignment of floristic community types to the Nowergup quadrats was made by summarising the results of two different methods:

- the classification, and
- the twenty nearest neighbours.

Experience demonstrates that the results of these are likely to vary, but that from nearest neighbours is likely to make more sense for it is not directly influenced by group membership. On the other hand the nearest neighbour analysis often is ambiquous as it provides several options.

To the classification dendrogram of the combined dataset, the FCT assigned by the SCP survey was associated with the SCP survey sites. The apparent FCTs were assigned to the Nowergup quadrats by interpreting the position of these sites in the dendrogram (particularly by the way they joined to the SCP sites).

The 20 sites in the combined data set that were most similar to each of Nowergup quadrats were obtained from the nearest neighbour method (NNB). By associating those nearest neighbours from the SCP survey, the most likely FCTs from this method for each of the Nowergup quadrats were determined.

It is common for there to appear tob inconsistencies in the affinietie indicated by these methods. Classification can be strongly influenced by the membership of groups which can "draw" a site "away" from another that it appears similar to. An attempt was then made to reconcile these different assignments of a Floristic Community Type. The relevant portion of the site by species matrix was examined to seek clarity in some cases.

3.0 LIMITATIONS

It has been found in earlier projects that the addition of new sites to the SCP survey data set to produce a combined classification disrupts the original classification. The more data added, the higher the level of the disruption. This is particularly the case with wetland sites, partly because there are relatively few of these in the SCP data set and these communities are often very distinctive. This problem can make it difficult to assign Floristic Community Types to new sites using this method.

Secondly, it is common for new data to group to their cohorts. In some cases this has proven to result from common deficiencies in the data, ie. whole groups of species

missing. This absence tends to draw them together. The more sites in the added batch, the tighter they draw together.

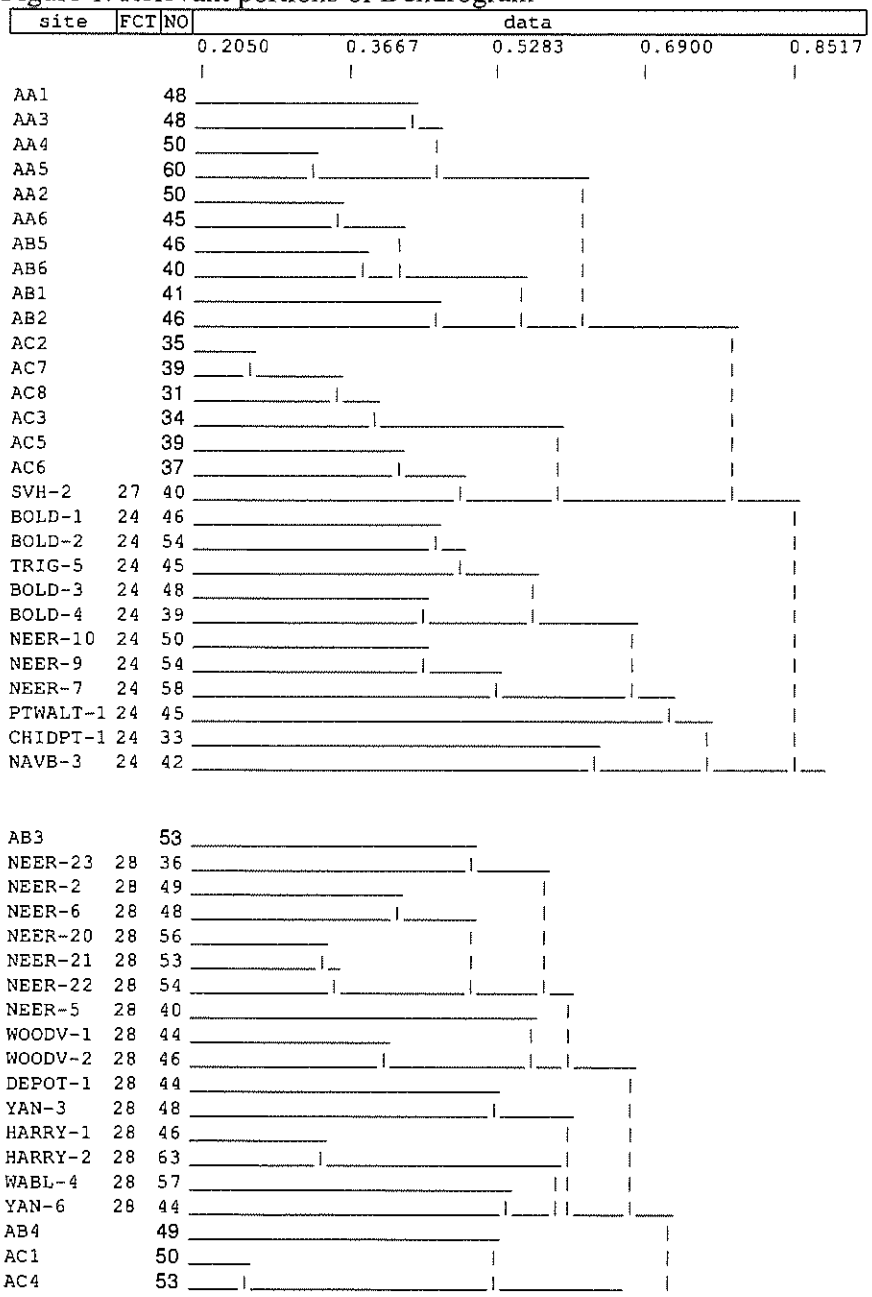
The analyses are conducted without personal knowledge of the sites.

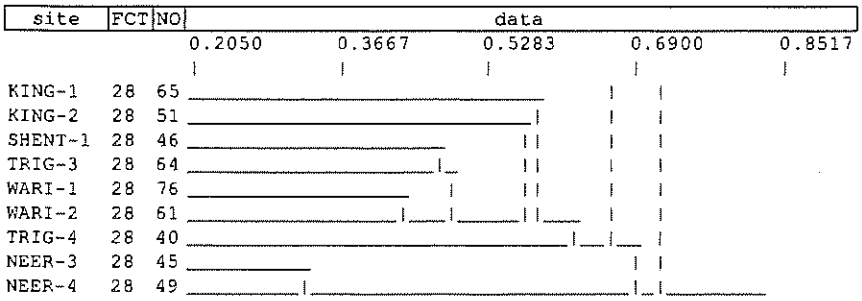
4.0 RESULTS

4.1 Determination of floristic community type by classification

The Nowergup sites largely are classified together but in reasonably distinct clusters. This suggests a project related difference in taxonomy or survey effort. The sites are broadly related to FCTs 24, 27 and 28. Generally, the 3 separate projects (AA, AB and AC) are distinct types.

Figure 1. Relevant portions of Dendrogram





4.2 Determination of floristic community type using Nearest Neighbour method

The summary of the nearest neighbour results presented in Table 1 are presented in Table 2. As the Nowergup sites were mostly more similar to their cohorts, these have been excluded from this presentation. Generally they are related to SCP sites from FCTs 28, 24, 26a and 27.

Table 1. Results of Nearest Neighbour analysis (most similar SCP sites)

s	s1	f1	v1	s2	f2	v2	s3	f3	v3	s4	f4	v4	s5	f5	v5
AA1	KING-1	28	0.51	WOODV-	28	0.54	WOODV-	28	0.55	YAN-4	28	0.56	SHENT-1	28	0.58
AA3	SHENT-1	28	0.54	NEER-11	24	0.55	NEER-22	28	0.56	WOODV-2	28	0.56	NEER-20	28	0.56
AA4	NEER-21	28	0.50	NEER-3	28	0.51	TRIG-3	28	0.52	NEER-20	28	0.52	WOODV-2	28	0.53
AA5	NEER-20	28	0.50	BULL-1	28	0.53	WARI-1	28	0.54	NEER-3	28	0.54	MTB-1	24	0.55
AA2	NEER-11	24	0.54	MTB-3	24	0.56	NEER-23	28	0.57	TRIG-3	28	0.58	TRIG-5	24	0.59
AA6	NEER-11	24	0.54	TRIG-5	24	0.57	NEER-1	24	0.57	WARI-1	28	0.58			
AB5	NEER-23	28	0.46	NEER-11	24	0.49	MTB-3	24	0.53	NEER-6	28	0.53	TRIG-5	24	0.54
AB6	NEER-23	28	0.53	BOLD-4	24	0.57	NEER-1	24	0.59	NEER-10	24	0.60	TRIG-5	24	0.60
AB1	MTB-3	24	0.51	BOLD-4	24	0.51	SVH-1	26a	0.53	NEER-1	24	0.53	NAVB-4	24	0.54
AB2	SVH-1	26a	0.51	YAN-12	26a	0.53	YAN-24	26a	0.54	YAN-13	26a	0.56	SHE-5	26a	0.59
AC2	SVH-1	26a	0.45	MTB-2	24	0.53	YAN-24	26a	0.56	NEER-10	24	0.57	YAN-12	26a	0.59
AC7	SVH-1	26a	0.42	YAN-24	26a	0.50	NEER-10	24	0.51	YAN-13	26a	0.51	YAN-12	26a	0.54
AC8	SVH-2	27	0.5	YAN-24	26a	0.56	YAN-13	26a	0.58	SVH-1	26a	0.59	YAN-2	26a	0.59
AC3	SVH-1	26a	0.47	YAN-13	26a	0.52	YAN-24	26a	0.54	CLIF-2	26a	0.54	SHE-4	26a	0.55
AC5	SVH-2	27	0.45	YAN-14	26b	0.54	NEER-9	24	0.55	NEER-7	24	0.56	WABL-3	26b	0.59
AC6	SVH-2	27	0.50	NEER-7	24	0.56	YAN-1	26b	0.57	YAN-14	26b	0.58	YAN-16	26b	0.59
AB3	NEER-23	28	0.49	NEER-20	28	0.53	NEER-21	28	0.53	YAN-1	26b	0.54	WELL-1	21a	0.55
AB4	WARI-2	28	0.45	NEER-21	28	0.49	HARRY-	28	0.50	NEER-2	28	0.51	NEER-3	28	0.51
AC1	WARI-2	28	0.53	SHENT-1	28	0.56	WELL-1	21a	0.57	NEER-21	28	0.58	CRAMPT-	21a	0.58
AC4	WARI-2	28	0.5	SHENT-1	28	0.54	YAN-11	26b	0.56	YAN-4	28	0.57	YAN-6	28	0.57

s – the site being compared
s1 to s10 – the 1st to 10th most similar sites
f1 to f10 – the FCT of the similar sites (only for SCP sites)
v1 to v10 – the dissimilarity value between the site and the similar sites (values above 0.6 tend to indicate low similarity)

4.3 Combining the results

There was modest accord between the classification and the Nearest Neighbour analyses. The Nearest Neighbour tends to be more reliable as it is less influences by its cohort sites.

There appears to be 4 FCTs in these data; 24, 26a, 27 and 28.
Probably the least certain are those 26a; partly as the species richness of the sites apparently closer to 26a appear a bit low in total richness (Appendix 2).

Table 2 Summary of FCT assignment

	Dendrogram	Nearest Neighbour	Conclusion
AA1	24 (?27)	28	28
AA3	24 (?27)	28,24	28
AA4	24 (?27)	28	28
AA5	24 (?27)	28	28
AA2	24 (?27)	24	24
AA6	24 (?27)	24	24
AB5	24 (?27)	28,24	24, 28
AB6	24 (?27)	28,24	24, 28
AB1	24 (?27)	24,26a	24, 26a
AB2	24 (?27)	26a	24, 26a
AC2	24 (?27)	26a,24	24, 26a
AC7	24 (?27)	26a	24, 26a
AC8	24 (?27)	27	27, ?24
AC3	24 (?27)	26a	27, ?24
AC5	24 (?27)	27	27, ?24
AC6	24 (?27)	27	27, ?24
AB3	28	28	28
AB4	28	28,24	28
AC1	28	28,21a	28
AC4	28	28	28

5.0 REFERENCES

Belbin, L. (1987) *PATN Reference Manual* (313p), *Users Guide* (79p), *Command Manual* (47p), and *Example Manual* (108p). CSIRO Division of Wildlife and Ecology, Lynham, ACT.

English, V., and Blyth, J. (1997) *Identifying and conserving threatened ecological communities (TECs) in the South West Botanical Province.* ANCA National Reserves System Cooperative Program: Project Number N702, Australian National Conservation Agency, Canberra

Gibson, N.G., Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M (1994). *A Floristic Survey of the Southern Swan Coastal Plain.* Unpublished report by the Department of Conservation and Land Management and the Conservation Council of Western Australia to the Australian Heritage Commission.

Trudgen, M.E. (1999). *A flora and vegetation survey of Lots 46 and 47 Maralla Road and Lexia Avenue, Ellenbrook.* Volumes 1-4. Unpublished report prepared for the Crown Solicitors Office, Government of Western Australia. December 1999.

APPENDIX 1

Names combined for reconciliation

FCODE	Species	Lookup
026	Triglochin nana	Triglochin centrocarpum
031	Aira cupaniana	Aira caryophyllea/cupaniana group
031	Avena barbata	Avena barbata/fatua
031	Brachypodium distachyon	omitted
032	Lepidosperma leptostachyum	Lepidosperma sp. (Coastal terete BJK & NG 231)
032	Lepidosperma pubisquameum	Lepidosperma angustatum/squamatum
032	Lepidosperma squamatum	Lepidosperma angustatum/squamatum
039	Desmocladus asper	Desmocladus flexuosus
054B	Myrsiphyllum asparagoides	Asparagus asparagoides
054C	Lomandra ?caespitosa	Lomandra caespitosa
054C	Lomandra sp.	omitted
054F	Chamaescilla corymbosa	Chamaescilla spiralis/corymbosa
054F	Thysanotus manglesianus	Thysanotus patersonii/manglesianus
054F	Thysanotus sp.	omitted
054J	Burchardia congesta	Burchardia umbellata/congesta
055	Conostylis aculeata subsp. cygnorum	Conostylis aculeata
055	Conostylis aculeata subsp. preissii	Conostylis aculeata
055	Conostylis setigera subsp. setigera	Conostylis setigera
055	Conostylis sp.	omitted
055	Haemodorum sp.	omitted
060	Moraea flaccida	Moraea flaccida
060	Watsonia meriana/bulbifera	Watsonia meriana var. bulbillifera
066	Caladenia sp.	omitted
066	Diuris magnifica	omitted
066	Monadenia bracteata	Disa bracteata
066	Pterostylis sp.	omitted
066	Thelymitra graminea	omitted
066	Thelymitra sp.	omitted
090	Banksia nivea subsp. nivea	Dryandra nivea
090	Banksia sessilis	Dryandra sessilis
090	Grevillea thelemanniana subsp. preissii	Grevillea preissii
090	Petrophile axillaris	Petrophile serruriae
105	Rhagodia baccata	Rhagodia baccata subsp. baccata
111	Calandrinia sp. SW coastal (J. Dodd 753)	Calandrinia brevipedata
113	Minuartia mediterranea	Minuartia hybrida
113	Petrorhagia dubia	Petrorhagia velutina
113	Silene nocturna	Silene gallica
113	Stellaria pallida	omitted
131	Cassytha racemosa forma pilosa	Cassytha racemosa
143	Drosera sp.	omitted
163	Acacia applanata	Acacia willdenowiana
163	Acacia benthamii	Acacia cochlearis
163	Acacia longifolia	omitted
165	Daviesia decipiens	Daviesia decurrens
165	Hovea trisperma	Hovea trisperma var. trisperma

FCODE	Species	Lookup
165	Isotropis cuneifolia	Isotropis cuneifolia
165	Nemcia capitata	Gastrolobium capitatum
185	Poranthera drummondii	Poranthera microphylla
215	Trymalium ledifolium var. ledifolium	Trymalium ledifolium
273	Astartea aff. fascicularis	Astartea affinis
273	Eucalyptus calophylla	Corymbia calophylla
273	Kunzea ericifolia	Kunzea glabrescens
273	Melaleuca sp. Wanneroo (G.J. Keighery 16705)	Melaleuca acerosa
273	Melaleuca systena	Melaleuca acerosa
281	Trachymene pilbarensis	Trachymene pilosa
288	Conostephium sp.	omitted
288	Consostephium sp.	omitted
293	Anagallis arvensis var. arvensis	Anagallis arvensis
293	Anagallis arvensis var. caerulea	Anagallis arvensis
303	Centaurium pulchellum	Centaurium erythraea
313	Hemiandra glabra	Hemiandra pungens/linearis
329	Plantago debilis	omitted
331	Galium divaricatum	Galium murale
345	Conyza albida	Conyza bonariensis
345	Lagenifera huegelii	Lagenophora huegelii
345	Rutidosis multiflora	Siloxerus multiflorus

Appendix 2 Comparison of average species per family per site for relevant FCTs.

	FCT	31	32	054B	054C	054D	054E	054F	054G	054H	054J	66	143	281	343	sum	Tot
	24	5.5	2.1	0.1	1.3	0.5	0.6	1.6	0	0.1	0.3	0.7	0.6	0.8	0.2	14	41
	26a	4.9	0.7		0.5	0.1		1.7			0.7	2.3	1.5	3.5	1.1	17	50
	26b	4.4	2.8		1.4	0.8	0.4	2.4	0.1		0.1	1.6	1	3.3	0.7	19	**52**
	27	1	2.1		1	0.6	0.1	1.3				2	1.6	2.4	1	13	39
	28	4.9	3.5	0.1	1.9	1	0.3	2.5		0	0.8	2	1.5	2.5	1.7	23	55
Site:																	
AA1	28	5	2			1	1	2			1	1		2		15	48
AA3	28	8	5		1	1		2			1					18	48
AA4	28	4	3	1	2	1		3			1	1	1	1		18	50
AA5	28	6	3	1	2	1		4			1			1		19	60
AA2	24	8	4		2	1							1	2		18	50
AA6	24	8	2	1		1	1	3					1	1		18	45
AB5	24, 28	3	3		1	1	1	4				3		3		19	46
AB6	24, 28	4	2	1	1	1		2						2		13	40
AB1	24, 26a	7		1			1	1				1		1		12	41
AB2	24, 26a	6		1				2				1	1	3	1	15	46
AC2	24, 26a	3	1		1			2				1	1	2		11	35
AC7	24, 26a	3	1		1	1		2				1	1	2		12	39
AC8	27, ?24		3		1	1		2					1	2		10	31
AC3	27, ?24	2	1			1		1					1	3		9	34
AC5	27, ?24	2	2		1	1		1				3	1	2		13	39
AC6	27, ?24	2	4		1	1		1				1	1	3		14	37
AB3	28	3	4	1	3	1	1	2				1	1	3	1	21	53
AB4	28	2	3		1	1		4			1	2	1	2	2	19	49
AC1	28	2	3		1	1		4				1	1	2	1	16	50
AC4	28	2	2		1	1		5				1		3	2	17	53

Appendix B
Flora Species List

Flora and Vegetation Assessment
M70/341 & M70/345 Cutler Road, Carabooda

Flora Species List

Flora and Vegetation Survey
Limestone Resources, Hopkins Road Carabooda

			# Records
	016A Zamiaceae		
	Macrozamia riedlei		4
	017A Pinaceae		
*	*Pinus* sp.		1
	031 Poaceae		
	Austrostipa elegantissima		2
	Austrostipa flavescens		2
	Austrostipa?hemipogon		1
*	*Avena barbata*		6
*	*Brachypodium distachyon*		5
*	*Briza maxima*		6
*	*Briza minor*		4
*	*Bromus diandrus*		5
*	*Catapodium rigidum*		1
*	*Ehrharta calycina*		2
*	*Ehrharta longiflora*		2
*	*Lagurus ovatus*		2
*	*Lolium perenne*		1
*	*Vulpia bromoides*		2
	032 Cyperaceae		
	Lepidosperma leptostachyum		1
	Lepidosperma ?pubisquameum		4
	Mesomelaena pseudostygia		6
	Schoenus clandestinus		3
	Tetraria octandra		5
	039 Restionaceae		
	Desmocladus flexuosus		6
	054B Asparagaceae		
*	*Asparagus asparagoides*	Declared Weed	3
	054C Dasypogonaceae		
	Acanthocarpus preissii		2
	Lomandra preissii		2
	Lomandra sp.		2
	054D Xanthorrhoeaceae		
	Xanthorrhoea preissii		6
	054E Phormiaceae		
	Dianella revoluta		2
	054F Anthericaceae		
	Caesia micrantha		5
	Corynotheca micrantha		1
	Sowerbaea laxiflora		5
	Thysanotus manglesianus		2
	Thysanotus sparteus		1
	Tricoryne elatior		2

	054J Colchicaceae		
	Burchardia congesta		4
	055 Haemodoraceae		
	Conostylis aculeata subsp. *?cygnorum*		2
	Conostylis candicans		4
	Conostylis setigera subsp. *setigera*		3
	Haemodorum laxum		1
	Haemodorum sp.		2
	060 Iridaceae		
*	*Gladiolus caryophyllaceus*		6
*	*Moraea flaccida*	Declared Weed	1
	Orthrosanthus laxus		1
	Patersonia occidentalis		2
	066 Orchidaceae		
	Caladenia arenicola		1
	Microtis sp.		1
	Thelymitra ?graminea		1
	070 Casuarinaceae		
	Allocasuarina fraseriana		2
	Allocasuarina humilis		1
	090 Proteaceae		
	Banksia attenuata		4
	Banksia grandis		1
	Banksia menziesii		1
	Banksia nivea subsp. *nivea*		2
	Grevillea vestita		1
	Hakea lissocarpha		3
	Hakea prostrata		1
	Hakea trifurcata		1
	Persoonia comata		1
	Petrophile axillaris		1
	Petrophile brevifolia		1
	Petrophile linearis		1
	Petrophile macrostachya		3
	Stirlingia latifolia		1
	105 Chenopodiaceae		
	Rhagodia baccata		1
	106 Amaranthaceae		
	Ptilotus manglesii		4
	Ptilotus polystachyus		1
	108 Gyrostemonaceae		
	Tersonia cyathiflora		1
	110 Aizoaceae		
*	*Carpobrotus ?edulis*		1
	111 Portulacaceae		
	Calandrinia sp. SW coastal (J. Dodd 753)		1
	Calandrinia ?sp. SW coastal (J. Dodd 753)		1
	113 Caryophyllaceae		
*	*Cerastium glomeratum*		2
*	*Minuartia mediterranea*		1
*	*Petrorhagia dubia*		4

*	*Silene nocturna*		3
	131 Lauraceae		
	Cassytha racemosa		2
	Cassytha ?racemosa forma *pilosa*		1
	138 Brassicaceae		
*	*Heliophila pusilla*		4
	143 Droseraceae		
	Drosera pallida		3
	163 Mimosaceae		
	Acacia applanata		1
	Acacia benthamii	Priority 2	2
*	*Acacia longifolia*		1
	Acacia pulchella		3
	165 Papilionaceae		
	Bossiaea eriocarpa		3
	Daviesia decurrens		1
	Daviesia divaricata		1
	Gastrolobium capitatum		4
	Gastrolobium linearifolium		1
	Hardenbergia comptoniana		4
	Isotropis cuneifolia		1
	Jacksonia sericea	Priority 4	3
	Jacksonia sternbergiana		2
	Kennedia prostrata		2
*	*Trifolium arvense*		2
*	*Trifolium dubium*		6
	167 Geraniaceae		
*	*Pelargonium capitatum*		5
	175 Rutaceae		
	Philotheca spicata		1
	183 Polygalaceae		
	Comesperma integerrimum		1
	185 Euphorbiaceae		
*	*Euphorbia peplus*		1
	Phyllanthus calycinus		2
	202 Stackhousiaceae		
	Tripterococcus brunonis		1
	215 Rhamnaceae		
	Spyridium globulosum		1
	226 Dilleniaceae		
	Hibbertia hypericoides		6
	Hibbertia racemosa		2
	243 Violaceae		
	Hybanthus calycinus		3
	273 Myrtaceae		
	Calothamnus quadrifidus		1
	Chamelaucium uncinatum		1
	Eremaea asterocarpa subsp. *asterocarpa*		1
	Eucalyptus gomphocephala		1

	Eucalyptus marginata	2
	Eucalyptus todtiana	1
*	*Leptospermum laevigatum*	1
	Melaleuca systena	1
	281 Apiaceae	
	Daucus glochidiatus	5
	Trachymene pilosa	2
	288 Epacridaceae	
	Conostephium pendulum	3
	Leucopogon ?propinquus	2
	293 Primulaceae	
*	*Anagallis arvensis* var. *caerulea*	6
	303 Gentianaceae	
*	*Centaurium erythraea*	2
	313 Lamiaceae	
*	*Rosmarinus officinalis*	1
	331 Rubiaceae	
*	*Galium divaricatum*	6
	340 Lobeliaceae	
	Lobelia tenuior	3
	341 Goodeniaceae	
	Lechenaultia linarioides	1
	Scaevola canescens	1
	343 Stylidiaceae	
	Stylidium calcaratum	1
	Stylidium schoenoides	1
	345 Asteraceae	
*	*Carduus pycnocephalus*	1
*	*Hypochaeris glabra*	5
	Lagenophora huegelii	2
	Millotia myosotidifolia	4
	Podolepis lessonii	1
	Podotheca gnaphalioides	3
*	*Sonchus asper*	1
*	*Sonchus oleraceus*	6
*	*Urospermum picroides*	6
*	*Ursinia anthemoides*	1

Native Species	98
Introduced Species	37
TOTAL SPECIES	**135**

* Denotes introduced (weed) species

Appendix C
Quadrat Data

Flora and Vegetation Assessment
M70/341 & M70/345 Cutler Road, Carabooda

Quadrat Data

Flora and Vegetation Survey
Limestone Resources, Hopkins Road Carabooda

Quadrat 1

Described: BL **Date:** 12/10/2009 **Type:** Quadrat (10m x10m) **Season:** Excellent

Location: Western side of site

MGA Zone: 50 381585mE, 6502713mN

Habitat: Flat

Soil: Yellow-brown sand

Vegetation: Low Open Forest of *Banksia attenuata, Allocasuarina fraseriana* and *Banksia menziesii* to 8m over Tall Open Shrubland of *Xanthorrhoea preissii* to 2.5m over Open Low Heath of *Hibbertia hypericoides* and *Allocasuarina humilis* to 0.8m over Very Open Grassland of **Avena barbata* and **Briza maxima* to 0.9m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.6m

Condition: Very Good

Notes: Occasional *Eucalyptus todtiana*

Species List:

Name	Cover (%)	Height (m)	
Acacia benthamii	1	1.3	***Priority 2***
Acacia pulchella	<1	0.05	
Allocasuarina fraseriana	15	8	
Allocasuarina humilis	2	0.8	
**Anagallis arvensis* var. *caerulea*	<1	0.07	
**Avena barbata*	2	0.9	
Banksia attenuata	25	8	
Banksia menziesii	2	3	
**Brachypodium distachyon*	1	0.18	
**Briza maxima*	2	0.35	
Burchardia congesta	<1	0.6	
Caesia micrantha	<1	0.3	

Caladenia arenicola	<1	0.25
Calandrinia ?sp. SW coastal (J. Dodd 753)	<1	0.05
Cassytha racemosa	<1	Climber
Conostylis aculeata subsp. *?cygnorum*	<1	0.18
Conostylis setigera subsp. *setigera*	<1	0.08
Daucus glochidiatus	<1	0.11
Daviesia divaricata	<1	0.7
Desmocladus flexuosus	1	0.3
Dianella revoluta	<1	0.4
**Ehrharta longiflora*	1	0.3
**Euphorbia peplus*	<1	0.15
**Galium divaricatum*	<1	0.13
Gastrolobium capitatum	<1	0.8
**Gladiolus caryophyllaceus*	<1	0.7
Haemodorum sp.	<1	0.2
Hakea lissocarpha	<1	1.2
**Heliophila pusilla*	<1	0.2
Hibbertia hypericoides	50	0.7
**Hypochaeris glabra*	<1	0.15
**Lagurus ovatus*	<1	0.2
Lobelia tenuior	<1	0.15
Macrozamia riedlei	<1	0.3
Mesomelaena pseudostygia	2	0.6
Orthrosanthus laxus	<1	0.35
**Pelargonium capitatum*	<1	0.2
Persoonia comata	<1	0.4
Petrophile linearis	<1	0.4
Petrophile macrostachya	<1	0.4
Ptilotus manglesii	<1	0.06
**Sonchus oleraceus*	<1	0.2
Sowerbaea laxiflora	<1	0.5
Tetraria octandra	<1	0.6
Trachymene pilosa	<1	0.1
**Trifolium dubium*	<1	0.1
**Urospermum picroides*	<1	0.2
Xanthorrhoea preissii	6	2.5

Quadrat 2

Described: BL **Date:** 12/10/2009 **Type:** Quadrat (10m x10m) **Season:** Excellent

Location: Western side of site between woodland areas

MGA Zone: 50 381819mE, 6502721mN

Habitat: Slight/gentle slope to the northeast

Soil: Yellow-brown sand

Rock Type: Limestone

Vegetation: Tall Open Scrub of *Banksia sessilis* and *Xanthorrhoea preissii* to 3.5m over Low Shrubland of *Hibbertia hypericoides* and *Jacksonia sericea* to 0.9m over Very Open Grassland of **Brachypodium distachyon* to 0.22m and Very Open Herbland of *Desmocladus flexuosa* to 0.11m

Condition: Very Good - Good

Notes: Occasional *Melaleuca huegelii* and *Melaleuca systena* on lower slope near powerline to the north of the quadrat; rabbit activity evident

Species List:

Name	Cover (%)	Height (m)	
Acacia benthamii	<1	1.1	***Priority 2***
Acanthocarpus preissii	2	0.6	
**Anagallis arvensis* var. *caerulea*	<1	0.12	
Austrostipa elegantissima	<1	0.7	
Austrostipa flavescens	<1	0.7	
**Avena barbata*	<1	0.7	
Banksia nivea subsp. *nivea*	<1	0.2	
Banksia sessilis	20	3.5	
**Brachypodium distachyon*	4	0.22	
**Briza maxima*	<1	0.35	
**Briza minor*	<1	0.19	
**Bromus diandrus*	<1	0.3	
Calandrinia sp. SW coastal (J. Dodd 753)	<1	0.05	
Cassytha racemosa	<1	Climber	
Conostylis candicans	<1	0.3	
Daucus glochidiatus	<1	0.12	
Desmocladus flexuosus	2	0.11	

Desmocladus flexuosus	<1	0.2	
Drosera pallida	<1	Climber	
**Ehrharta longiflora*	<1	0.8	
**Galium divaricatum*	<1	0.02	
**Gladiolus caryophyllaceus*	<1	1.2	
Haemodorum laxum	<1	0.9	
Hardenbergia comptoniana	<1	Climber	
Hibbertia hypericoides	10	0.9	
Hybanthus calycinus	<1	0.2	
**Hypochaeris glabra*	<1	0.05	
Jacksonia sericea	4	0.5	***Priority 4***
Lechenaultia linarioides	<1	0.25	
Lepidosperma ?pubisquameum	<1	0.25	
Leucopogon ?propinquus	<1	0.3	
Lobelia tenuior	<1	0.2	
Lomandra sp.	<1	0.3	
Mesomelaena pseudostygia	<1	0.7	
Millotia myosotidifolia	<1	0.05	
**Pelargonium capitatum*	<1	0.2	
Petrophile axillaris	<1	0.7	
Petrophile brevifolia	<1	0.17	
**Petrorhagia dubia*	<1	0.3	
Phyllanthus calycinus	<1	1.2	
Podotheca gnaphalioides	<1	0.15	
Rhagodia baccata	<1	0.9	
Schoenus clandestinus	<1	0.04	
**Silene nocturna*	<1	0.2	
**Sonchus oleraceus*	<1	0.25	
Tetraria octandra	<1	0.2	
Trachymene pilosa	<1	0.15	
**Trifolium arvense*	<1	0.08	
**Trifolium dubium*	<1	0.06	
**Urospermum picroides*	1	0.2	
Xanthorrhoea preissii	15	3	

Quadrat 3

Described: BL **Date:** 12/10/2009 **Type:** Quadrat (10m x10m) **Season:** Excellent

Location: Woodland in middle of site

MGA Zone: 50 381959mE, 6502717mN

Habitat: Very gentle slope to the north

Soil: Yellow-brown sand

Vegetation: Low Woodland of *Banksia attenuata* and *Allocasuarina fraseriana* to 6.5m over Tall Shrubland of *Xanthorrhoea preissii* and *Hakea prostrata* to 3.5m over Low Open Shrubland of *Hibbertia hypericoides* to 0.9m over Very Open Sedgeland of *Tetraria octandra* and *Mesomelaena pseudostygia* to 0.8m over Open Grassland of **Briza maxima* and **Brachypodium distachyon* to 0.4m over Very Open Herbland of *Desmocladus flexuosus* to 0.2m

Condition: Good

Notes: Some *Banksia* deaths nearby (old and new), no dead *Xanthorrhoea*

Species List:

Name	Cover (%)	Height (m)
Acanthocarpus preissii	<1	0.5
Allocasuarina fraseriana	2	5
**Anagallis arvensis* var. *caerulea*	<1	0.1
**Avena barbata*	1	1
Banksia attenuata	20	6.5
**Brachypodium distachyon*	10	0.22
**Briza maxima*	2	0.4
**Briza minor*	<1	0.2
**Bromus diandrus*	<1	0.3
Burchardia congesta	<1	0.4
Caesia micrantha	<1	0.6
**Carduus pycnocephalus*	<1	0.3
**Carduus pycnocephalus*	1	0.18
**Catapodium rigidum*	<1	0.1
**Cerastium glomeratum*	<1	0.11
Comesperma integerrimum	<1	Climber
Conostylis candicans	<1	0.2

Conostylis setigera subsp. *setigera*	<1	0.11	
Desmocladus flexuosus	2	0.2	
Desmocladus flexuosus	1	0.5	
**Galium divaricatum*	<1	0.08	
Gastrolobium capitatum	<1	0.2	
**Gladiolus caryophyllaceus*	<1	0.9	
Haemodorum sp.	<1	6.5	
Hakea prostrata	3	3.5	
**Heliophila pusilla*	<1	0.2	
Hibbertia hypericoides	10	0.9	
Hybanthus calycinus	<1	0.2	
**Hypochaeris glabra*	<1	0.12	
Jacksonia sericea	<1	0.3	***Priority 4***
Kennedia prostrata	<1	Climber	
**Lagurus ovatus*	<1	0.15	
Lepidosperma leptostachyum	<1	0.7	
Lepidosperma ?pubisquameum	<1	0.3	
Leucopogon ?propinquus	<1	0.25	
**Lolium perenne*	<1	0.5	
Macrozamia riedlei	<1	1.4	
Mesomelaena pseudostygia	2	0.8	
**Pelargonium capitatum*	<1	0.6	
**Petrorhagia dubia*	<1	0.25	
Podolepis lessonii	<1	0.2	
Ptilotus manglesii	<1	0.11	
Schoenus clandestinus	<1	0.06	
**Silene nocturna*	<1	0.2	
**Sonchus oleraceus*	<1	0.12	
Sowerbaea laxiflora	<1	0.4	
Tetraria octandra	2	0.5	
**Trifolium dubium*	<1	0.05	
**Urospermum picroides*	<1	0.15	
Xanthorrhoea preissii	9	3.2	

Quadrat 4

Described: BL **Date:** 12/10/2009 **Type:** Quadrat (10m x10m) **Season:** Excellent

Location: Middle to eastern end of site in woodland

MGA Zone: 50 382134mE, 6502698mN

Habitat: Flat to very slight slope to east

Soil: Yellow-brown sand

Vegetation: Woodland of *Eucalyptus marginata* to 10m over Open Woodland of *Banksia attenuata* to 7m over Tall Open Shrubland of *Xanthorrhoea preissii* to 2.3m over Closed Low Heath of *Hibbertia hypericoides* to 0.7m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.8m over Very Open Herbland of **Urospermum picroides* to 0.2m

Condition: Excellent - Very Good

Notes: Scattered *Banksia grandis* and very occasional *Eucalyptus gomphocephala*

Species List:

Name	Cover (%)	Height (m)	
Acacia pulchella	<1	1.3	
**Anagallis arvensis* var. *caerulea*	<1	0.1	
**Asparagus asparagoides*	<1	Climber	***Declared Weed***
Austrostipa ?hemipogon	<1	0.4	
**Avena barbata*	<1	0.7	
Banksia attenuata	10	7	
Bossiaea eriocarpa	<1	0.35	
**Briza maxima*	1	0.5	
**Bromus diandrus*	<1	0.3	
Burchardia congesta	<1	0.5	
Caesia micrantha	<1	0.5	
Conostephium pendulum	<1	0.3	
Daucus glochidiatus	<1	0.15	
Desmocladus flexuosus	1	0.25	
Drosera pallida	<1	Climber	
Eucalyptus marginata	27	10	
**Galium divaricatum*	<1	0.05	
Gastrolobium capitatum	<1	0.4	

**Gladiolus caryophyllaceus*	<1	1
Hakea lissocarpha	1	1.2
Hardenbergia comptoniana	<1	Climber
**Heliophila pusilla*	<1	0.2
Hibbertia hypericoides	80	0.7
**Hypochaeris glabra*	<1	0.1
Isotropis cuneifolia	<1	0.2
Jacksonia sternbergiana	<1	1
**Lagenophora huegelii*	<1	0.22
Lobelia tenuior	<1	0.2
Lomandra ?caespitosa	<1	0.2
Lomandra preissii	<1	0.3
Macrozamia riedlei	<1	1.5
Mesomelaena pseudostygia	2	0.8
Millotia myosotidifolia	<1	0.06
**Minuartia mediterranea*	<1	0.05
Patersonia occidentalis	<1	0.4
Petrophile macrostachya	<1	0.2
**Petrorhagia dubia*	<1	0.3
Podotheca gnaphalioides	<1	0.11
Ptilotus manglesii	<1	0.05
Schoenus clandestinus	<1	0.04
**Silene nocturna*	<1	0.17
**Sonchus oleraceus*	<1	0.4
Sowerbaea laxiflora	<1	0.35
Tetraria octandra	<1	0.35
Thelymitra ?graminea	<1	0.3
Thysanotus manglesianus	<1	Climber
**Trifolium dubium*	<1	0.07
**Urospermum picroides*	2	0.2
**Ursinia anthemoides*	<1	0.12
Xanthorrhoea preissii	8	2.3

Quadrat 5

Described: BL **Date:** 15/10/2009 **Type:** Quadrat (10m x10m) **Season:** Excellent

Location: Eastern side of site

MGA Zone: 50 382250mE, 6502670mN

Habitat: Flat

Soil: Yellow-brown sand

Vegetation: Woodland of *Eucalyptus marginata* to 14m over Low Woodland of *Banksia attenuata* to 5.5m over Open Shrubland of *Xanthorrhoea preissii* to 2m over Low Shrubland of *Hibbertia hypericoides* to 0.4m over Very Open Sedgeland of *Mesomelaena pseudostygia* to 0.5m over Very Open Herbland of **Urospermum picroides* to 0.2m over Very Open Grassland of **Brachypodium distachyon* to 0.15m

Condition: Excellent - Very Good

Species List:

Name	Cover (%)	Height (m)	
Acacia applanata	<1	0.4	
**Acacia longifolia*	<1	0.7	
**Anagallis arvensis var. caerulea*	<1	0.12	
**Asparagus asparagoides*	<1	Climber	***Declared Weed***
**Avena barbata*	<1	0.3	
Banksia attenuata	12	5.5	
Banksia nivea subsp. *nivea*	<1	0.18	
Banksia sessilis	<1	1.8	
Bossiaea eriocarpa	1	0.5	
**Brachypodium distachyon*	2	0.15	
**Briza maxima*	1	0.25	
**Briza minor*	<1	0.08	
**Bromus diandrus*	<1	0.4	
Burchardia congesta	<1	0.75	
Caesia micrantha	<1	0.3	
**Centaurium erythraea*	<1	0.1	
**Cerastium glomeratum*	<1	0.1	
Conostephium pendulum	<1	0.3	

Conostylis aculeata subsp. *?cygnorum*	<1	0.2
Conostylis candicans	<1	0.15
Conostylis setigera subsp. *setigera*	<1	0.1
Daucus glochidiatus	<1	0.13
Daviesia decurrens	<1	0.3
Desmocladus flexuosus	1	0.3
Eucalyptus marginata	20	14
**Galium divaricatum*	<1	0.03
Gastrolobium capitatum	<1	0.4
Gastrolobium capitatum	<1	0.7
Gastrolobium linearifolium	<1	0.3
**Gladiolus caryophyllaceus*	<1	1.1
Hardenbergia comptoniana	<1	Climber
**Heliophila pusilla*	<1	0.25
Hibbertia hypericoides	15	0.4
Hibbertia racemosa	<1	0.2
Jacksonia sternbergiana	<1	0.6
Kennedia prostrata	<1	Climber
**Lagenophora huegelii*	<1	0.06
Lepidosperma ?pubisquameum	<1	0.28
Lomandra preissii	<1	0.25
Lomandra sp.	<1	0.25
Macrozamia riedlei	<1	0.25
Mesomelaena pseudostygia	6	0.5
Millotia myosotidifolia	<1	0.05
Patersonia occidentalis	<1	0.5
**Pelargonium capitatum*	<1	0.06
Petrophile macrostachya	1	0.3
**Petrorhagia dubia*	<1	0.15
Philotheca spicata	<1	0.28
Ptilotus manglesii	<1	0.06
Scaevola canescens	<1	0.17
**Sonchus oleraceus*	<1	0.2
Sowerbaea laxiflora	<1	0.4
Spyridium globulosum	1	2
Tetraria octandra	<1	0.25
Thysanotus manglesianus	<1	Climber
Tricoryne elatior	<1	0.4
**Trifolium arvense*	<1	0.12
**Trifolium dubium*	<1	0.11
**Urospermum picroides*	2	0.2
**Vulpia bromoides*	<1	0.18
Xanthorrhoea preissii	10	2

Office of the Appeal Convenor
Level 22 Forrest Centre
221 St Georges Terrace
PERTH, Western Australia 6000

15 March 2011

Appeal Against

Limestone Building Block Company
Clearing Permit Application 3107/1 – M70/339

Limestone Building Block Company is lodging this appeal against the approval to clear issued on 24 February 2011, the Department of Mines and Petroleum "granted" a 0.62 hectare portion of the 4.0 hectares applied for in the Clearing Permit Application, under delegated authority from the Department of Environment and Conservation.

Limestone Building Block Company requests that the whole 4.0 hectares be granted with no conditions related to offsets in line with Government Policy documents.

Limestone Building Block Company also requests progress towards a negotiated solution for future operations.

Limestone Building Block Company is keen to meet with the Officer of the Appeals Convenor to explain and discuss the matter of the Appeal.

See the document inside and the included attachments.

Contacts are

[redacted]

or

[redacted]

Office of the Appeal Convenor
Level 22 Forrest Centre
221 St Georges Terrace
PERTH, Western Australia 6000

15 March 2011

Appeal Against

Limestone Resources
Clearing Permit Application 2858/1 – M70/341 and M70/345

Limestone Resources is lodging this appeal against the approval to clear issued on 24 February 2011, the Department of Mines and Petroleum "granted" a 1.08 hectare portion of the 6.4 hectares applied for in the Clearing Permit Application, under delegated authority from the Department of Environment and Conservation.

Limestone Resources requests that the whole 6.4 hectares be granted with no conditions related to offsets in line with Government Policy documents.

Limestone Resources also requests progress towards a negotiated solution for future operations.

Limestone Resources is keen to meet with the Officer of the Appeals Convenor to explain and discuss the matter of the Appeal.

See the document inside and the included attachments.

Contacts are

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15 March 2011

Appeal Against

Limestone Building Block Company
Clearing Permit Application 3107/1 – M70/339

Limestone Building Block Company is lodging this appeal against the approval to clear issued on 24 February 2011, the Department of Mines and Petroleum "granted" a 0.62 hectare portion of the 4.0 hectares applied for in the Clearing Permit Application, under delegated authority from the Department of Environment and Conservation.

Limestone Building Block Company requests that the whole 4.0 hectares be granted with no conditions related to offsets in line with Government Policy documents.

Limestone Building Block Company also requests progress towards a negotiated solution for future operations.

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See the document inside and the included attachments.

Contacts are

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Suppliers of quality natural and manufactured limestone blocks
A.B.N. 51 009 252 608 A.C.N. 009 252 608 P.O. Box 60 Applecross W.A. 6953

Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 694

1 March 2011

Analysis of the Clearing Assessment Report on CPS 2858/1

Clearing Application – Limestone Resources Australia Pty Ltd
M70/109, M70/341 and M70/346, Cutler - Hopkins Road Carabooda
CPS 2858/1
DMP Reference A1737/200802 – CPS 2558/1
Area applied for 6.4 hectares

Analysis of Clearing Assessment Report CPS 2858/1

Sections 1 .1 – 1.4	Agreed
Section 2.1.1	Agreed **Area Previously Cleared** 1. This has been noted, but the fact that Limestone Resources has paid the State compensation for the clearing of 4.8 hectares is ignored. **Rehabilitation** 1. Clearing will be progressive with a return to local native vegetation. In addition an extra 15.8 hectares of land not currently included in Bush Forever will be rehabilitated to local native vegetation. This is already conditioned on the Mining Tenement Conditions but is ignored.
2.1.1 (a) Biodiversity	**Degree of Biodiversity** 1. Much of the discussion is agreed. 2. Listing of generalisations does not justify the conclusions. For example it is the vegetation on the ground that will determine the level of biodiversity not the wider general classifications of vegetation. 3. The vegetation is listed as Degraded to Good with a small area Good to Very Good. As noted in the DMP consideration the total species count cannot be used as it covers a much larger area within an additional number of vegetation communities.

4. The best evidence of the biodiversity is the sample plot located in the area proposed to be cleared. That is Plot Q6. Plot Q6 contains 27 native taxa and 18 weeds. The data from the PATN analysis suggests that this sample plot was FCT 24 but possibly 27. (Coffey Environments 2010) As a comparison, in *Gibson et al 2004 A Floristic Survey of the southern Swan Coastal Plain* this community averages a mean species richness of native plants of 27.6 species. Therefore is this sample plot is average with respect to the species richness.

Vegetation Communities

1. The report notes that TEC and PEC occur within 5 km of the proposal. This may be factual but is really only adding information to alert the reader to issues that are not relevant and increases the apparent conservation status of the site. In fact the main issue is what is actually on site.

2. Although Coffey Environments noted that the vegetation on site is FCT 24 the PATN analysis actually noted that the closest fit was FCT 24 with a possibility of 27 (27?).

3. The important thing here is that only 6.4 hectares has been applied for, of which 4.8 hectares have previously been cleared and compensation paid to the State. Also that 92.6% of the total vegetation on Limestone Resources leases under Bush Forever will be protected if the small area of limestone is able to be cleared.

4. No analysis has been provided on the implications of the various nominations on the vegetation communities. For example what is the current status of FCT 24 found on site apart from a listing as a PEC?. What proportion of these communities does the clearing represent and how does this relate to the amount found in conservation areas such as Neerabup National Park? How does it relate to the continual mapping and preservation of these communities in terms of percentage? In other words, what exactly is the impact of clearing. Have the areas of each FCT been mapped in conservation areas. If not, then perhaps the scientific basis for DEC decision making is potentially flawed. On the other hand if it has been mapped, exactly what is the impact in % terms?. It is insufficient to simply say the community should be protected because it is listed.

5. No-one wants to clear native vegetation, but the reality is that companies are forced into that position by the tying up of large areas of similar vegetation on limestone within the conservation estate and urban development, with no evidence presented in the reports on how much of each community is already protected. For the vegetation complexes the vegetation already exceeds the required level of protection. This is mentioned in the Clearing Assessment Report but then given no further consideration. Notice that this is not mentioned in the letter of likely refusal.

Priority Species

1. The summary presented by DEC is representative of the issues. However the presence of a Priority species does not preclude clearing and the species can be used in rehabilitation. There are other clearing permits provided in local areas in which Priority species have been cleared under Clearing Permits such as Lot 8 Wattle Avenue, and it would not be an even playing field to use this as grounds for refusal and could be grounds for favouritism, which is illegal.

	Conclusion • Bearing in mind the above, the Clearing Assessment Report may be incorrect in finding the proposal at variance with Clearing Principle (a). The statements need to be qualified and with that in mind a "partially at variance" would be a more considered conclusion.
2.1.1 (b) fauna habitat	**Significant Fauna** 1. It is acceptable to list the significant fauna that may occur in the 6.4 hectares if it is placed in context. With a negotiated solution only an additional 12.2 hectares of the site is likely to be applied for to be cleared, which includes the already applied for 6.4 hectares. This means that on the Mining Leases held by Limestone Resources, covered by Bush Forever, 82% will not be cleared and at the end of excavation the amount of local native vegetation will be greater than currently exists on site. 2. It should also be noted that 4.8 hectares has previously been cleared and compensation paid to the State. If the fauna was a significant issue then previously, with the clearing of 4.8 hectares, the fauna will have moved from site and returned. The same will happen to well rehabilitated land. These factors help negate any potential impact on significant fauna. 3. To this needs to be added the large impact of clearing the local pine plantations and allowing them to rehabilitate to local native vegetation which will also help offset the impact. 4. The fact that Limestone Resources has already paid compensation for clearing the vegetation may even provide them with rights to clear. 5. Really it is not up to Limestone Resources to do the analysis of the issues. **Graceful Sunmoth** 1. Western Wildlife did not find any evidence of the Graceful Sunmoth in the field studies they conducted. **Black Cockatoos** 1. The clearing principle states that the vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia. The key here is significant habitat. 2. There are no trees on the area applied for and therefore no possible nesting sites. The issue becomes one of food supply. The best food supply is the pine plantations and then *Banksia* Woodland. This is well documented in *Valentine and Stock, 2008, Food Resources of Carnaby's Black Cockatoo (Calyptorhynchus latirostris) in the Gnangara Sustainability Strategy Study Area, Gnangara Sustainability Strategy*, and in *Shah, 2006, Conservation of Carnaby's Black Cockatoo on the Swan Coastal Plain Western Australia Birds Australia.* 3. A comparison of the species found on site and those contained in Valentine and Stock show that the main food supply of *Banksia* Woodland will supply sufficient food

	for one bird for six months. The amount of food resources in the few seeds produced by the main food species on site as *Dryandra sessilis* and *Hakea lissocarpha* need to be considered. 4. From an observational guestimate of the mass of seeds produced in one hectare of vegetation on site it is assumed that the food supply of the shrubland on site is perhaps only 10% that of *Banksia* Woodland with 1.8 hectares of *Banksia* Woodland in the west. Taking this into consideration there is likely to be enough food on the area proposed to be cleared for 1 bird. With progressive clearing and rehabilitation this can hardly be considered significant, particularly when considering the many hectares of pine plantations which are the principle food resources that have been locally cleared by DEC. 5. Even Valentine and Stock note on page 13 that clearing of the many hectares of pines "may lead to a shortage of food ...". If this is only a "may" it could not be argued that clearing of the proposed vegetation will cause a significant impact on food supply. 6. It should also be noted that even if approval to take all the limestone was provided then 136.4 hectares of *Banksia* Woodland will be retained. Taking into account the existing pines on the leases of 12.6 hectares, which can supply more food than *Banksia* Woodland (*Valentine and Stock*) in other words, on the Mining Tenements, there is sufficient food for approximately 75 birds remaining on site. 7. This is where a Negotiated Solution is the appropriate mechanism to ensure that any impact will be known and that there is provision for protection of a known quantity of food resource. 8. In addition there will be staged clearing over a number of years followed by revegetation with local trees and shrubs. This is already conditioned on the Mining Tenements. 9. There is no evidence put forward by DMP to demonstrate that the progressive excavation will be a significant impact; just simply an unsubstantiated comment which hardly satisfies a "considered" assessment. **Conclusion** • Bearing in mind the above the Clearing Assessment Report is incorrect in finding the proposal at variance with Clearing Principle (b). • The only affected fauna are Black Cockatoos, and DMP has not presented any evidence which would demonstrate that the Carnaby's Cockatoos will be significantly impacted on.
2.1.1 (c) rare flora	Agreed
2.1.1 (d) Threatened Ecological Community	Agreed

2.1.1 (e) remnant vegetation	**Vegetation Representation** 1. The critical factor in this Clearing Principle is "should not be cleared if it is a significant factor as a remnant of native vegetation in an area that has been extensively cleared." 2. The listings provided by the DMP show that on all scales, apart from the representation within the City of Wanneroo, the existing levels of protection meet all the EPA guidelines of 10% representation in constrained areas such as the Perth metropolitan Area. In the case of the City of Wanneroo data the vegetation is well represented at 49.7% remaining but insufficient occurs within secure reserves. With the proposed extension to the Yanchep National Park the level of representation within the City of Wanneroo is not considered at risk of not meeting the EPA criteria. **Conclusion** • Bearing in mind the above the Clearing Assessment Report is incorrect in finding the proposal may be at variance with Clearing Principle (b). Limestone Resources contends that the data shows that the principle is not at variance with this principle.
2.1.1 (f) Watercourse - wetland	Agreed
2.1.1 (g) land degradation	It is agreed that the soil in the pit area will be altered and temporarily degraded, but not permanently degraded. **Land Degradation** 1. This is always listed as may be at variance for quarries. However it is no different to any other development such as a house or road, or for that matter agricultural activities. 2. It is a temporary non compliance until the land is revegetation to local native species. 3. The key here is the environmental management of the quarrying operations. The floor of the pit will be limestone, not sand. The pit floor of course will have the soils altered, but with the proposed revegetation that is conditioned on the Mining Leases, and the planting of 15.8 hectares of cleared land to local native species that is currently not included in Bush Forever, this principle is a temporary non compliance. 4. There is an extensive rehabilitation program to be implemented under conditions and bonds already in place with the DMP. **Conclusion** • Bearing in mind the above the Clearing Assessment Report is correct in finding the proposal may be at variance with Clearing Principle (f) however the non compliance will be temporary only.

2.1.1 (h) conservation areas	**State Forest** 1. The application area lies within the Gnangara-Moore River State Forest. The use of the land for forestry is not a conservation matter. 2. The Forest Products Commission and Conservation Council administered by DEC are well aware of the limestone extraction in the area and have approved that excavation since the 1980's. 3. The DEC has approved the rehabilitation programs and accepts payment for all land cleared. Up to this point in time Limestone Resources has paid compensation for clearing a total of 21 hectares of land, including 4.6 hectares that is covered by the current application. 4. The approval of the existing limestone operations by the DEC with a return to local native vegetation, demonstrates consistency with the Forest. **Bush Forever Site 290** 1. The area applied for is located on Mining Leases that have been held and operated since the 1980's for limestone for the domestic development market. 2. In 2000, State Planning Policy 2.4 Basic Raw Materials was revised and gazetted. The subject land and surrounding land was confirmed as a Priority Limestone Resource Area, which is the position of the DMP. 3. In 2000, Bush Forever was placed over the top of the leases and as the mapping in that document shows, the existing open areas were excluded from Bush Forever. 4. In July 2010 State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (Bush Forever) was gazetted and required Negotiated Solutions under Section 5.1.2.2 for sites such as this. 5. The vegetation on site is Cottesloe Complex Central South which currently meets the EPA criteria for the level of preservation. See 2.1.1 (e) above) 6. A statement is made that Bush Forever Site 290 is an "important ecological linkage to adjacent bushland to the north, south and west". Whilst this is copied from Bush Forever 2000 the statement is clearly incorrect. 7. If we are talking about the 6.4 hectares applied for, it will have no impact on the linkages. It will simply extend the cleared land to the north. The areas of completed excavation will be progressively rehabilitated and this will compensate for any land cleared. In addition there will be an additional 15.8 hectares of land already cleared and not included in Bush Forever that will be added to habitat and linkages. 8. If the statement refers to the Bush Forever Site linkages, then the statement is clearly wrong. Bush Forever Site 290 ends at Wesco Road in the south at Mining leases, and an existing area of cleared land that is used for composting and recycling of organic matter. To the east Bush Forever Site 290 abuts cleared land that was planted to pine but which has now been cleared by the Forest Products Commission with no restoration applied to that land. That land is however, by default, slowly rehabilitating to local native species. The remainder of the land to the east abuts pine

plantation, as does the land to the north.

9. The land to the west is private land subject to agricultural purposes and approved quarries with some remnant vegetation remaining, although that vegetation itself is not linked. See **Attachment 3**.

10. Western Wildlife stated that the proposed clearing would have no impact on linkages in the area.

The land does not constitute an important linkage because it is not linked.

EPA Guidance Statement 19, 2008, Offsets

1. The Clearing Assessment Report states that "Bush Forever reserves are considered *critical assets" (* EPA 2006 Offsets) ***This is incorrect and a misleading statement. EPA 2006 Offsets in Appendix 3, Critical Assets actually states "Bush Forever sites (not including those areas subject to negotiated planning solution or complementary mechanisms and for which agreement has been reached that such areas fall outside the conservation requirements) having regard for the Western Australian Planning Commission's Statement of Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (Draft).*** **(Now SPP 2.8). EPA Guidance 19, 2008 Offsets, reiterates the compliance with the earlier EPA 2006 Offsets.**

2. EPA Position Statement 9 Offsets 2006 is no longer available on the EPA website. EPA Guidance Statement 19 lists Bush Forever Sites under Principle F as an action that may require environmental offsets. The most appropriate mechanism for the implementation of offsets is through conditions placed on a Clearing Permit or Conditions placed on a Mining Proposal.

3. The other key mechanism that is to be used to mitigate potential impacts on biodiversity and Bush Forever Sites is outlined in the "specific policy measures" outlined in State Policy 2.8 which, in Section 5.1.2.2, clearly requires a negotiated solution for mining tenements overlain by Bush Forever and SPP 2.8. Unfortunately to date, and in spite of numerous requests and the requirement of the CEO to have regard for Planning Instruments under Part V of the *Environmental Protection Act 1986, namely Section 51O (2), (3) and (4),* this has not been offered. Again Limestone Resources requests such a determination of a negotiated outcome.

4. There are already in place conditions placed on the Mining Proposal, including the rehabilitation of all disturbed land to local native vegetation communities. This includes the 15.8 hectares of already cleared land that is excluded from Bush Forever Site 290.

5. Under mitigation there is a series of five steps to reduce impact on biodiversity, and in this case part of Bush Forever Site 290. These are all used or are available in this proposal. As the Clearing Permit process is the only mechanism available then it is under this legislation that any offsets and negotiated outcomes must be implemented. From a reading of the legislation, failure to act on State Planning Policy would be a failure of due process and inconsistent with the legislation.

    - ***Avoidance*** – The proposed excavation at this stage is restricted to 6.4 hectares of which 4.6 hectares has previously been cleared. There is only another 5.8 hectares of limestone available after the 6.4 hectares applied

for. In turn this leaves 92.6% of the Bush Forever area on land held by Limestone Resources and meets this criteria.

- ***Minimisation*** – This is similar to Avoidance but includes the use of local plant communities for revegetation which is proposed.

- ***Rectification*** – The site is already conditioned under the Mining Lease to be rehabilitated to local native species and communities and there are rehabilitation bonds in place. The DEC has approved the rehabilitation plans and has accepted compensation for the clearing of the 4.6 hectares on behalf of the Conservation Council. The same will apply to newly cleared areas. Whilst this is a recognised principle, DMP has not even considered this in their consideration of the Clearing proposal.

- ***Reduction*** – This refers to the progressive clearing and rehabilitation that is already conditioned and approved.

- ***Offsets*** – Firstly, from discussions held with some officers of DMP, it appears that the policy of the DMP or at least some sections of the DMP is to oppose the use of offsets. There are many different types of offsets that are available, including providing better protection to vegetation, restoration of vegetation, financial contributions and the like. As noted above, the most appropriate mechanism for the implementation of an offset package is through a negotiated solution as required under State Planning Policy 2.8.

- The other factor not considered by the Assessment process is that the only high grade limestone available is restricted to the Priority Resource Area as identified in SPP 2.4. Attachment 10. Most of this is also on land covered by native vegetation. It is simplistic for the DMP to think that stopping this clearing application and closing these operations will stop clearing. It will simply shift the problem somewhere else. Elsewhere limestone is also associated with the same vegetation as is present on this site.

  A number of offset mechanisms are already in place with respect to this proposal and can be added to as part of a negotiated solution.

  Compensation has already been paid to the DEC on behalf of the Conservation Council for 4.6 hectares of the applied for area under application, and will be paid for any future land to be cleared.

  15.8 hectares of already cleared land that is excluded from Bush Forever Site 290 is already conditioned and bonded to be rehabilitated to local native species and communities and this can be added to Bush Forever Site 290 in the future.

  There is potential for negotiation to protect the 92.6% of Bush Forever Site 290 on land held by Limestone Resources that is not underlain by useable limestone.

  There is potential for Limestone Resources to excavate sand from the 12.6 hectares of pine plantation that currently exists on their leases and then return the land to local native vegetation.

	All of these actions are considered to greatly exceed the potential loss of biodiversity which will amount to 6.4 hectares (4.6 hectares previously cleared) and the further 5.8 hectares of limestone available. **Conclusion** • Limestone Resources does not agree with the statements contained within the Assessment Report and contends that the Assessment Document and the "CEO" draft position has not been arrived at in compliance with the legislation. • The potential for a negotiated solution, as required under SPP 2.8 and which the legislation directs the CEO to have regard for, combined with the fact that the Clearing Proposal is the only mechanism available to implement SPP 2.8, mitigates impacts on biodiversity. • Considering the offsets that are already in place and available and can be implemented under a negotiated solution, Limestone Resources contends that this principle is not at variance with Clearing Principle (h).
2.1.1 (i) water quality	Agreed
2.1.1 (j) flooding	Agreed
Planning Matters, Native Title, previous EPA decision or other matters.	**Background** 1. The legal requirements and process are provided in Part V of the *Environmental Protection Act 1986, namely Sections 51E (4) (b), 51E (5), Section 51O (2), (3) and (4)*. Other sections generally deal with the "mechanics" of the process. Section 51 (O) appears to be the key section. A copy of that section is included below There are four subsections, (1) dealing with definitions, (2) requiring the CEO to have regard for the clearing principles in so far as they are relevant to the matter under consideration. (3) Allowing the CEO to make a decision that is at serious variance with the clearing principles if in the CEO's opinion there is good reason for doing so. (4) Section (4) requires the CEO to have regard to any planning instrument, or other matter that the CEO considers relevant. 2. From the legislation, it would appear that the determination of a Clearing Permit Application should be a balanced decision weighing up the clearing principles (collectively stated) against the planning and other matters. The Act does not say that the planning instruments and other matters should be given equal weighting as one Clearing Principle.

3. The Act does require the CEO to consider the Clearing Principles in the decision making process. However of equal weighting in the Act are Planning and other Matters. Unfortunately the way in which Clearing Permits are assessed is to consider the Clearing Principles in a thorough manner and, as an addendum, consider the planning and other matters.

4. The Planning and Other Matters are provided with less rigour in the assessment process and there are many deficiencies in research, evidence and knowledge.

5. To further illustrate this point, and the bias of only seriously considering the conservation aspects, *Section 51O (2)* states that the CEO is to have regard for the clearing principles in so far as they are relevant". In the methodology used, all clearing principles are considered even if dismissed, which is the correct procedure and demonstrates evidenced diligence and compliance with the legislation. On the other hand *Section 51O (4)* uses the same wording of "have regard for" and yet many important aspects are ignored, such as a negotiated solution under SPP 2.8, the impact on jobs, development in Western Australia, the fact that some other land will have to be cleared, Limestone Resources has already paid compensation for clearing the 4.6 hectares of the 6.4 hectares applied for, etc. This is an inconsistent application of the legislation and does not show either due diligence or evidenced compliance.

6. When reviewing the wording and format of *the Environmental Protection Act 1986*, the current methodology used by the DEC to assess Clearing Permits does not appear to reflect the weighting required by the Act. Therefore the methodology, and this Clearing Permit Assessment in particular, can be viewed as not complying with the Act.

Planning Instruments

State Planning Policy 2.4 – Basic Raw Materials

1. The DMP takes an invalid and superficial stance on this matter. They only consider SPP 2.4 and only Priority Resource Areas. That is not what the Act requires the CEO to do. The Act clearly states Planning Instruments. There are many Planning Instruments and by only considering parts of the planning instruments, Limestone Resources contends that the Assessment does not comply with the legislation.

2. The DMP notes that the site is listed as a Priority Resource and provides some valid comments to this effect. This is true, however the officer did not contact the Department of Planning in 2010 or seek and provide written evidence on the value and critical shortage of limestone even from within the Department of Mines and Petroleum. More about this later.

3. The officer then dismisses the policy by saying that the "extraction of basic raw materials should not adversely affect the environment". This is a very selective and superficial interpretation of SPP 2.4. The comments are inconsistent with the intent and objectives of SPP 2.4 when the policy is considered as a whole. In summary the policy does not say that environmental impact should preclude extraction, but rather that the extraction should not affect the amenity and environment in the locality during and after extraction (SPP 2.4 objective 3). Rather it is a management issue. Limestone Resources has adequate management in place, already conditioned and

bonded by the DMP.

4. The relevant points are listed in SPP 2.4 Section 6.3.1. The first thing to be considered is the significance of the resource. *Section 51O (4)* of the legislation directs the CEO to have regard for SPP 2.4 and yet there is no consideration of the significance of the resource. The officer did not even provide updated information from the Department of Planning or their own department, the DMP. Neither did they take into consideration the statement made in Parliament by the Hon John Day relating to the shortage of limestone in this area.

5. The second point in SPP 2.4 Section 6.3.1 alerts the approving authority to protecting the environment. It does not preclude development but says "may require referral to the DEP (now DEC. Limestone is extracted from the site with the approval of the DEC. They have approved the rehabilitation plan and have accepted compensation payments from Limestone Resources for the clearing including the clearing, of 4.6 hectares of the requested 6.4 hectares. How a suggestion of referral to another authority is turned into a refusal is unclear.

6. The other relevant points are dot point 4, which refers to operational management and is controlled under DMP licence conditions, and dot point 5 which discusses rehabilitation. The rehabilitation program is conditioned and bonded by the DMP and has been approved by the DEC.

7. The assessing officer does not appear to have any expertise in planning matters and yet does not seek up to date planning information or present any evidence of having done so. For example State Planning Policy 2.4 is currently being reviewed and the maps updated

8. SPP 2.4 was last revised in 2000 and is currently being reviewed with new mapping and new status for the resource areas. On numerous occasions Limestone Resources has informed the DMP of this even though they should not have needed to do so and yet DMP did not even bother to get a comment from Department of Planning that was relevant to SPP 2.4, up to date, or present any written evidence as would be required under due diligence.

9. The DMP needs to contact and then provide written evidence or opinion from DoP (Geoffrey Findlay) or DMP (Warren Ormsby and Colin Strickland) on the significance and status of SPP 2.4.

State Planning Policy 2.8 – "Bush Forever"

1. SPP 2.8 was released in June 2010 and yet the only advice form the Department of Planning is from 2009 and appears to relate to Bush Forever and not basic raw materials. No up to date response was sought with respect to the newly gazetted policy.

2. The assessment has not followed the "specific policy measures" outlined in State Policy 2.8 which, in Section 5.1.2.2, clearly requires a negotiated solution for mining tenements overlain by Bush Forever and SPP 2.8. The report takes and uses out of context part (iv) relating to "future extraction".

3. Limestone Resources has been told that it was on the insistence of the DMP that a negotiated solution was provided for when considering Basic Raw Materials. If so

then the Clearing Assessment Report does not comply with the DMP position on the matter.

4. The assessment report documents the issues relating to basic raw materials and Section 5.1.2.2 and then simply dismisses them with no consideration or evidence presented on the need for limestone or the impacts if the limestone is not available. In fact the intent of Section 5.1.2.2 is very clear. It is to find a negotiated solution. No attempt has been made by the DMP to seek a negotiated solution. It was only at the insistence of Limestone Resources that a meeting has been arranged between the parties for 10 January 2011 long after the preliminary clearing assessment report was produced, in spite of numerous requests for a meeting prior to any decisions or assessments being made and promises by the DMP that this would happen.

5. The quote from part (iv) of Section 5.1.2.2 is taken out of context and is abbreviated. Part (iv) clearly states that a "strategic outcome" is the favoured approach, so why is it not offered in this the only process in which it can be offered? It does also state that there may be "overriding restrictions on future extraction for environmental reasons". Limestone Resources contends that the policies are clear and support the extraction of limestone from a proposal such as this where environmental management and a negotiated solution is provided for.

6. EPA 2006 Offsets in Appendix 3, Critical Assets actually states "Bush Forever sites (not including those areas subject to negotiated planning solution or complementary mechanisms and for which agreement has been reached that such areas fall outside the conservation requirements) having regard for the Western Australian Planning Commission's Statement of Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (Draft). (Now SPP 2.8). EPA Guidance 19, 2008 Offsets, reiterates the compliance with the earlier EPA 2006 Offsets. All EPA policies and positions point towards a negotiated solution which has not been offered. Limestone Resources therefore contends that the assessment of the clearing proposal does not comply with the legislation on the basis of *Section 51O (4)* of the Act.

7. The EPA chose not to formally assess the clearing but directed that the assessment should be undertaken during the clearing process. The EPA did not deem the project unacceptable. Therefore the EPA must have deemed the project not to be a significant environmental impact or an impact that could be managed, and that was the wording used. On the other hand the Clearing Permit Report has deemed the proposal as a possible refusal on flawed interpretation, inadequate assessment and non compliance with the relevant legislation.

8. The EPA position is consistent with the published statements. The Clearing Assessment is not.

Native Title – Aboriginal Sites

Agreed

Shortage of Limestone

1. If the provision of limestone is not an "other matter" under *Section 51O (4)* of the Act, to be taken into account by the CEO, then it is difficult to see what such a matter might be. The Urban Development Industry Association and Chamber of Commerce and Industry will provide background on the need for limestone.

2. There is in fact no mention of shortage of limestone within the assessment.

3. All developments, housing and other, are required to provide level Site A Class lots which are constructed using reconstituted limestone block retaining walls. These two companies are the two largest suppliers, providing about 90% of the market. Without the reconstituted limestone blocks, the impact will be severe in terms of disruption, cost increases and the potential to not be able to construct the subdivisions to the required standard. This will be immediate and will seriously put at risk all future developments already in the pipeline.

4. Limestone is used for all developments on the Swan Coastal Plain. Every road is constructed of limestone, limestone is used for the neutralisation of acid sulfate soils, which is a major environmental issue, and for many products in the construction of dwellings.

5. This of course does not take into account the loss of jobs, and the slow down in the economy as the construction industry is one of the main drivers of the economy as will be confirmed by the UDIA.

6. This was reiterated by the speech of the Hon. John Day to Parliament recently which clearly outlined the seriousness of the lack of limestone in the Neerabup Nowergup area and of the lack of the other basic raw materials.

7. There is a critical shortage of limestone in the Northern Perth Metropolitan Area and Perth in general. If DMP had contacted DoP (Geoffrey Findlay) or DMP (Warren Ormsby and Colin Strickland) they would have been provided with this information. If the provision of limestone is not an "other matter" to be taken into account by the CEO then it is difficult to see what such a matter might be.

8. The State Government has documented the uses and need for limestone in Mineral Resources Bulletin 19 but this has not been mentioned.

9. The Department of Planning Directions 2031, planning statement for the next 20 years, records that there will extensive additional dwellings required constructed in the northern Perth region for which the limestone is required for the construction of the subdivisions. Directions 2031 is another planning instrument that should have been considered.

10. I have provided some photographs showing the use of limestone in dwellings and subdivisions.

11. If limestone cannot be obtained then it does not mean that there will be no clearing of vegetation, but rather the clearing will take place on the Darling Scarp because the only alternative source of road making materials is granite hard rock. A Clearing Permit such as this cannot be considered in isolation. The provision of basic raw materials, in this case limestone for future developments, is part of the State Development. The attitude of the State Government with respect to this can be judged by the speech that the Minister for Planning the Hon John Day made to

Parliament at the end of November.

12. As noted previously, an officer of the DMP cannot be expected to have expertise or knowledge in planning or basic raw material availability and therefore, unless advice is sought and the written evidence provided, due diligence under the *Environmental Protection Act 1986*, *namely Section 51O (4)* cannot be achieved and compliance with the legislation is unlikely to be achieved.

13. All other high grade limestone is already on private land, under contract to other operators or lies on land held by Cockburn Cement ultimately for their own purposes and therefore unlikely to be available at some point in the future.

City of Wanneroo

1. The City of Wanneroo advice does not preclude excavation but rather seeks to minimise adverse impacts. The items raised are covered in previous sections.

Impacts on Perth and Limestone Resources

1. Limestone Resources has prepared a summary of their operations and the potential impact that refusal of the clearing permit will have on employment, all development in the northern Perth corridor and the company operations.

2. None of this is has been considered. With the restricted expertise of one officer and not researching these impacts from a range of sources and providing written responses and evidence, then the assessment of this proposal cannot be considered to have complied with the legislation.

Conclusions

- There is overwhelming evidence that limestone is in critical shortage in the northern Perth Metropolitan Area.

- There is also overwhelming evidence that the policies currently in place support a negotiated solution for continued limestone excavation. This is the only mechanism for this to occur.

- Frankly, matters of such State importance cannot be left to DMP officers preparing a Clearing Assessment Report. They simply do not have the expertise or experience to weigh up all the issues. Clearing Permits for extractive industries should only be decided by a panel of DMP, DEC and DoP representatives who make a recommendation to the CEO for consideration. This is the case under current legislation.

- In reality Limestone Resources does not believe it is in the State interest for one Government Department with a narrow operational brief to make determinations that can have huge impacts on future development.

- In the case of the DMP one part of the Department is determining Clearing Permits, which in this case only select information in support of conservation, whilst the other

	part of the Department is currently seeking to protect the basic raw materials and permit their staged use to enable development in Western Australia. Unfortunately this part of the DMP has been ignored and no evidence submitted to support the Clearing Assessment Report. • This, therefore, is the reason that Limestone Resources has chosen to provide copies of this Preliminary Clearing Decision to the Minister for Mines, Minister for Planning, Minister for Housing and Minister for the Environment, in addition to alerting the organisations such as the Chamber of Commerce and Industry and the Urban Development Institute of Australia, of the problems associated with providing enough houses or fulfilling the current approved developments.

[redacted]
on behalf of Limestone Resources

Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 694

Department Of Mines and Petroleum
100 Plain Street
East Perth WA 6004

20 October 2010

Attention; [redacted]
Environment Branch - DMP

Re; **Clearing Application**
M70/339 and M70/013, Hopkins Road, Nowergup

Limestone Building Block Company

Limestone Building Block Company is very keen to see that the correct weighting is applied to the various State Planning Procedures with respect to the consideration of the clearing permit.

From our discussions this morning the lease holder, Limestone Building Block Company, does not feel very comforted that their business, which has operated since the mid 1980's, is being supported by the Department of Mines and Petroleum.

To this end there seems to be a conflict of interest within the DMP. On the one hand the DMP is keen to protect the limestone resources and, I understand, has submitted material to the Department of Planning in relation to the Priority Limestone Resource Areas which I believe strongly puts the case for these materials to be retained and used by the Community.

On the other hand a branch of the DMP is charged with protecting vegetation and administering the Environmental Protection Clearing Regulations.

Limestone Building Block Company believes very strongly that due consideration is not being given to the protection and use of limestone resources and that State Planning Policies are not being given the weighting that they deserve.

They also believe that their interests, the interests of the community and the staff are not adequately being protected. Limestone Building Block Company is the largest supplier of reconstituted blocks for the construction and development industry.

The industry is built on these resources that have been used on M70/339 for over 25 years. A decision to not permit the small area applied for clearing is a decision to destroy the viability of the company, place the 30 plus jobs (combined with related jobs) at risk; and place all development in the northern Metropolitan Area at risk if the reconstituted blocks cannot be supplied.

25 Heather Road, Roleystone WA 6111
Tel 9397 5145 Fax 9397 5350
Lindsay Stephens Bsc (Geology), Msc (Botany) MEIANZ
Mem Aust Geomechanics Soc - Mem WA Environ Cons Assoc

It is repeated, from the correspondence of 25 July 2010, that failure to gain continued access to limestone from the leases will have an immediate and catastrophic effect on all development north of Perth and in the Metropolitan area overall.

Both Limestone Building Block Company and Limestone Resources produce most of the reconstituted limestone blocks that are used for all subdivisions and developments. If production ceased because access to high grade limestone is denied, almost no subdivision or land development would be able to be commenced, or completed.

There are many existing contracts in place and many subdivisions under construction and planned. Every one of these subdivisions uses reconstituted blocks from Limestone Building Block Company and Limestone Resources.

To this end the companies have previously met with the Principal Policy Advisor (Mines and Petroleum) Mr Bob Stevens on 21 July 2010.

THE FOLLOWING POINTS ARE STRESSED

1. It is believed that the seriousness of any decision to not grant clearing permits to enable the extraction of limestone to continue, and its impact on development in the Perth Metropolitan Area, is not realised.

2. It is our understanding that ***Planning Policies must be considered when dealing with Mining Tenements.***

3. ***Planning Policies must also be considered under Section 51O of the Environmental Protection Act 1986*** with respect to Clearing Permits.

4. ***The limestone resources applied for are part of the last limestone available in the Northern Metropolitan Area*** as all other resources outside the Priority Limestone Resource Area have been sterilised by Conservation or taken for urban development and small rural holdings.

5. ***Adequate weighting does not appear to have been given to Statement of Planning Policy 2.4 Basic Raw Materials*** which lists the site as the only Priority Limestone Resource in the Northern Metropolitan Area. This was undertaken to ensure that high grade limestone remains available to the community. From what I am hearing it is the vegetation on the limestone that DMP Vegetation Branch is considering refusal of clearing.

   How is it possible that the limestone can be taken when DMP appears to be considering preventing the clearing of vegetation from the limestone areas? This would mean that no limestone is protected for use by the community as required by SPP 2.4.

   I have attached an aerial photograph showing the limestone areas as identified by DMP and the areas that probably occur from ground based consideration. Note that the majority of the leases will not be affected by excavation for limestone and could be part of a "negotiated solution" recommended by Statement of Planning Policy 2.8.

6. ***No weighting appears to have been given to Bush Forever in Statement of Planning Policy 2.8 which states that there will be a "negotiated solution".*** There have been no negotiations with respect to a negotiated solution Limestone Building Block Company has requested negotiations but has so far been unsuccessful. Any determination of the Clearing Permit should be part of a negotiated solution under Statement of Planning Policy 2.8.

7. SPP 2.8 is not being followed. ***SPP 2.8 states that "the existing mining operations, which may continue to operate in accordance with their existing levels of extraction approvals and policies, and seek a reasonable balance between conservation and development of resource extraction through a negotiated outcome."*** It is even understood that this clause was inserted by DMP to protect the limestone and yet the officers did not avail themselves of the information.

   Surely it is up to the DMP to facilitate a solution that everyone can operate to and provide certainty for the operations. As the DMP deals with both resources and clearing I believe that they should be the agent to facilitate a negotiated solution.

   Limestone Building Block Company requests DMP to establish negotiations for a solution under Statement of Planning Policy 2.8 as part of the determination of the Clearing Permit.

8. The EPA has listed the proposed clearING as "Not Assessed" Advice Given.

9. The issue of the Bush Forever Site and its linkages does not appear to be given adequate consideration from a rehabilitation point of view. Bush Forever Site 290 is listed as having linkages to the west and south in Bush Forever 2000, on page 311 but this is not necessarily the case. The area adjoining to the east is pine plantation, some of which has recently been felled. There is some linkage to the south which adjoins excavated limestone and an organic waste recycling facility in that area. There is linkage to the west, and this can be continued through the areas where no limestone is present. Linkages can also be maintained through rehabilitation, which will be progressive, and at the end of excavation with the whole site being returned to local native vegetation.

10. Inadequate notice may have been given to of the global vegetation issues. Whilst it is noted that the vegetation must be considered locally, it must also be considered in the overall context.

    Large areas of limestone based communities have been reserved in the Neerabup National Park, the Yanchep National Park and potentially in the proposed extensions to the Yanchep National Park. Much of this has occurred since the publishing of Bush Forever 2000 as shown by Cottesloe Complex Central South now apparently having over 10% in secure tenure in the Metropolitan Area even without the additional area contained within the proposed extension to the Yanchep National Park.

    If more vegetation is now preserved in the Conservation Estate does that mean that a small area may be taken on a site like this?

WHAT IS SOUGHT?

1. An assessment is required, as part of a negotiated solution, as directed under Statement of Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region. (Bush Forever) and Statement of Planning Policy 2.4.

2. Delay in the determination of the Clearing Permit until a negotiated solution is in place. The negotiated solution will determine the total area required and available for limestone extraction for the foreseeable future and provide certainty to Government and the quarry operators.

3. Of course this does not change the Commonwealth Assessments, but this site is so important to the current and future development of Perth that some assistance from Government is needed to enable working with the Commonwealth.

4. The remaining areas of the leases could be retained as native vegetation through the negotiated solution, and held on the same lease. This could provide greater levels of protection if the ground outside the negotiated solution remains on the leases and will prevent overpegging by a different entity.

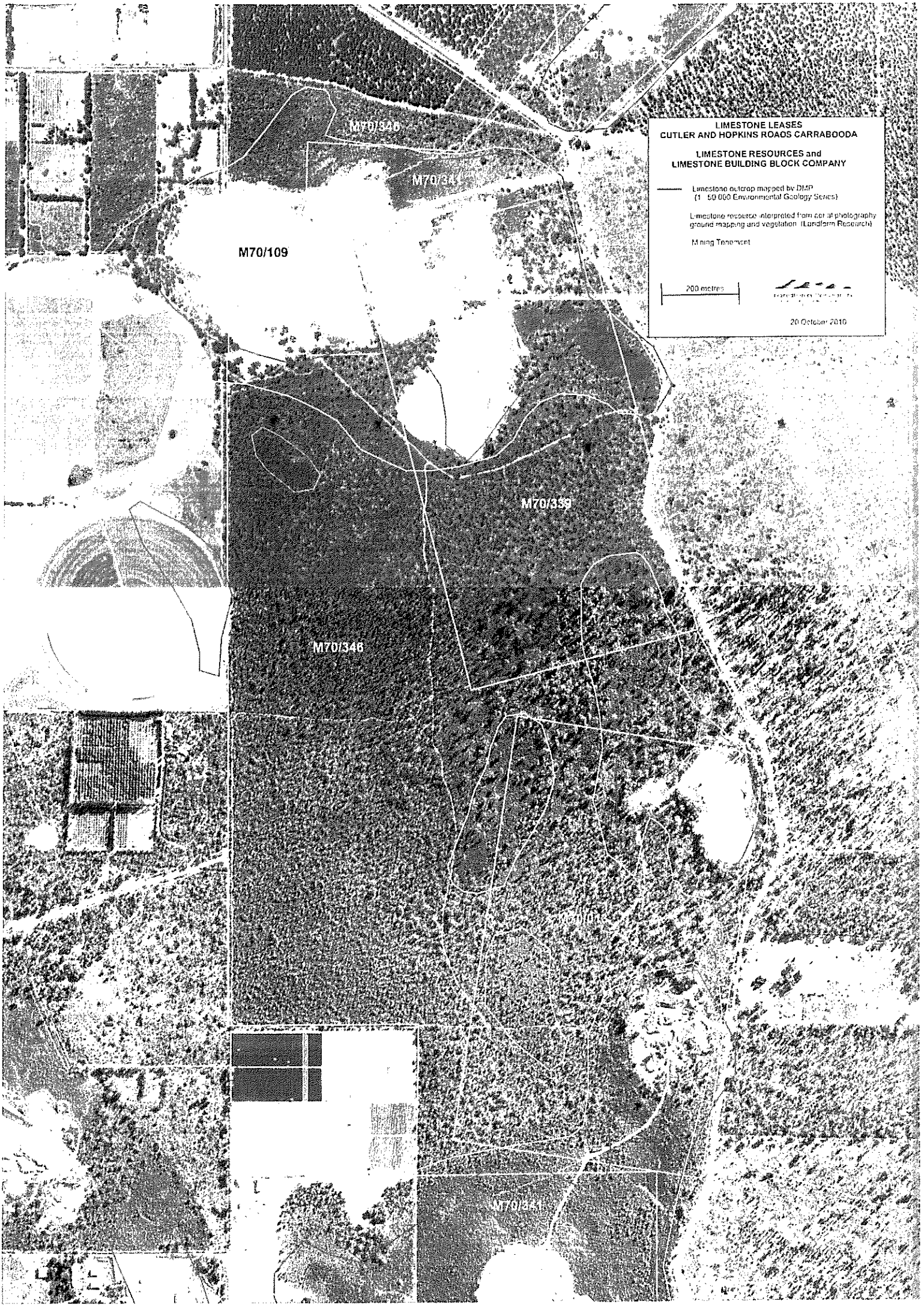
Limestone Building Block Company anticipates substantial progress towards resolving these issues as a result of the meeting that they are requesting, which hopefully will take place in the near future.

Regards [redacted]

on behalf of Limestone Building Block Company

Attachment Aerial Photograph

cc Principal Policy Advisor (Minister for Mines and Petroleum) [redacted]



LIMESTONE LEASES
CUTLER AND HOPKINS ROADS CARRABOODA

LIMESTONE RESOURCES and
LIMESTONE BUILDING BLOCK COMPANY

Limestone outcrop mapped by DMP
(1 : 50 000 Environmental Geology Series)

Limestone resource interpreted from aerial photography ground mapping and vegetation (Landform Research)

Mining Tenement

200 metres

20 October 2010

Plan 2858/1

LEGEND

- Mining Tenements
- Clearing Instruments
- Areas Approved to Clear
- Perth Metropolitan Area North 20cm Orthomosaic - Landgate 2007

N

0 75 m

Scale 1:2500
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

Date 24/2/2011

PHIL GOREY

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowleged by the agency acronym in the legend.

Government of Western Australia
Department of Mines and Petroleum

Our Ref: File No: A1737/200802- CPS 2858/1
Enquiries [redacted]
Email [redacted]

[redacted]
Limestone Resources Australia Pty Ltd
25 Frobisher Street
OSBORNE PARK WA 6017

[redacted]

Permit to Clear Native Vegetation under the *Environmental Protection Act 1986*
Limestone Resources Australia Pty Ltd – Limestone Extraction (CPS 2858/1)

I refer to your application (reference CPS 2858/1) to clear 6.4 hectares of native vegetation on Mining Leases 70/341 and 70/345 for the purpose of expanding the existing limestone mining operation.

Your clearing application has been assessed, taking into account the information you have provided, as well as information the Department of Mines and Petroleum (DMP) has obtained through consultation with other stakeholders. In considering your proposal, I must have regard to the Clearing Principles listed under Schedule 5 of the *Environmental Protection Act 1986*, as well as any planning or other relevant matters.

I advise that the following issues of significance were identified during the assessment of the above application:

- The vegetation under application is considered to comprise a high level of biological diversity and provides habitat for two Priority Flora species;
- The application area is located within Bush Forever Site No. 290 which is considered to provide a significant local ecological linkage to adjacent bushland to the north, south and west of the area under application and the proposed clearing of this vegetation would reduce this linkage and connectivity;
- The ecological linkage facilitates fauna movement within the landscape. In particular, several fauna species of conservation significance have been identified as likely to utilise the area proposed to be cleared. These include the Carnaby's Black Cockatoo, Carpet Python and Quenda;
- The vegetation under application is representative of the Priority 3 Priority Ecological Community 'Northern Spearwood shrublands and woodlands';
- The vegetation under application is located within a 'Priority Resource Location Area', as identified within State Planning Policy No 2.4: Basic Raw Materials (2000); and
- The area applied to be cleared resides over a high grade limestone resource which is required for the continued development of housing and infrastructure in the Perth northern corridor.

The assessment has determined that the proposed clearing is **'at variance'** to Clearing Principles:

- **(a) Native vegetation should not be cleared if it comprises a high level of biological diversity;**
- **(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia; and**
- **(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;**

In addition, the proposed clearing **'may be at variance'** to Clearing Principles:

- **(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; and**
- **(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.**

Considering the above, only 1.08 hectares of the original 6.4 hectare application area has been approved for clearing subject to conditions which include the requirement to develop an approved offset proposal prior to native vegetation being cleared under this permit.

Please find enclosed your permit to clear native vegetation granted under s.51E of the *Environmental Protection Act 1986*. This authorisation gives you approval to clear, subject to certain terms, conditions or restrictions. A copy of your permit is now available for the public to view, as required by the regulations.

Read your permit carefully. If you do not understand your permit, contact this Department immediately. There are penalties for failing to comply with the requirements of your permit.

If you are aggrieved by a decision of the Department of Mines and Petroleum, an appeal may be lodged with the Minister for Environment. If you choose to appeal, it must be in writing, clearly setting out the grounds of your appeal, and received by the Minister for Environment within **21** days of being notified. More information on lodging an appeal is available from the Office of the Appeals Convenor on telephone (08) 6467 5190. Completed appeals should be posted or delivered to:

Office of the Appeals Convenor	Tel: 6467 5190
Level 22 Forrest Centre	Fax: 6467 5199
221 St Georges Terrace	Email: admin@appealsconvenor.wa.gov.au
PERTH WA 6000	Web: www.appealsconvenor.wa.gov.au

Third parties may also appeal against the issue of this permit. **Please note that clearing must not commence until the date stated on the permit (19 March 2011) or until notified on the outcome of any appeal. In addition, clearing must not commence until an offset proposal has been approved as required by Condition 5 of your permit and all other environmental approvals have been obtained.**

Under Condition 7 of your permit to clear native vegetation, you are required to submit an annual clearing report. This clearing report should be forwarded to the Director, Environment Division, prior to the due date.

Please be aware that Mining Lease 70/341 will expire prior to the expiration of the clearing permit. Should a renewal of this lease not be granted by the DMP, any clearing permit granted will no longer be valid over that tenement.

Compliance with the terms, conditions or restrictions of this permit does not absolve the Permit Holder from responsibility for compliance with the requirements of all Commonwealth and State legislation.

If you have any queries regarding this decision, please do not hesitate to contact James Best in the Department's Native Vegetation Assessment Branch on (08) 9222 3073 or email james.best@dmp.wa.gov.au.

Yours sincerely

[redacted]

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

24 February 2011

Encs

Government of Western Australia
Department of Mines and Petroleum

Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 2858/1
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: **Limestone Resources Australia Pty Ltd**

1.3. Property details

Property: Mining Lease 70/341
Mining Lease 70/345
Local Government Area: City of Wanneroo

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
6.4		Mechanical Removal	Limestone Extraction

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 24 February 2011

2. Background

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description
Vegetation within the application area has been mapped at a 1:250,000 scale as the following Beard vegetation association (Shepherd, 2009; GIS Database):

- **949:** Low woodland; banksia.

A Level 2 flora and vegetation survey of the application area and surrounding vegetation (referred to as the survey area) was undertaken in early Spring (12 and 15 October 2009) and late Spring (24 November 2009). Two vegetation communities were identified within the application area (Coffey Environments, 2010).

LWBa: Low Woodland of *Banksia attenuata* and *Allocasuarina fraseriana* over Tall Shrubland of *Xanthorrhoea preissii* and *Hakea prostrata* over Low Open Shrubland of *Hibbertia hypericoides* over Very Open Sedgeland of *Tetraria octandra* and *Mesomelaena pseudostygia* over Open grassland of *Briza maxima* and *Brachypodium distachyon* over Very Open Herbland of *Desmocladus flexuosus*. Approximately 1.8 hectares of **LWBa** occurs within the application area.

TOSBsOSXp: Tall Open Scrub of *Banksia sessilis* over Open Shrubland of *Xanthorrhoea preissii*, *Melaleuca systena* and *Hakea lissocarpha* over Low Open Shrubland of *Jacksonia sericea* and *Hibbertia hypericoides* over Very Open Grassland of *Brachypodium distachyon* over Very Open Herbland of *Anagallis arvensis* var. *caerulea*, *Hypochaeris glabra* and *Urospermum picroides*. The majority of vegetation type **TOSBsOSXp** has been cleared and ripped in the past with good regeneration (Coffey Environments, 2010). Approximately 4.6 hectares of **TOSBsOSXp** occurs within the application area.

Clearing Description
Limestone Resources Australia Pty Ltd has applied to clear up to 6.4 hectares of native vegetation for the expansion of limestone mining operations.

The proposal involves clearing approximately 1.8 hectares of vegetation community **LWBa** and approximately 4.6 hectares of **TOSBsOSXp**.

Vegetation and topsoil will be cleared using a bulldozer, and stockpiled for later use in rehabilitation activities (Landform Research, 2008).

Vegetation Condition
Very Good: Vegetation structure altered; obvious signs of disturbance (Keighery, 1994).

to

Degraded: Structure severely disturbed; regeneration to good condition requires intensive management (Keighery, 1994).

Comment
Vegetation condition was assessed by Coffey Environments (2010) and by the assessing officer during site visits to the application area on 2 October 2009 and 19 October 2010.

3. Assessment of application against Clearing Principles

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

Comments

Proposal is at variance to this Principle

The application area is located within the Perth subregion of the Swan Coastal Plain Interim Biogeographic Regionalisation of Australia (IBRA) bioregion (GIS Database). The Perth subregion forms part of the South West Botanical Province which has a very high degree of species diversity (Mitchell et al., 2002).

Coffey Environments (2010) recorded two vegetation communities within the application area (five vegetation communities were recorded within the survey area) and vegetation condition ranged from 'Very Good-Good' to 'Good-Degraded' (Coffey Environments, 2010). A total of 98 native and 37 non-native (weed) species were recorded during the flora and vegetation survey (Coffey Environments, 2010). Given the number of vegetation communities within the application area compared to the survey area, it could be expected that the species count within the application area would be less than the survey area.

No Declared Rare Flora were recorded within the application area, however, two Priority Flora species, *Acacia benthamii* (Priority 2) and *Jacksonia sericea* (Priority 4), were recorded within and immediately adjacent to the application area. Over 200 individuals of *Acacia benthamii* were recorded within the survey area, and approximately 41 individuals may be disturbed by the proposed clearing (Coffey Environments, 2010). *Acacia benthamii* is known from areas including Cataby, Gnangara, Karnup, North Dandalup, Pinjarra (Coffey Environments, 2010). Over 700 individuals of *Jacksonia sericea* were observed scattered throughout the survey area (Coffey Environments, 2010). Approximately 400 individuals may be disturbed by the proposed clearing based on mapping by Coffey Environments (2010). This species has been recorded from Gnangara, Koondoola, Mullaloo and Neerabup and appears to be a disturbance opportunist (Coffey Environments, 2010; Western Australian Herbarium, 2010).

The two vegetation communities recorded within the application area were **LWBa** and **TOSBsOSXp** (Coffey Environments, 2010). **LWBa** covers an area of approximately 1.8 hectares over the western portion of the application area, whilst **TOSBsOSXp** covers the remaining (eastern) portion of the application area. Coffey Environments (2010) and Landform Research (2010) have confirmed that the majority of the area mapped as **TOSBsOSXp** has been cleared and ripped in the past with good regeneration, and this was evident during a site inspection of the application area by the assessing officer on 19 October 2010. Vegetation condition of community **TOSBsOSXp** ranged from 'Good' to 'Good-Degraded' (Coffey Environments, 2010).

Several occurrences of one Threatened Ecological Community (TEC) and three Priority Ecological Communities (PEC's) occur within 5 kilometres of the application area (GIS Database; Coffey Environments, 2010). No TEC's were identified within the application area during the flora and vegetation survey (Coffey Environments, 2010). Coffey Environments (2010) identified that the vegetation types **TOSBsOSXp** and **TOSBsXp** (which is located north-west of the application area) are representative of the Priority 3 (PEC) 'Northern Spearwood shrublands and woodlands'. This PEC is considered to be well reserved but susceptible to threatening processes such as land development (Coffey Environments, 2010).

The Department of Environment and Conservation (2010b), during a site inspection conducted on 4 November 2010, confirmed the presence of the Priority 3 PEC which aligns approximately with the mapped vegetation types **TOSBsOSXp** and **TOSBsXp** and covers 5.3 hectares of the area under application. A total of 35 occurrences of this PEC are presently recorded on the Department of Environment and Conservation's TEC database with a total area of 1012 hectares (Department of Environment and Conservation, 2010c).

The vegetation under application is part of an area of remnant native vegetation known as Bush Forever site No. 290 which covers an area of approximately 406.9 hectares (Government of Western Australia, 2000). The vegetation within this portion of Bush Forever site No. 290 has been mapped as Cottesloe – Central and Southern vegetation complex of which approximately 36% of the pre-European extent of this vegetation complex remains (GIS Database; Coffey Environments, 2010).

The presence of Priority Flora and PEC's within the application area raises the diversity of the area from a floristic perspective. Whilst there were a high number of weed species (37) recorded within the survey area, aerial imagery confirms that the local area has largely been cleared for horticultural and plantation purposes (GIS Database). As a result, given the extent of land clearing that has occurred in the local area and the quality of vegetation within the application area, the vegetation under application is likely to represent an area of higher ecosystem and species diversity than the surrounding landscape. However, a portion of the application area covered by vegetation community **TOSBsOSXp** is regrowth vegetation in 'Good-Degraded' condition (Coffey Environments, 2010). The potential impacts to biodiversity caused by the removal of this portion of vegetation community **TOSBsOSXp** may be mitigated by the implementation of an offset condition.

Based on the above, the proposed clearing is at variance to this Principle.

Methodology

Coffey Environments (2010)
Department of Environment and Conservation (2010b)
Department of Environment and Conservation (2010c)
Government of Western Australia (2000)
Mitchell et al. (2002)

Shepherd (2009)
Western Australian Herbarium (2010)
GIS Database:
- IBRA Australia
- Perth Metropolitan Area North 20cm Orthomosaic - Landgate 2007

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments

Proposal is at variance to this Principle

Landform Research (2008) carried out a search of the Department of Environment and Conservation's (DEC) Threatened and Priority Fauna Database between the coordinates 31.572°S 115.658°E and 31.751°S 115.842°E. The following fauna species of conservation significance have the potential to utilise the habitat within the application area:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*, and Schedule 1 (Fauna that is rare or is likely to become extinct) under the Wildlife Conservation (Specially Protected Fauna) Notice 2010 (2);
- Graceful Sun-moth (*Synemon gratiosa*), listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*, and Schedule 1 (Fauna that is rare or is likely to become extinct) under the Wildlife Conservation (Specially Protected Fauna) Notice 2010 (2);
- Peregrine Falcon (*Falco peregrinus*), Schedule 4 (Other specially protected fauna) under the Wildlife Conservation (Specially Protected Fauna) Notice 2010 (2);
- Carpet Python (*Morelia spilota imbricata*), Schedule 4 (Other specially protected fauna) under the Wildlife Conservation (Specially Protected Fauna) Notice 2010 (2), and DEC Priority 4;
- Western Brush Wallaby (*Macropus irma*), DEC Priority 4; and
- Quenda (*Isoodon obesulus fusciventer*), DEC Priority 5.

Of particular importance is the suitability of the vegetation to provide foraging habitat for Carnaby's Black Cockatoo. The vegetation within the application area comprises of various *Banksia, Eucalyptus, Hakea* and *Grevillea* species which are considered important feed sources for Carnaby's Black Cockatoo (Department of Sustainability, Environment, Water, Population and Communities, 2011a). Large flocks of Black Cockatoo's have been observed in the vicinity of the application area, including an observation by Department of Mines and Petroleum staff during an inspection on the neighbouring Mining Lease 70/339 on 24 June 2009. While small areas of foraging habitat around the metropolitan area support only small numbers of birds for short periods of time, the progressive loss of small areas is an on-going concern for this species (Department of Sustainability, Environment, Water, Population and Communities, 2011a). The proposed clearing of up to 6.4 hectares will adversely impact on vegetation that is considered foraging habitat for Carnaby's Black Cockatoo.

The Graceful Sun-moth has been found to occur on Spearwood dune soils, with low open woodlands or open forest dominated by *Banksia* and *Eucalyptus* (Department of Sustainability, Environment, Water, Population and Communities, 2011a). The distribution of the species is known to extend the full length of the Swan Coastal Plain, from Binningup in the south to Leeman in the north (Department of Environment and Conservation, 2010a). However, within this range the sub-populations are severely fragmented due to natural and human induced disjunctions (Department of Environment and Conservation, 2010a). The soil and vegetation complexes within the application area have the potential to represent suitable habitat for this endangered species. A Graceful Sun-moth survey of the application area and adjoining vegetation was conducted on 15 and 25 March and 1 and 6 April 2010. Whilst suitable habitat was recorded in the study area, no adult Graceful Sun-moths were recorded.

The Carpet Python has been recorded from semi-arid coastal and inland habitats that comprise of Banksia woodland, Eucalypt woodland and grasslands (Department of Environment and Conservation, 2009a). This species is known to occur in the Yanchep National Park which is located approximately 6 kilometres north-west from the application area (Department of Environment and Conservation, 2009a). The Carpet Python may be present within the application area given the presence of suitable habitat. The proposed clearing is likely to result in some loss of habitat for this species.

Government of Western Australia (2000) states that Bush Forever Site No. 290 provides suitable habitat for the Quenda which is known to inhabit dense scrubby vegetation up to one metre high (Department of Environment and Conservation, 2009b). The Quenda has been recorded at a range of locations that include Neerabup National Park, Wanneroo, Carabooda, Pinjar and Burns Beach (Landform Research, 2008; DEC, 2007). It is likely that this species would utilise the habitat within the application area. The Western Brush Wallaby has also been recorded at nearby locations that include Neerabup National Park, Nowergup and Pinjar (Landform Research, 2008; DEC, 2007). The proposed clearing is likely to result in habitat loss for both of these species.

The vegetation under application is part of an area of remnant native vegetation known as Bush Forever site No. 290 which covers an area of approximately 406.9 hectares (Government of Western Australia, 2000). Large areas surrounding this remnant area of native vegetation have been cleared for horticultural and plantation purposes. Assessment of aerial imagery demonstrates that the vegetation under application, as well as the adjoining vegetation within the Bush Forever Site No. 290 forms part of an important linkage to adjacent bushland to the north, south and west (GIS Database, Government of Western Australia, 2000).

Coffey Environments (2010) has rated the vegetation condition of the application area as 'Very Good-Good' to 'Good-Degraded'. The vegetation in the middle portion of the application area was rated as 'Good-Degraded' having been historically disturbed through mechanical ripping (Coffey Environments, 2010). This area has regenerated with native species, although contained a higher level of weed invasion compared to the adjoining areas (Coffey Environments, 2010).

The proposed clearing is likely to reduce fauna linkages, and available fauna habitat in the local area. Given the extent of land clearing that has occurred in the local area and the quality of vegetation within and adjacent to the application area, the vegetation under application is considered important habitat for fauna species in the local area. However, a portion of the application area covered by vegetation community **TOSBsOSXp** is regrowth vegetation in 'Good-Degraded' condition (Coffey Environments, 2010). The potential impact to fauna habitats caused by the removal of this portion of vegetation community **TOSBsOSXp** may be mitigated by the implementation of an offset condition.

Based on the above, the proposed clearing is at variance to this Principle.

Methodology
Department of Environment and Conservation (2007)
Department of Environment and Conservation (2009a)
Department of Environment and Conservation (2009b)
Department of Environment and Conservation (2010a)
Department of Sustainability, Environment, Water, Population and Communities (2011a)
Department of Sustainability, Environment, Water, Population and Communities (2011b)
Government of Western Australia (2000)
Landform Research (2008)

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

Comments

Proposal is not likely to be at variance to this Principle

According to available datasets there are no known records of Declared Rare Flora (DRF) species within the application area (GIS database). There are seven records for the DRF species *Eucalyptus argutifolia* within 5 kilometres of the application area (GIS Database). There are no other records for any DRF species within 8 kilometres of the application area.

A Level 2 flora and vegetation assessment of the application area was undertaken by Coffey Environments (2010). No DRF was recorded within the application area during the survey (Coffey Environments, 2010).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology
Coffey Environments (2010)
GIS Database:
- Declared Rare and Priority Flora List

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

Comments

Proposal is not likely to be at variance to this Principle

According to available datasets there are no known Threatened Ecological Communities (TEC's) within the application area (GIS database).

A computer floristic analysis (PATN) was undertaken to clarify the alignment of Floristic Community Types to the vegetation communities recorded within the application area. Based on this analysis, no TEC's were identified within the application area (Coffey Environments, 2010). The Department of Environment and Conservation (2010b), during a site inspection conducted on 4 November 2010, did not identify any TECs within the area under application.

The nearest known TEC is '*Melaleuca huegelii - Melaleuca acerosa* shrublands on limestone ridges (Gibson et al. 1994 type 26a)' which is located approximately 500 metres south of the application area (GIS database; DEC, 2010a; DEC 2010b). Although the 6.4 hectares of vegetation applied to be cleared is within close proximity to this TEC the two areas are separated by existing limestone quarry operations and it is unlikely that the vegetation applied to be cleared is necessary for the maintenance of this TEC.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology
Coffey Environments (2010)
Department of Environment and Conservation (2010a)
Department of Environment and Conservation (2010b)
GIS Database:
Threatened Ecological Sites Buffered

(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.

Comments

Proposal may be at variance to this Principle

The clearing application area is located within the Perth subregion of the Swan Coastal Plain Interim Biogeographic Regionalisation for Australia (IBRA) bioregion. Approximately 39% of the pre-European vegetation remains within the bioregion (see table) (GIS database; Shepherd, 2009).

The vegetation of the clearing application area has been mapped as Beard vegetation association 949: Low woodland; banksia (GIS Database). According to Shepherd (2009) approximately 57.2% and 58% of Beard vegetation association 949 remains at both the state and bioregional level respectively (see table).

The vegetation under application is part of an area of remnant native vegetation known as Bush Forever site No. 290 which covers an area of approximately 406.9 hectares (Government of Western Australia, 2000). Bush Forever aims to retain a minimum of 10% of each vegetation complex in the Perth Metropolitan Region (Government of Western Australia, 2000). The vegetation complex for this portion of Bush Forever site No. 290 has been mapped as Heddle Vegetation Complex Cottesloe – Central and South (GIS Database). According to Government of Western Australia (2000) in 'Bush Forever Volume 1' approximately 36% of Heddle Vegetation Complex Cottesloe – Central and South remains (see table).

The National Objectives and Targets for Biodiversity Conservation (2001-2005) recognise that retention of 30% or more, of the pre-clearing extent of each ecological community is necessary to protect Australia's biological diversity. However, the Environmental Protection Authority's modified objective for constrained areas for the Swan Coastal Plain portion of the Perth Metropolitan Area targets a minimum retention of 10% of the pre-clearing ecological community (Environmental Protection Authority, 2000).

Whilst it is acknowledged that both Beard Vegetation Association 949 and Heddle Vegetation Complex Cottesloe – Central and South are above recognised thresholds, assessment of aerial imagery confirms that the local area (1: 25,000 scale) has been largely cleared for horticultural and plantation purposes and the vegetation under application forms part of a significant area of native vegetation (Bush Forever site no. 290). This bushland is considered an important ecological linkage to adjacent bushland to the north, south and west (Government of Western Australia, 2000). However, a portion of the application area covered by vegetation community **TOSBsOSXp** is regrowth vegetation in 'Good-Degraded' condition (Coffey Environments, 2010). The potential impacts to ecological linkages caused by the removal of this portion of vegetation community **TOSBsOSXp** may be mitigated by the implementation of an offset condition.

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-european % in IUCN Class I-IV Reserves
IBRA bioregion – Swan Coastal Plain	1,501,209	583,140	~39	Depleted	10.5
Beard veg assoc. – State					
949	218,194	124,865	~57.2	Least Concern	13.3
Beard veg assoc. – Bioregion					
949	209,984	122,678	~58	Least Concern	13.4
Shire					
City of Wanneroo	67,697	33,637	~49.7	Depleted	8.3
Heddle Vegetation Complex					
Cottesloe – Central and South	34,439	12,362	~36	Depleted	18

* Shepherd (2009)
** Department of Natural Resources and Environment (2002)

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology

Department of Natural Resources and Environment (2002)
Environmental Protection Authority (2000)
Government of Western Australia (2000)
Shepherd (2009)
GIS Database:

- Heddle Vegetation Complexes
- IBRA Australia
- NLWRA, Current Extent of Native Vegetation
- Perth Metropolitan Area North 20cm Orthomosaic - Landgate 2007

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

Comments

Proposal is not likely to be at variance to this Principle

Analysis of Geographic Information Systems (GIS) hydrography data indicates there are no watercourses or wetlands within the application area. A site visit to the application area on 2 October 2009 by Department of Mines and Petroleum staff confirmed there are no watercourses or wetlands within the application area.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology

GIS Database:
- Hydrography, linear

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments

Proposal may be at variance to this Principle

The soils within the application area comprise of yellow or brown sands over abundant limestone outcrop (Landform Research, 2008). Soil coverage is low on the ridges, varying between 200 to 300 millimetres (Landform Research, 2008). Topographic information indicates that slope within the application area varies between approximately 2% on the flat plains, to approximately 6% in areas closer to limestone ridges (GIS Database; Landform Research, 2008).

The sandy and porous nature of the soils within the application area indicates that the site is well drained Landform Research, 2008). The absence of any significant overland flows would thereby minimise the risk of water erosion.

Depth to groundwater within the application area varies from approximately 21 metres in the west to approximately 25 metres in the east (Landform Research, 2008). Given the porosity of the soils and absence of any low-lying or drainage areas within the application area, the proposed clearing is not likely to cause any water-logging issues.

In areas where the limestone ridge rises to the surface there is likely to be a negligible wind erosion risk due to the hard and binding nature of the limestone material. In the areas that are overlain by deeper sand sheets there is likely to be a moderate wind erosion risk due to the high sand content and the relative ease at which these materials may be transported by wind. The potential impacts of this risk may be minimised through the implementation of a staged clearing condition.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology

Landform Research (2008)
GIS Database:
- Topographic Contours, Statewide

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.

Comments

Proposal is at variance to this Principle

The application area is located within the Gnangara-Moore River State Forest which is managed by the Department of Environment and Conservation (GIS Database). The Gnangara-Moore River State Forest encompasses an area in excess of 50,000 hectares, however a large portion of this State Forest is covered by pine plantation (GIS Database).

The application area is located within Bush Forever Site No. 290 which covers an area of approximately 406.9 hectares (Government of Western Australia, 2000).

Bush Forever Site No. 290 is considered an important ecological linkage to adjacent bushland to the north, south and west (Government of Western Australia, 2000). Assessment of aerial imagery demonstrates that the area under application contributes to an important linkage between the vegetation to the north and south of the existing quarries, and connects with remnant native vegetation on adjoining properties to the west. The proposed clearing of this vegetation would reduce this linkage and connectivity and is likely to result in negative impacts on Bush Forever Site No. 290 (Department for Planning, 2010).

Given the location of the application area within Bush Forever Site No. 290 and the Gnangara-Moore River State Forest the proposed clearing may also impact on the environmental values of this area through the increased potential for intrusion of dieback or weed species. The implementation of dieback and weed management conditions may minimise this risk.

Under the Environmental Protection Authority's Position Statement No. 9 Environmental Offsets (2006) Bush Forever sites are considered "critical assets". There is a presumption against recommending approval for proposals that are likely to have significant adverse impacts to "critical assets" (Environmental Protection Authority, 2006). However, 1.08 hectares of the application area covered by vegetation community **TOSBsOSXp** is in poorer condition than the remainder of the application area and is regrowth vegetation considered to be in 'Good-Degraded' condition (Coffey Environments, 2010). The potential impacts to the Bush Forever site caused by the removal of this portion of vegetation community **TOSBsOSXp** may be mitigated by the implementation of an offset condition.

Based on the above, the proposed clearing is at variance to this Principle.

Methodology Department for Planning (2010)
Environmental Protection Authority (2006)
Government of Western Australia (2000)
GIS Database:
- DEC Tenure

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments

Proposal is not likely to be at variance to this Principle

The application area is located immediately adjacent to the Gnangara Underground Water Pollution Control Area which is managed for Priority 1 (P1) water source protection (Department of Water, 2009; GIS Database). Extractive industries are an acceptable land use in P1 areas, however, conditions apply to the storage of fuels and chemicals, the depth of excavation related to the water table and rehabilitation criteria (Department of Water, 2008).

Landform Research (2008) advises that depth to groundwater is approximately 21 metres in the west to approximately 25 metres in the east. Groundwater salinities within and surrounding the application area have been recorded at less than 500 milligrams per litre Total Dissolved Solids (GIS Database). The soils within the application area comprise of limestone ridges overlain by yellow or brown sand (Landform Research, 2008). The sandy and porous nature of the soils indicates that the application area is likely to be considered well drained (Landform Research, 2008). Although the proposed clearing may increase the amount of rainwater that infiltrates to groundwater, given the nature of the overlying materials, the proposed clearing is not likely to adversely impact the quality of groundwater within the Gnangara Underground Water Pollution Control Area.

There are no hydrological features within the application area and this was confirmed during a site visit to the application area on 2 October 2009 (GIS Database). The proposed clearing is not likely to impact on the quality of surface water in any nearby watercourses or wetlands.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methoology Department of Water (2008)
Landform Research (2008)
GIS Database:
- Groundwater Salinity, Statewide
- Hydrography, linear_1
- Public Drinking Water Source Areas (PDWSAs)
- Topographic Contours, Statewide

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments

Proposal is not likely to be at variance to this Principle

There are no watercourses or wetlands within the application area (GIS Database). The vegetation is not growing in association with any low lying areas which may be prone to seasonal inundation. The soils within the application area comprise of limestone ridges overlain by yellow or brown sand (Landform Research, 2008). The sandy and porous nature of the soils indicates that the application area is likely to be considered well drained (Landform Research, 2008). The proposed clearing is not likely to cause or increase the incidence of flooding.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology Landform Research (2008)
GIS Database:
- Hydrography, linear

Planning instrument, Native Title, RIWI Act Licence, EP Act Licence, Works Approval, Previous EPA decision or other matter.

Comments

There are no native title claims over the area under application. However, the mining tenure has been granted in accordance with the future act regime of the *Native Title Act 1993* and the nature of the act (i.e. the proposed clearing activity) has been provided for in that process, therefore the granting of a clearing permit is not a future act under the *Native Title Act 1993*.

There are no registered Sites of Aboriginal Significance within the area applied to clear (GIS Database). It is the proponent's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Sites of Aboriginal Significance are damaged through the clearing process.

It is the proponent's responsibility to liaise with the Department of Environment and Conservation and the Department of Water to determine whether a Works Approval, Water Licence, Bed and Banks Permit, or any other licence or approvals are required for the proposed works.

The clearing permit application was referred to the Environmental Protection Authority in 2008 and the published level of assessment was 'Not Assessed, No Advice Given, Managed under Part V of *Environmental Protection Act 1986'*.

The clearing permit application was advertised on 15 May 2009 by the Department of Mines and Petroleum (DMP) inviting submissions from the public. One submission was received from the City of Wanneroo who provided the following advice (City of Wanneroo, 2009; City of Wanneroo, 2010):

- that the proposed clearing may impact on an area of remnant vegetation;
- that the proposed clearing may impact on ecological linkages and important foraging habitat for Rare Fauna listed under the *Environment Protection and Biodiversity Conservation Act 1999*;
- that a management and rehabilitation plan should be developed prior to removal of any vegetation;
- that the application area is located within State Forest and Bush Forever; and
- that care should be taken to mitigate adverse impacts on surrounding native vegetation.

DMP consider that the abovementioned issues have been addressed throughout the clearing application assessment report.

Mining Leases 70/341 and 70/345 are located within a 'Priority Resource Location Area', as identified within State Planning Policy 2.4: Basic Raw Materials (SPP 2.4). Priority Resource Locations are considered regionally significant resources which should be recognised for future basic raw materials extraction and not be constrained by incompatible land uses or development (Western Australian Planning Commission, 2000). SPP 2.4 is designed to facilitate the extraction of basic raw materials close to major markets in the metropolitan region. The policy recognises the importance of ensuring the extraction of basic raw materials occurs with minimal detriment to the environment, including regionally significant bushland and in a manner that allows for the future use and development consistent with the long-term planning intentions for the area (Western Australian Planning Commission, 2000). SPP 2.4 does not remove obligations to identify environmental constraints that may determine the extent and/or manner in which a proposal can be implemented (Western Australian Planning Commission, 2000). SPP 2.4 specifically states that the development of land for the extraction of basic raw materials should not adversely affect the environment. It is for this reason that key legislation for the protection of the environment, including the clearing provisions of the *Environmental Protection Act 1986*, applies to limestone extraction.

State Planning Policy 2.8 Bushland Policy for the Perth Metropolitan Region (SPP 2.8) provides a policy and implementation framework for the management and protection of bushland in the Perth Metropolitan Region (Western Australian Planning Commission, 2010). The policy does not prevent development provided that it is consistent with the policy and other planning and environmental considerations (Western Australian Planning Commission, 2010). The policy contains a specific policy measure identified under section 5.1.2.2 relating to 'Bush Forever Areas – Urban, Industrial or Resource Development' where land includes significant bushland identified as a priority resource location, key extraction area or extraction area, as identified in SPP 2.4 (Western Australian Planning Commission, 2010). Section 5.1.2.2 allows decision makers to recognise regionally significant bushland as constrained by existing commitments and approvals, including existing mining operations, which may continue to operate in accordance with their existing levels of extraction approvals (Western Australian Planning Commission, 2010).

DMP has considered SPP 2.4 and SPP 2.8 during the assessment of this clearing permit application and has also considered information provided by the proponent and the Geological Survey of Western Australia (GSWA) highlighting the importance of the Wanneroo high grade limestone resource to the continued development of affordable housing and infrastructure in the Perth northern corridor.

The proponent has applied to clear 6.4 hectares of native vegetation however given the high environmental values associated with the area applied to be cleared only 1.08 hectares of the regrowth vegetation type **TOSBsOSXp** in 'Good-Degraded' condition (Coffey Environments, 2010) has been approved to be cleared subject to the implementation of an offset condition.

Methodology City of Wanneroo (2009)

City of Wanneroo (2010)
Department of Planning (2010)
Western Australian Planning Commission (2000)
Western Australian Planning Commission (2010)
GIS Database
- Native Title Claims
- Sites of Aboriginal Significance DIA

4. References

City of Wanneroo (2009). Application to Clear Native Vegetation CPS 2858/1, Advice to Assessing Officer, Native Vegetation Assessment Branch, received 18 December 2008, Infrastructure Planning, City of Wanneroo.

City of Wanneroo (2010). Application to Clear Native Vegetation CPS 2858/1, Advice to Assessing Officer, Native Vegetation Assessment Branch, received 15 December 2010, City of Wanneroo.

Coffey Environments (2010). Flora and Fauna Assessment M70/341 & M70/345 Cutler Road, Carabooda, Prepared for Limestone Resources Australia Pty Ltd, Prepared by Coffey Environments Australia, February 2010.

Department of Environment and Conservation (2007). Threatened and Priority Fauna Database, A search between 31.572°S 115.658°E and 31.751°S 115.842°E – Wattle Av/Dayrell Rd (~10 kilometre buffer). Department of Environment and Conservation, 13 June 2007.

Department of Environment and Conservation, (2009a). Carpet Python *Morelia spilota imbricata* (Lacepede, 1804) in Fauna Species Profiles, Department of Environment and Conservation, Perth, viewed 9 September 2009, <http://www.dec.wa.gov.au/animals/fauna-management/fauna-species-profiles/reptiles.html>.

Department of Environment and Conservation, (2009b). Quenda *Isoodon obesulus fusciventer* (Shaw, 1797) in Fauna Species Profiles, Department of Environment and Conservation, Perth, viewed 9 September 2009, <http://www.dec.wa.gov.au/animals/fauna-management/fauna-species-profiles/marsupials-and-monotremes.html>.

Department of Environment and Conservation (2010a). List of Threatened Ecological Communities on the Department and Environment's Threatened Ecological Community (TEC) Database endorsed by the Minister for the Environment, Species and Communities Branch, Department of Environment and Conservation, December 2006.

Department of Environment and Conservation (2010b). Environmental Management Branch, Updated Comments on Flora and Vegetation Assessments M70/339, M70/341 and M70/345 Hopkins Rd and Cutler Road, Nowergup.

Department of Environment and Conservation (2010c). Environmental Management Branch, Significance of the Occurrence of TECs/PECs at Hopkins Rd and Cutler Road, Nowergup.

Department of Sustainability, Environment, Water, Population and Communities, (2011a). *Calyptorhynchus baudinii* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra, viewed 22 February 2011, <http://www.environment.gov.au/sprat>.

Department of Sustainability, Environment, Water, Population and Communities, (2011b). *Synemom gratiosa* in Species Profile and Threats Database, Department of Sustainability, Environment, Water, Population and Communities, Canberra, viewed 22 February 2011, <http://www.environment.gov.au/sprat>.

Department of Natural Resources and Environment (2002). Biodiversity Action Planning. Action planning for native biodiversity at multiple scales; catchment bioregional, landscape, local. Department of Natural Resources and Environment, Victoria.

Department for Planning (2010). Application to Clear Native Vegetation CPS 2858/1, Advice to Assessing Officer, Native Vegetation Assessment Branch, Department of Mines and Petroleum, received 22 December 2010, State Strategic Policy, Department for Planning.

Department of Water (2008). Application to Clear Native Vegetation CPS 2858/1, Advice to Assessing Officer, Native Vegetation Assessment Branch, Department of Mines and Petroleum, received 18 December 2008, Swan Avon Region, Department of Water.

Environmental Protection Authority (2000). Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation, With Particular Reference to the Agricultural Area, Position Statement No. 2, Prepared by the Environmental Protection Authority, December 2000.

Environmental Protection Authority (2006). Environmental Offsets. Position Statement No.9. Perth, Western Australia, January 2006.

Government of Western Australia (2000). Bush Forever Volumes 1 and 2. Western Australian Planning Commission, Perth WA.

Keighery, B.J. (1994). Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Landform Research (2008). Updated Vegetation Assessment, M70/341 and M70/345, Cutler Road, Carabooda, Prepared for Limestone Resources Australia Pty Ltd, Prepared by Landform Research, 21 April 2008.

Mitchell, D., Williams, K. and Desmond, A. (2002). Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion), In a Biodiversity Audit of Western Australia's 53 Biogeographical Subregions. Department of Conservation and Land Management, pp 606-623.

Shepherd, D.P. (2009). Adapted from: Shepherd, D.P., Beeston, G.R., and Hopkins, A.J.M. (2001), Native Vegetation in Western Australia. Technical Report 249. Department of Agriculture Western Australia, South Perth. Includes subsequent updates for 2006 from Vegetation Extent dataset ANZWA1050000124.

Western Australian Herbarium (2010). Florabase - The Western Australia Flora, accessed 24 September 2010, <http://florabase.calm.wa.gov.au.html>.

Western Australian Planning Commission (2000). Statement of Planning Policy No. 2.4 Basic Raw Materials, Perth, WA.

Western Australian Planning Commission (2010). Statement of Planning Policy No. 2.8 Bushland Policy for the Perth Metropolitan Region, Perth, WA.

5. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government
CALM	Department of Conservation and Land Management (now DEC), Western Australia
DAFWA	Department of Agriculture and Food, Western Australia
DEC	Department of Environment and Conservation, Western Australia
DEH	Department of Environment and Heritage (federal based in Canberra) previously Environment Australia
DEP	Department of Environment Protection (now DEC), Western Australia
DIA	Department of Indigenous Affairs
DLI	Department of Land Information, Western Australia
DMP	Department of Mines and Petroleum, Western Australia
DoE	Department of Environment (now DEC), Western Australia
DoIR	Department of Industry and Resources (now DMP), Western Australia
DOLA	Department of Land Administration, Western Australia
DoW	Department of Water
EP Act	Environmental Protection Act 1986, Western Australia
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Federal Act)
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
RIWI Act	Rights in Water and Irrigation Act 1914, Western Australia
s.17	Section 17 of the Environment Protection Act 1986, Western Australia
TEC	Threatened Ecological Community

Definitions:

{Atkins, K (2005). *Declared rare and priority flora list for Western Australia, 22 February 2005.* Department of Conservation and Land Management, Como, Western Australia} :-

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.
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.

{Wildlife Conservation (Specially Protected Fauna) Notice 2005} [Wildlife Conservation Act 1950] :-

Schedule 1	**Schedule 1 – Fauna that is rare or likely to become extinct:** being fauna that is rare or likely to become extinct, are declared to be fauna that is need of special protection.
Schedule 2	**Schedule 2 – Fauna that is presumed to be extinct:** being fauna that is presumed to be extinct, are declared to be fauna that is need of special protection.
Schedule 3	**Schedule 3 – Birds protected under an international agreement:** being birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is need of special protection.

Schedule 4 **Schedule 4 – Other specially protected fauna:** being fauna that is declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 or 3.

{CALM (2005). *Priority Codes for Fauna.* Department of Conservation and Land Management, Como, Western Australia} :-

P1 **Priority One: Taxa with few, poorly known populations on threatened lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

P2 **Priority Two: Taxa with few, poorly known populations on conservation lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

P3 **Priority Three: Taxa with several, poorly known populations, some on conservation lands:** Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

P4 **Priority Four: Taxa in need of monitoring:** Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

P5 **Priority Five: Taxa in need of monitoring:** Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Categories of threatened species (*Environment Protection and Biodiversity Conservation Act 1999)*

EX **Extinct:** A native species for which there is no reasonable doubt that the last member of the species has died.

EX(W) **Extinct in the wild:** A native species which:
(a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
(b) 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.

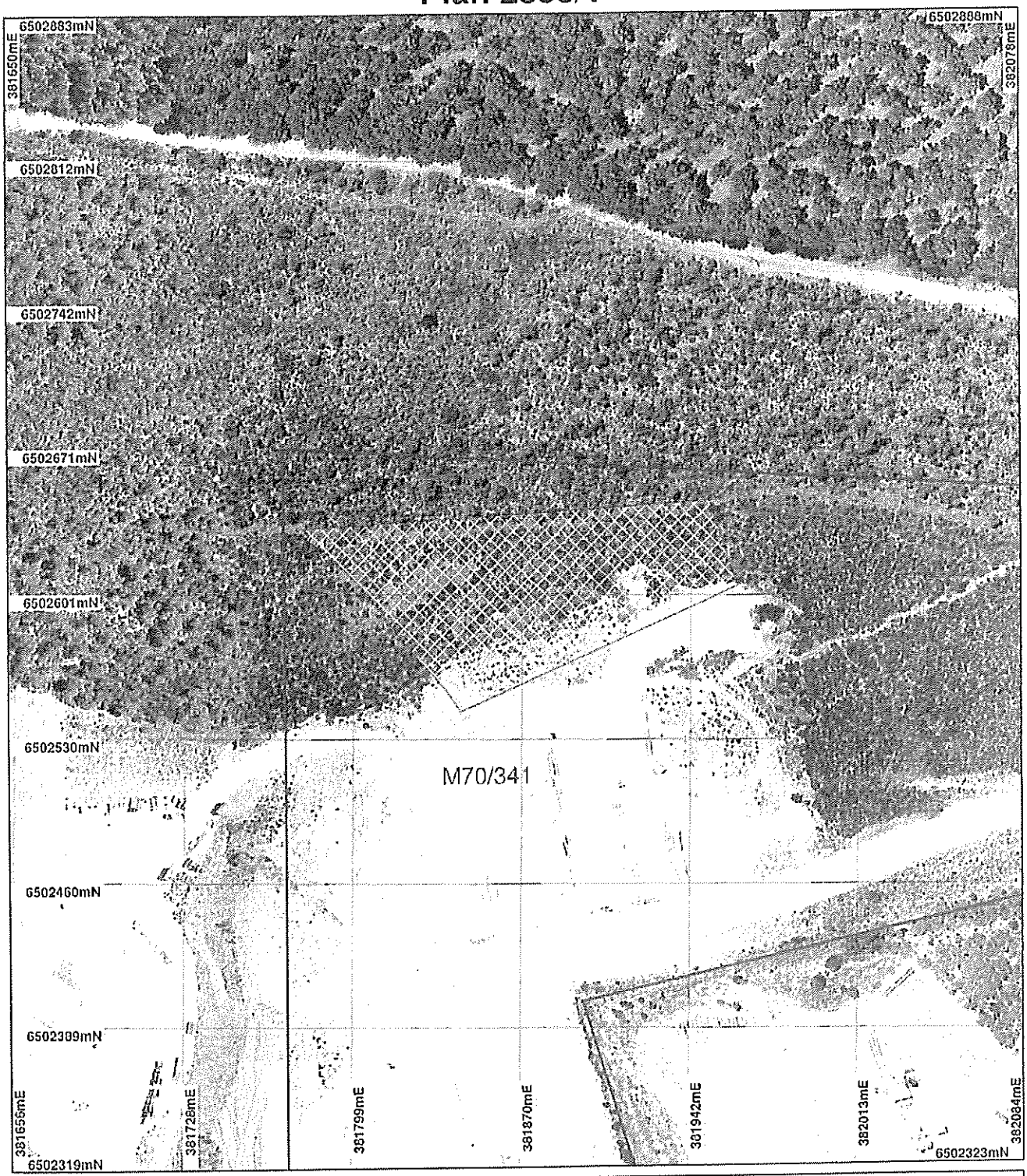
CR **Critically Endangered:** A native species which is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.

EN **Endangered:** A native species which:
(a) is not critically endangered; and
(b) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

VU **Vulnerable:** A native species which:
(a) is not critically endangered or endangered; and
(b) 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:** A native species which 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.

Plan 2858/1



LEGEND

- Mining Tenements
- Clearing Instruments
- Areas Approved to Clear

Perth Metropolitan Area
North 20cm Orthomosaic - Landgate 2007

N

0 ~75 m

Scale 1:2500
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion of measurement instruments.

Date

PHIL GOREY
Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend

GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

PERMIT DETAILS
Purpose Permit Number: 2858/1
File Number: A1737/200802
Duration of Permit: From 19 March 2011 to 31 March 2016

PERMIT HOLDER
Limestone Resources Australia Pty Ltd

LAND ON WHICH CLEARING IS TO BE DONE
Mining Lease 70/341

PURPOSE FOR WHICH THE CLEARING MAY BE DONE
1. Clearing for the purpose of limestone extraction.

CONDITIONS

Type of clearing authorised
1. The Permit Holder must not clear more than 1.08 hectares of native vegetation. All clearing must be within the area cross-hatched yellow on attached Plan 2858/1.

Period in which clearing is authorised
2. The Permit Holder shall not clear native vegetation unless actively mining within 6 months of the authorised clearing being undertaken.

Avoid, minimise etc clearing
3. In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:
   (i) avoid the clearing of native vegetation;
   (ii) minimise the amount of native vegetation to be cleared; and
   (iii) reduce the impact of clearing on any environmental value.

Dieback and Weed control
4. When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of weeds and dieback:
   (i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
   (ii) shall only move soils in *dry conditions*;
   (iii) ensure that no *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
   (iv) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

Offsets
5. If part or all of the clearing to be done is or may be at variance with one or more of the clearing principles, then the Permit Holder must implement an *offset* in accordance with Conditions 5(a) and 5(b) of this Permit with respect to that clearing.

   (a) Determination of *offsets*:
      (i) in determining the *offset* to be implemented with respect to a particular area of native vegetation proposed to be cleared under this Permit, the Permit Holder must have regard to the *offset* principles contained in Condition 5(b) of this Permit;

(ii) once the Permit Holder has developed an *offset proposal*, the Permit Holder must provide that *offset proposal* to the Director, Environment Division, Department of Mines and Petroleum for approval prior to undertaking any clearing to which the *offset* relates, and prior to implementing the offset;
(iii) clearing may not commence until and unless the Director, Environment Division, Department of Mines and Petroleum has approved the *offset proposal* to which the clearing relates;
(iv) the Permit Holder shall implement the *offset proposal* approved under Condition 5(a)(iii); and
(v) each *offset proposal* shall include a *direct offset*, timing for implementation of the *offset proposal* and may additionally include *contributing offsets*.

(b) For the purpose of this condition, the *offset* principles are as follows:
(i) *direct offsets* should directly counterbalance the loss of the native vegetation;
(ii) *contributing offsets* should complement and enhance the *direct offset*;
(iii) *offsets* are implemented only once all avenues to avoid, minimise, rectify or reduce environmental impacts have been exhausted;
(iv) the environmental values, habitat, species, *ecological community*, physical area, ecosystem, landscape, and hydrology of the *offset* should be the same as, or better than, that of the area of native vegetation being *offset*;
(v) a ratio greater than 1:1 should be applied to the size of the area of native vegetation that is offset to compensate for the risk that the *offset* may fail;
(vi) *offsets* must entail a robust and consistent assessment process;
(vii) in determining an appropriate *offset*, consideration should be given to ecosystem function, rarity and type of *ecological community*, vegetation *condition*, habitat quality and area of native vegetation cleared;
(viii) the *offset* should either result in no net loss of native vegetation, or lead to a net gain in native vegetation and improve the *condition* of the natural environment;
(ix) *offsets* must satisfy all statutory requirements;
(x) *offsets* must be clearly defined, documented and audited;
(xi) *offsets* must ensure a long-term (10-30 year) benefit; and
(xii) an *environmental specialist* must be involved in the design, assessment and monitoring of *offsets*.

Records to be kept

6. The Permit Holder must maintain the following records for activities done pursuant to this Permit:

(a) In relation to the clearing of native vegetation authorised under this Permit:
(i) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
(ii) the date that the area was cleared;
(iii) the size of the area cleared (in hectares); and
(iv) purpose for which clearing was undertaken.

(b) In relation to the *offset* of areas pursuant to Condition 5:
(i) the location of any area of *offsets* recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
(ii) a description of the *offset* activities undertaken; and
(iii) the size of the *offset* area (in hectares).

Reporting

7. (a) The Permit Holder shall provide a report to the Director, Environment Division, Department of Mines and Petroleum by 31 July each year for the life of this permit, demonstrating adherence to all conditions of this permit, and setting out the records required under Condition 6 (a) and 6(b) of this permit in relation to clearing carried out between 1 July and 30 June of the previous financial year.

(b) Prior to 31 March 2016, the Permit Holder must provide to the Director, Environment Division, Department of Mines and Petroleum a written report of records required under Condition 6 of this Permit where these records have not already been provided under Condition 7(a) of this Permit.

Definitions

The following meanings are given to terms used in this Permit:

condition means the rating given to native vegetation using the *Keighery scale* and refers to the degree of change in the structure, density and species present in the particular vegetation in comparison to undisturbed vegetation of the same type;

contributing offset/s has the same meaning as is given to that term in the Environmental Protection Authority's *Position Statement No.9: Environmental Offsets*, 2006;

dieback means the effect of *Phytophthora* species on native vegetation;

direct offset/s has the same meaning as is given to that term in the Environmental Protection Authority's *Position Statement No.9: Environmental Offsets*, 2006;

dry conditions means when soils (not dust) do not freely adhere to rubber tyres, tracks, vehicle chassis or wheel arches;

ecological community/ies means a naturally occurring biological assemblage that occurs in a particular type of habitat (English and Blythe, 1997; 1999);

environmental specialist means a person who is engaged by the Permit Holder for the purpose of providing environmental advice, who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit;

fill means material used to increase the ground level, or fill a hollow;

Keighery scale means the vegetation condition scale described in *Bushland Plant Survey: A Guide to Plant Community Survey for the Community (1994)* as developed by B.J. Keighery and published by the Wildflower Society of WA (Inc). Nedlands, Western Australia;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

offset/s means an offset required to be implemented under condition [5] of this Permit;

offset proposal means an *offset* determined by the Permit Holder in accordance with condition [5]of this Permit;

weed/s means a species listed in Appendix 3 of the "Environmental Weed Strategy" published by the Department of Conservation and Land Management (1999), and plants declared under section 37 of the *Agriculture and Related Resources Protection Act 1976*.

[redacted]

DIRECTOR
ENVIRONMENT DIVISION
DEPARTMENT OF MINES AND PETROLEUM

Officer with delegated authority under Section 20
of the Environmental Protection Act 1986

24 February 2011

Main Identity

From: [redacted]
To:
Sent: Monday, 25 October 2010 4:15 PM
Attach: Limestone Building Block Limestone Availability Hopkins Road Carabooda.pdf
Subject: Fw: Limestone Building Block M70-13 and M70-339

----- Original Message -----
[redacted]
Sent: Monday, October 25, 2010 11:49 AM
Subject: Limestone Building Block M70-13 and M70-339

Hi Grant

For your information.

As you can see the maximum amount of limestone is limited. During excavation linkages will be maintained through the Banksia Woodland which will not be taken. There is also the opportunity to add to Bush Forever Site 290 when the existing pits are rehabilitated. This will act as an offset.

It is my understanding from our discussions that round the table discussions will be held prior to any decision being made on the Clearing Permit.

Thanks

[redacted]
LANDFORM RESEARCH
[redacted]

LIMESTONE BUILDING BLOCK MINING LEASES – HOPKINS ROAD, CARABOODA

LIMESTONE BUILDING BLOCK COMPANY	TOTAL LEASE AREA	AREA OF LEASE COVERED BY BUSH FOREVER	EXCAVATED AREA OF LEASE NOT INCLUDED IN BUSH FOREVER	INTERPRETED MAXIMUM ADDITIONAL AREA OF LIMESTONE RESOURCE	IF MAXIMUM LIMESTONE RESOURCE IS TAKEN AREA OF BUSH FOREVER TO BE CLEARED ON THE LEASE %	PERCENTAGE OF LEASE THAT DOES NOT CONTAIN LIMESTONE AND WILL NOT BE CLEARED %	AREA BUSH FOREVER AFTER EXCAVATION
M70/013	68.87 ha	54.17 ha	8.8 ha	30.6 ha	56.5 %	57.2 %	8.8 ha revegetation added to Bushforever 30.6 ha revegetation 29.5 ha natural vegetation
M70/339	68.0783 ha	59.3 ha	14.7 ha	19.9 ha	33.6 %	50.8 %	14.7 ha revegetation added to Bushforever 19.9 ha revegetation 33.5 ha natural vegetation
TOTAL FOR ALL LEASES	136 94 ha	113.5 ha	23.5 ha	50.5 ha	44.5 %	45.9 %	23.5 ha revegetation added to Bushforever 50.5 ha revegetation 63.0 ha natural vegetation

Notes

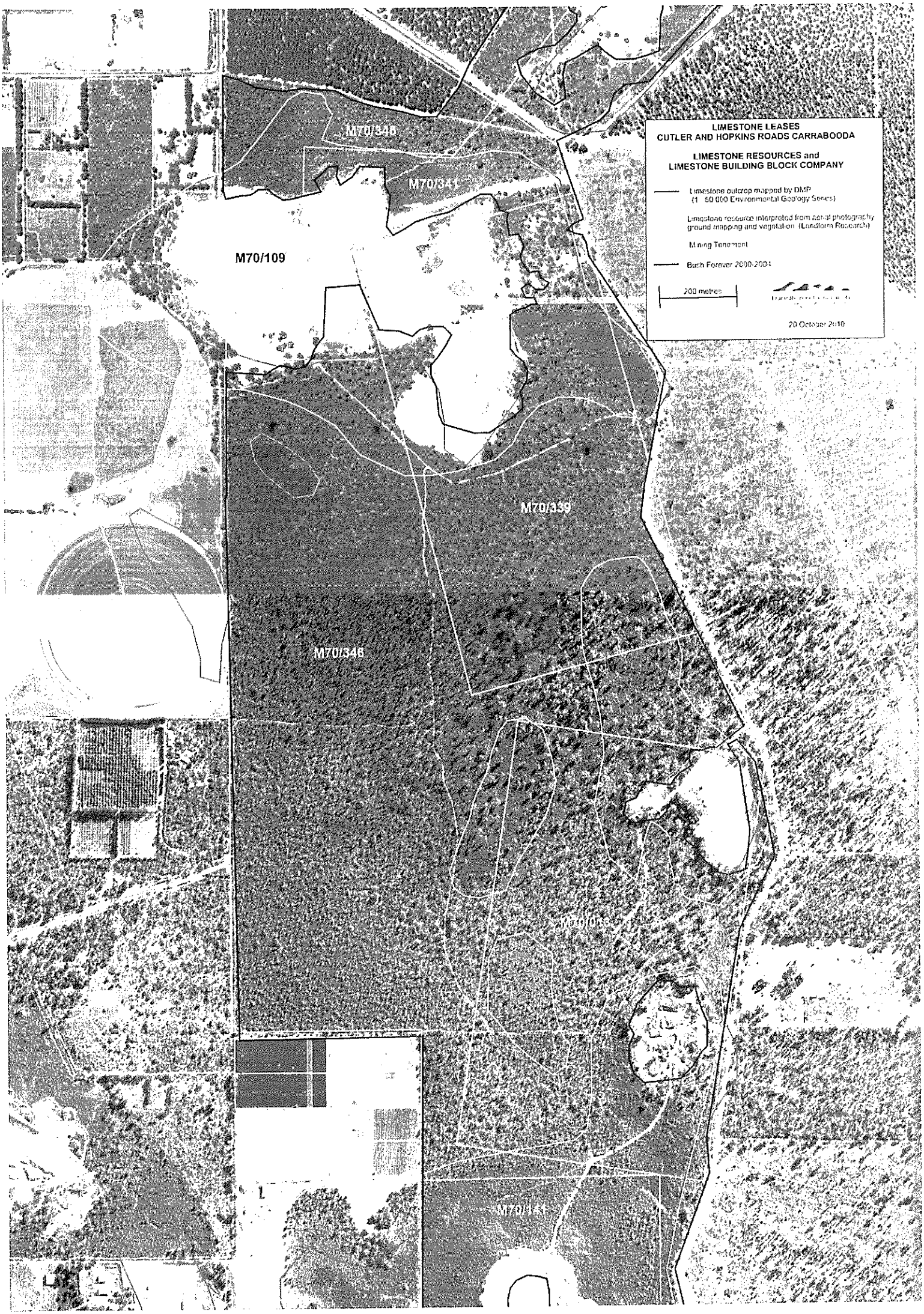
The areas have been calculated by digital planimeter.

The areas of limestone shown are the maximum and as the grade of limestone in some locations may be lower the actual resource area taken may be less.

Currently there is 23.5 hectares of limestone quarry that is not included in Bush Forever 290. With rehabilitation this could be added to an expanded Bush Forever Site.

As this area forms part of the Priority Limestone Resource Area in Statement of Planning Policy 2.4 the excavation of the sand areas (*Banksia* Woodland) could be retained as part of a negotiated solution through the processes outlined in Statement of Planning Policy 2.8. SPP 2.8 appears to require any negotiated solution to consider the whole area of leases and not each Clearing Permit application in isolation.

The *Banksia* Woodland will continue to provide undisturbed linkages. Excavation can be staged to ensure progressive rehabilitation and maintenance of linkages.


LIMESTONE LEASES
CUTLER AND HOPKINS ROADS CARRABOODA
LIMESTONE RESOURCES and
LIMESTONE BUILDING BLOCK COMPANY
Limestone outcrop mapped by DMP
(1 : 50 000 Environmental Geology Series)
Limestone resource interpreted from aerial photography
ground mapping and vegetation (Landform Research)
Mining Tenement
Bush Forever 2000-2001
200 metres
20 October 2010
M70/345
M70/341
M70/109
M70/339
M70/346
M70/1

Main Identity

From: [redacted]
To:
Sent: Monday, 25 October 2010 11:50 AM
Attach: Limestone Resources - Limestone Availability Cutler Road Carabooda.pdf
Subject: Limestone Resources M70-341, M70-345, M70-346

Hi Grant

For your information.

As you can see the maximum amount of limestone is limited. During excavation linkages will be maintained through the Banksia Woodland which will not be taken. There is also the opportunity to add to Bush Forever Site 290 when the existing pits are rehabilitated. This will act as an offset.

It is my understanding from our discussions that round the table discussions will be held prior to any decision being made on the Clearing Permit.

Thanks

[redacted]

[redacted]

LIMESTONE RESOURCES MINING LEASES – CUTLER/HOPKINS ROAD, CARABOODA

LIMESTONE RESOURCES LEASES	TOTAL LEASE AREA	AREA OF LEASE COVERED BY BUSH FOREVER	EXCAVATED AREA OF LEASE NOT INCLUDED IN BUSH FOREVER	INTERPRETED MAXIMUM ADDITIONAL AREA OF LIMESTONE RESOURCE	IF MAXIMUM LIMESTONE RESOURCE IS TAKEN AREA OF BUSH FOREVER TO BE CLEARED ON THE LEASE %	PERCENTAGE OF LEASE THAT DOES NOT CONTAIN LIMESTONE AND WILL NOT BE CLEARED %	AREA BUSH FOREVER AFTER EXCAVATION
M70/109	8.09 ha	Nil	8.09 ha	Nil	Nil	Nil	8.09 ha revegetation added to Bushforever
M70/345	26.14 ha	11.0 ha	0.1 ha plus 12.6 ha pine plantation	4.1 ha	15.7 %	84 % Note includes the 12.6 ha of pine plantation	4.2 ha revegetation 12.6 ha revegetated plantation 9.34 ha natural vegetation
M70/346	111.94 ha	111.1 ha	0.9 ha	14.2 ha	12.7 %	12.0 %	0.9 ha revegetation added to Bushforever 14.2 ha revegetation 96.84 ha natural vegetation
M70/341	18.23 ha	11.63 ha	6.7 ha	9.7 ha	85.5 %	53.2 %	6.7 ha revegetation added to Bushforever 9.7 ha revegetation 1.83 ha natural vegetation
TOTAL FOR ALL LEASES	164.4 HA	148 6 ha	15.8 ha	28.0 ha	18.8 %	26.6 %	15.7 ha revegetation added to Bushforever 33.3 ha revegetation 12.6 ha revegetated plantation 102.8 ha natural vegetation

Notes

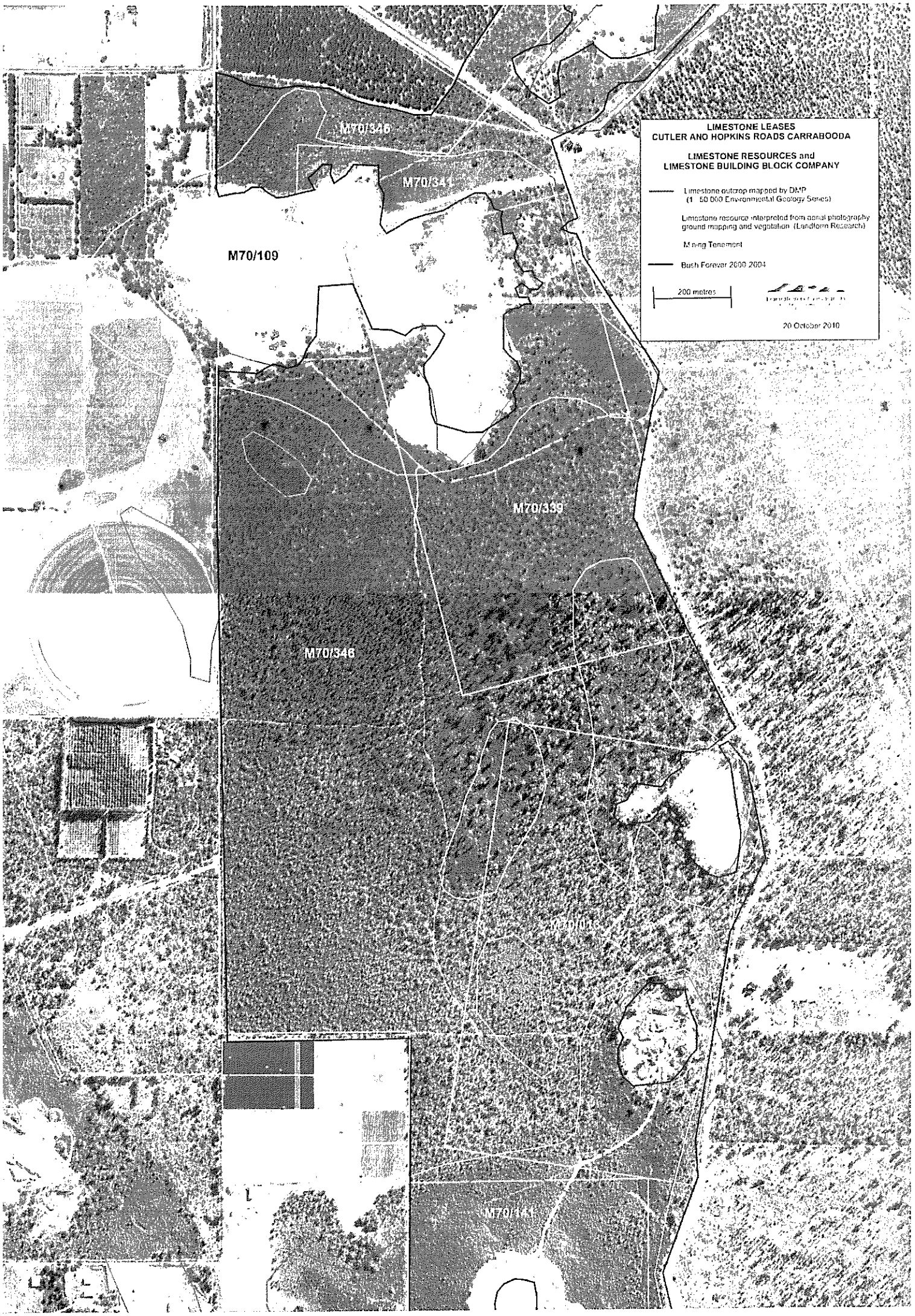
The areas have been calculated by digital planimeter.

The areas of limestone shown are the maximum and as the grade of limestone in some locations may be lower the actual resource area taken may be less.

Currently there is 23.5 hectares of limestone quarry that is not included in Bush Forever 290. With rehabilitation this could be added to an expanded Bush Forever Site.

As this area forms part of the Priority Limestone Resource Area in Statement of Planning Policy 2.4 the excavation of the sand areas (*Banksia* Woodland) could be retained as part of a negotiated solution through the processes outlined in Statement of Planning Policy 2.8. SPP 2.8 appears to require any negotiated solution to consider the whole area of leases and not each Clearing Permit application in isolation.

The *Banksia* Woodland will continue to provide undisturbed linkages. Excavation can be staged to ensure progressive rehabilitation and maintenance of linkages.


LIMESTONE LEASES
CUTLER AND HOPKINS ROADS CARRABOODA
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