

**NEAVES ROAD PROPOSED SAND MINE
Prospecting Licences P 70/1596 and 70/1597**

Vegetation and Flora Survey



Author: Tim Crane BSc Environmental Biology, Dip Environmental Science

October 2013

Report prepared for Eclipse Resources Pty Ltd by:

Author: Tim Crane BSc Environmental Biology Dip Environmental Science

Tim Crane:

A handwritten signature in blue ink, appearing to read 'Tim Crane', with a stylized flourish at the end.

Date: 17 October 2013

CONTENTS

No.	Subject	PAGE
1	Summary	4
2	Introduction	7
3	Regional Vegetation Context	7
4	Methods	9
5	Results 3.1 Vegetation Community One: Existing Pine Plantation NW. 3.2 Vegetation Community Two: Existing Pine Plantation SE. 3.3 Vegetation Community Three: Recently cleared plantation areas. 3.4 Vegetation Community Four: Previously cleared plantation areas.	10
6	References	18
7	Appendix A: Vegetation and Flora Survey Results	19
	Appendix B: Site plan with vegetation and flora survey areas	21
	Appendix C: Vegetation mapping plan	22
	Appendix D: NatureMap species report	23

1. Summary

The findings of the Level 1 Flora and Vegetation survey conducted within Prospecting Licences P 70/1596 and 70/1597 Neaves Road, Pinjar, (the "study area") in August 2013 can be summarised as follows:

- The study area was cleared of native vegetation many years ago, planted and managed as pine plantation with the introduced species *Pinus pinaster* and subsequently logged within the past decade;
- There is no intention to re-establish pine plantations on the land;
- There are some remnants of native vegetation re-growth and some better quality vegetation around three wetlands within the study area;
- However, the overall condition of the vegetation on the study area is rated degraded to good on the Keighery Condition Rating Scale which is not surprising given its previous land use;
- A number of weed species were found;
- No Declared Rare Flora species were located within the study area (as listed under subsection (2) of Section 23F of the *Western Australian Wildlife Conservation Act 1950* or as listed by the Department of Environment and Conservation (Atkins, 2008));
- No flora species governed by the *Environment Protection and Biodiversity Conservation Act 1999* were located within the survey area;
- No Threatened Ecological Communities (TECs) were defined for the survey area;
- No flora species of 'other conservation significance' (as stated in EPA Guidance Statement 51) were recorded in the survey area (EPA, 2004);
- The Flora and Vegetation of the survey area was assessed against the Del Marco et al. (2004) criteria for regional and local significance, - under which the study area does not hold any regional conservation value, and around the wetlands is of limited local significance;
- The condition of the remnant vegetation was assessed against Keighery's Condition Rating Scale (Keighery 1994) and the results mapped.

State Forest 65 and Bush Forever sites 295, 398 and 107 nearby provide viable extensive reservation of relevant flora and vegetation in the local area.

Noting that the wetland vegetation will be protected by a 200 metre buffer, there is no impediment from the conservation viewpoint to clearing remnant re-growth vegetation for mining.

On an initial inspection of the study area, it was clear that the overall condition of the vegetation and flora is generally degraded. A thorough inspection revealed low species biodiversity and fast growing opportunistic species were dominating most areas.

All areas outside the three identified wetland areas are existing pine plantations, recently cleared former pine plantations or regeneration in areas cleared several years ago. Pine plantations have many associated short term and long-term ecological impacts as a land use. Other human impacts include unregulated rubbish disposal and recreational vehicle use; these issues are outlined in the results section of the report.

The Maritime Pine (*Pinus pinaster*) is a fast growing tree planted in Western Australia in 1896 for use as a construction timber. It grows very successfully in Perth's Mediterranean climate. However, its dominant growth habit and dense canopy greatly shades out most plant species occurring in the understory.

In addition to competing for water, shade and nutrients, pine trees produce an allelopathic chemical that inhibit cell division in many plant species. This chemical is continuously introduced to the soil by falling pine leaves (needles). Some plants are tolerant to these adverse conditions and can grow with very little competition due to large areas of bare soil available for seed recruitment. The ground conditions within a pine plantation however, produce unstable ecosystems with very low biodiversity.



Plate 1: Existing pine plantation in the NW corner. Only a few opportunistic species exist.

Negative effects caused by pine planting and harvesting are very evident on the Neaves Road site. Flora biodiversity in both established pine plantation areas and previously cleared areas is low and there is a distinct lack of native trees that have reached their full expected growth potential for that species.

Illegal dumping of rubbish is a major issue on site. General household waste, green waste as well as building rubble and industrial waste is scattered throughout the site. Because the rubbish entering the site is unregulated and seemingly un-policed, it is quite likely that environmental contamination, e.g. chemical leaching, could be a problem. Waste such as refrigerators, electrical appliances, chemical containers and automotive parts were evident across the site. Moreover, such intrusion spreads weeds and disease and physically disturbs the soil and vegetation.

2. Introduction

This flora and vegetation survey report has been prepared in order to provide supporting information for the application by Eclipse Resources Pty Ltd to convert Prospecting Licences P 70/1596 and P 70/1597 to Mining Leases under the Mining Act 1978.

It should be read in conjunction with the application prepared by Aurora Environmental (2013) "Neaves Road Sand Mine Project Mining Proposal".

Eclipse Resources proposes to establish a shallow sand mine within a Mining Lease bounded by Neaves Road to the south and Pinjar Road to the west, approximately 40 kilometres north of Perth, in the City of Wanneroo.

The proposed mining lease is located within the Gnangara-Moore River State Forest, which is Department of Parks and Wildlife managed land.

Currently there is a shortage of basic raw materials required for development in the south-west of Western Australia (WA). The WA Department of Planning recognises this shortage and has adopted *Statement of Planning Policy No 2.4 Basic Raw Materials*.

The policy is designed to facilitate the extraction of basic raw materials close to the major markets in the metropolitan region.

3. Regional Vegetation Context

The proposed Mining Lease overlays the Gnangara groundwater system which is located on the Swan Coastal Plain and covers an area of approximately 2200 square kilometres. It extends from the Swan River in the south, Moore River and Gingin Brook in the North and from Ellen Brook and the Swan Valley in the east to the Indian Ocean to the West (Kinloch et al (2009)).

The regional area has undergone intensive urban, rural and pine plantation development though extensive areas of Banksia woodlands remain, as do permanent and seasonal wetlands.

The vegetation of the Gnangara groundwater system, where extant, is dominated by heath and/or tuart woodlands on limestone, Banksia and jarrah – Banksia woodlands on dune systems of various ages, marri on colluvial and alluvial soils, and paperbarks in swampy areas.

Mattiske (2003) identified 32 vegetation types on the Gnangara groundwater system based on available floristic plot data and the system developed by Havel (1968).

Table 1: Description and extent of main Vegetation Types. (From Mattiske (2003)).

Vegetation Type Code	Description	Total area (hectares) * * Of portion of the Gnangara Mound mapped by Mattiske (2003)
I1	Low Open Woodland of <i>Banksia attenuata</i> - <i>Banksia menziesii</i> over <i>Verticordia nitens</i> , <i>Dasypogon bromeliifolius</i> , <i>Melaleuca seriata</i> and <i>Patersonia occidentalis</i> .	19932
H1	Low Woodland to Low Open Woodland of <i>Banksia attenuata</i> - <i>Banksia menziesii</i> - <i>Banksia ilicifolia</i> <i>Nuytsia floribunda</i> over <i>Beaufortia elegans</i> , <i>Leucopogon polymorphus</i> , <i>Melaleuca systema</i> , <i>Calytrix angulata</i> , <i>Calytrix flavescens</i> , <i>Stirlingia latifolia</i> , <i>Dasypogon bromeliifolius</i> , <i>Leucopogon conostephioides</i> , <i>Lyginia barbata</i> , <i>Macrozamia riedlei</i> and <i>Xanthorrhoea preissii</i> .	13478
G2	Low Open Woodland of <i>Banksia attenuata</i> - <i>Banksia menziesii</i> - <i>Allocasuarina fraseriana</i> - <i>Eucalyptus todtiana</i> over <i>Xanthorrhoea preissii</i> , <i>Lysinema ciliatum</i> , <i>Verticordia nitens</i> , <i>Hibbertia hypericoides</i> , <i>Philothea spicata</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Bossiaea eriocarpa</i> , <i>Daviesia nudiflora</i> , <i>Mesomelaena pseudostygia</i> and <i>Stirlingia latifolia</i> .	1200

4. Methods

A Level 1 survey was considered appropriate because of the long term land use of the site as pine plantation: established after the clearing of native vegetation and recently logged.

A Level 1 survey comprises (EPA (2004)):

Background research or 'desktop' study

The purpose is to gather background information on the target area (usually at the locality scale).

This involves a search of all sources of literature, data and map-based information.

Reconnaissance survey

The purposes are: i) to verify the accuracy of the background study; ii) to further delineate and characterise the flora and the range of vegetation units present in the target area; and iii) to identify potential impacts.

This involves a target area visit by suitably qualified personnel to undertake selective, low intensity sampling of the flora and vegetation, and to produce maps of vegetation units and vegetation condition at an appropriate scale.

Vegetation condition was assessed using the Keighery Condition Rating Scale (Keighery 1994). The site was separated into distinct vegetation communities and each area was assessed based on the following parameters;

- Vegetation structure and cover; condition and density of trees, shrubs, grasses, sedges and herbs
- Species presence; both native and introduced

Percentage total cover of species was graded with the following scale;

Percentage cover of total area

1	0-10%
2	10-20%
3	20-30%
4	30-50%
5	>50%

From information gathered during the survey, the bush condition was graded using the scale. A copy of the results and the Keighery Condition Rating Scale is included in Appendix A.

Photographs of areas showing plants, rubbish and severe degradation were taken and GPS coordinates were recorded when necessary.

5. Results.

5.1 Vegetation Community 1: Existing Pine Plantation NW.



Plate 2: Example of vegetation community 1

Vegetation community 1 (see Appendix B) is located in the north-western portion of the site and makes up approximately one quarter of the proposed mining area. This area displays low species diversity and poor vegetation structure.

After a thorough investigation, it is clear that this area of the site is overall degraded bushland. All species, both native and introduced, are growing under the shade and allelopathic conditions of a dense pine plantation (*Pinus pinaster*). Sporadic and inconsistent distribution of native shrubs and sedges exist in the understory of the pines and the disturbed buffer zones are heavily colonised with cape weed (*Arctotheca calendula*), Geraldton carnation weed (*Euphorbia terracina*) and perennial veldt grass (*Erhartha calycina*).

Minimal competition and poor growing conditions under established pine trees has resulted in the 'blanketing' growth of *Lotus* SP. and *Trifolium hirtum*.

Native herb, shrub and sedge species are scattered through this area, most notably *Leschenaultia* sp., *Davesia* sp. and *Gompholobium tomentosum*. However, there is very little evidence of new seedling recruitment and individuals occur as solitary specimens.

Rubbish has been dumped along the tracks through this area with significant amounts dumped at the junctions. Most of the rubbish is furniture, white goods and electrical appliances.



Plate 3: Example of some of the sporadic rubbish piles in the pine plantation.

In the centre of the plantation area some sporadic communities of *Melaleuca raphiophylla* exist which are not considered significant because of their degraded condition.

Three species of orchid were also identified: Short eared snail orchid (*Pterostylis* SP.), Common donkey orchid (*Diuris* sp.) and Cowslip orchid (*Caledonia flava*).

These orchid species occurred mainly as solitary, individual plants in this area, most often near the base of the pine trees where competition from other plants was minimal. Although these three orchid species were present, they were not widespread and only one group (of five individual donkey orchids) was found.

5.2 Vegetation community 2: Existing pine plantation SE



Plate 4: example of vegetation community 2

Vegetation community 2 (see Appendix B) displays some of the lowest quality bushland on the whole site. The plantation is dense and large cut pine limbs are scattered throughout the area.

Overall vegetation condition for this area is degraded. It displays a significant cover of weeds and has almost no structure. The only trees other than pine trees are some small solitary Jarrah trees with less than five individuals sighted.

Opportunistic weeds such as *Lotus* sp., lupins (*Lupinus cosentini* and/or *Lupinus angustifolius*), burr medic (*Medicago polymorpha*) and blowfly grass (*Briza maxima*) dominate this area, much like the plantation in the north west of site. A large, dense community of sand plain lupins occupy a significant area on the western side of the plot. The only native species successfully growing under these dense pine trees are *Adenanthos cygnorum* and *Acacia pulchella*. Other native plants listed above exist sporadically only as individuals or small groups. There are very few native seedlings in this area.

Rubbish has impacted on this vegetation community and is scattered throughout the area. The type of rubbish identified in this area includes mattresses, car parts and an old, rusted petrol engine.

5.3 Vegetation community 3: Recently cleared plantation area.



Plate 5: example of vegetation community 3

Vegetation community 3 (see Appendix B) runs along the southern border of the proposed mining area. This area is bordered by Neaves Road, Old Yanchep Road and the sand track south of Koala Road and ends on the eastern side at a track where the south eastern plantation begins.

It is evident that this area has been recently cleared due to the uneven and ripped ground, large pine tree root masses and branches on the ground and very little presence of trees. Perennial veldt grass occurs consistently throughout this area.

This area is displaying some regeneration of native shrubs and sedges. The small north-western part of this cleared area, on the corner of Koala Road and Old Yanchep Road, shows signs of native seed germination and species progression. In particular, native Restionaceae and Anarthriaceae species, e.g. *Lyginia barbata*, *Leptocarpus SP.* and *Hypolaena exsulsa*, are displaying some re-colonisation.



Plate 6: *Lyginia barbata* near Koala Road

Many small shrubs also occur in this area including *Davesia* sp., *Gompholobium tomentosum*, *Hypocalymma angustifolium* and *Scholzia involucrata*.

Native tree species occurring sporadically through this area includes *Adenanthos cygnorum*, *Acacia saligna*, *Jacksonia furcelata*, *Acacia longiflora* and several solitary Jarrah trees (*Eucalyptus marginata*). Bushland structure and quality is higher in the southern portions of this area and is considered to be 'good' on the Keighery scale.

Like most areas of the site, cape weed, Geraldton carnation weed and veldt grass occurs along the sides of the tracks to approximately ten metres into the bush. Some rubbish is also scattered along either side of these tracks.

It should also be noted that twelve lines have recently been ripped north to south on the western side of this cleared area, presumably by the land

manager. A mixture of tube stock eucalypts have been planted along these rip lines at three metre spacing (pictured in the title photograph for this area).

5.4 Vegetation community 4: Previously cleared plantation area.

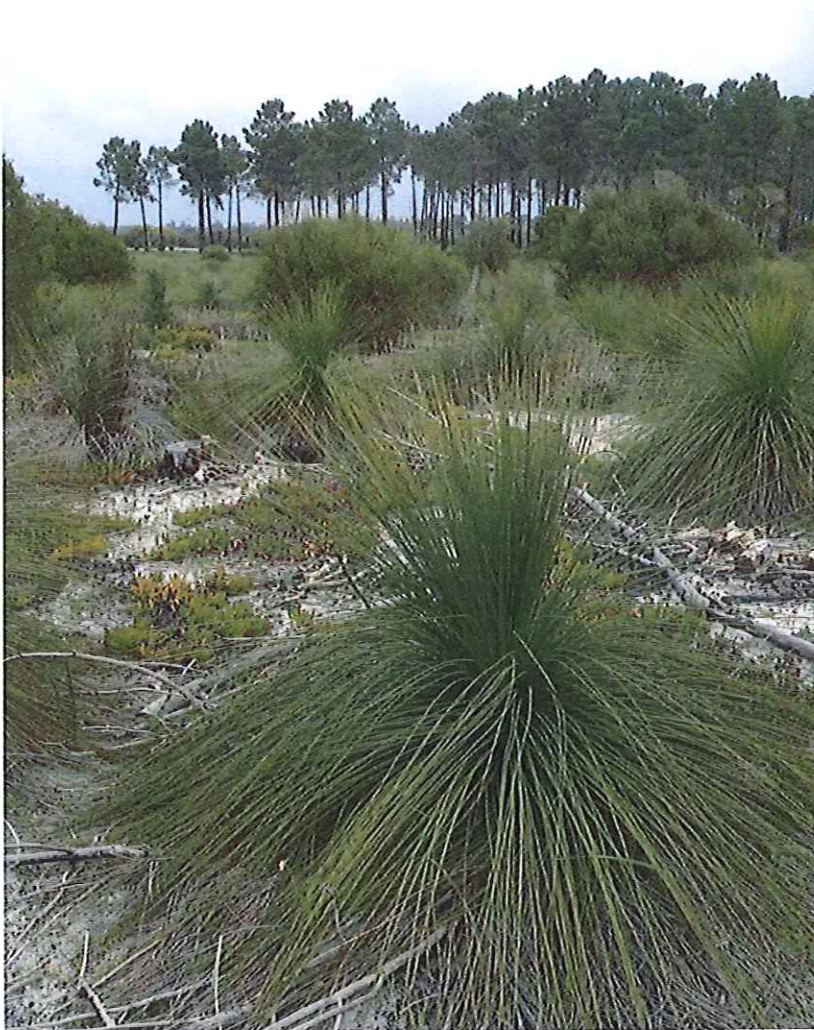


Plate 7: Example of vegetation community 4

Vegetation community 4 (see Appendix B) starts at the eastern end of the western plantation area. It continues east to Bardie Road and is separated by Koala Road. This area is in close proximity to wetland areas to the north and west. The most northern portion of this area is adjacent to an undeveloped Water Corporation site.

This area has been labelled as the 'previously cleared' area because of the presence of some larger, slower growing native plants and dense native shrub communities occurring around old pine tree stumps. Established *Xanthoroea priesii* and *Nuytsia florabunda* are very slow growing plants that require a certain level of ecosystem stability in order to germinate and reproduce. Grass trees (following clearing of native vegetation.) occur in areas of vegetation community four and are more densely populated in the western tip.

Adenanthos cygnorum, *Jacksonia furcelata* and *Acacia saligna* are the dominant tree species with the occasional Jarrah tree in the northern areas. Significant amounts of *Conostylus candicans*, *C. aculeata* and *C. setigera* successfully inhabit most areas in the centre of the community on the southern side of Koala Road. Tree species are very sparse in the centre of this area. *Pelargonium capitatum*, *Euphorbia terracina*, *Erhartha calycina* and *Arctotheca calendula* are dominating the edges of the tracks and boundaries in this area. These weed species continue to about fifteen metres into the bush where vegetation changes to consistent scrubland dominated by *Conostylus* species and *Desmocladius flexuosus*. There are also some localised Smoke bush (*Conospermum* SP.) and *Burchardia umbellata* distributed sporadically through this area.

Rubbish on either side of Koala Road is very significant and damage from recreational vehicles is very evident. The majority of vehicle damage and informal tracks is more apparent on the northern side of Koala Road. It is assumed that people are creating these tracks to access the wetlands.



Plate 8: Household refuse dumped along Koala Road

Vegetation is quite sparse in the northern part of this community. Some *Nuytsia floribunda* communities were identified just south of the Water Corporation site.

This area displays some examples of dense shrub bushland that could be considered 'very good' on the Keighery Scale however, overall this vegetation community can only be described as 'good' due to the prevalence of weeds and rubbish.

NatureMap

NatureMap (<http://naturemap.dec.wa.gov.au/default.aspx>) was interrogated with respect to species identified within a 5km radius of the approximate center of the two Prospecting Leases. The report on species generated by NatureMap is at Appendix D. There are two fauna species (*Leioproctus contraries*, *Nyctophilus geoffroyi*) and no flora species shown as having been identified on the site. The location of the fauna species is within a mining exclusion zone under this plan.

6. References

Atkins, K	2008	Declared Rare and Priority Flora List for Western Australia	Department of Environment and Conservation, Western Australia
Del Marco, A et al	2004	Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region	Western Australian Local Government Association.
EPA	2004	Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia	Guidance Statement No. 51. Perth WA
Government of WA	2000	Bush Forever	WA Government
Havel, J. J.	1968	The potential of the Northern Swan-coastal Plain for Pinus pinaster Ait. Plantations	Bulletin Forests Department of Western Australia, 7-73
Keighery, B.J	1994	Bushland Plant Survey	Wildflower Society of WA (Inc)
Kinloch, J, Zdunic, K, Behn G, and Wilson, B	2009	Monitoring Vegetation Condition in the Banksia woodland of the Gnangara Mound: the role of Remote Sensing Tools	Report to the Department of Environment and Conservation and Gnangara Sustainability Strategy. Department of Environment and Conservation
Mattiske Consulting Pty Ltd	2003	Flora and vegetation studies - Gnangara Mound. Stages 1, 2 and 3. Part A	Report. Report prepared for Water and Rivers Commission and Water Corporation, Perth

Appendix A: Vegetation and Flora survey results

Vegetation and Flora survey results

	Vegetation Community 1	Vegetation Community 2	Vegetation Community 3	Vegetation Community 4
Native species				
<i>Acacia longiflora</i>	1		1	1
<i>Acacia pulchella</i>	1	2	2	2
<i>Acacia saligna</i>	1	1	2	2
<i>Acanthocarpus pretsii</i>		1	1	1
<i>Adenanthos cygnorum</i>	1	2	3	3
<i>Angoanathos humilis</i>	1	1	1	1
<i>Astatea</i> SP.		1	1	1
<i>Banksia attenuata</i>	1	1	1	1
<i>Burchardia umbellata</i>				2
<i>Coladenia flava</i>	1		1	1
<i>Carpobrotus virescens</i>	1	2	2	2
<i>Conospermum</i> SP.				1
<i>Conostylus oculata</i>	1	1	2	2
<i>Conostylus condicans</i>	1	1	2	2
<i>Conostylus sagittata</i>			1	1
<i>Dasypogon</i> SP.	1		1	1
<i>Daviesia</i> SP.	1	1	1	1
<i>Desmodium flexuosus</i>	1	1	1	2
<i>Dianella revoluta</i>	1	1	1	1
<i>Dihuris</i> SP.	1		1	1
<i>Drosera</i> SP.	1		1	1
<i>Eucalyptus marginata</i>	1	1	1	1
<i>Gompholobium tomentosum</i>	1	1	2	2
<i>Hardenbergia comptoniana</i>		1	1	1
<i>Hibbertia roemosa</i>	1	1	2	1
<i>Hypocylisma angustifolium</i>	1	1	1	2
<i>Hypolaena exsulca</i>	1		2	1
<i>Jacksonia furcata</i>	1	1	3	3
<i>Leptocarpus</i> SP.			1	1
<i>Leschenaultia</i> SP.	1		1	1
<i>Lomandra</i> SP.	1		1	1
<i>Lyginia barbata</i>	1		2	1
<i>Macrozamia reidii</i>	1		1	2
<i>Meeboldina</i> SP.				1
<i>Melaleuca raphiophylla</i>	2		2	2
<i>Nyctia florabunda</i>			1	1
<i>Pterostylis</i> SP.	1		1	1
<i>Scholtzia involucrata</i>			1	2
<i>Templetonia retusa</i>			1	1
<i>Xanthoroa priesii</i>				2

	Vegetation Community 1	Vegetation Community 2	Vegetation Community 3	Vegetation Community 4
Introduced species				
African love grass (<i>Eragrostis curvula</i>)	1	2	1	
Annual veldt grass (<i>Ehrharta longiflora</i>)	1	2	1	
Blackberry nightshade (<i>Solanum nigrum</i>)	1	1	1	1
Blowfly grass (<i>Briza maxima</i>)		2	2	3
Burr medic (<i>Medicago polymorpha</i>)	2	2	1	1
Cape weed (<i>Arctotheca calendula</i>)	2	1	2	2
Clover (<i>Trifolium hirtum</i>)	3	2	1	1
Dock (<i>Rumex</i> SP.)	1			
<i>Gazania</i> SP. 1				1
Geraldton carnation weed (<i>Euphorbia terracina</i>)	2	2	1	1
<i>Lotus</i> SP. 3	4	3	1	1
Marshmallow (<i>Molva parviflora</i>)	1			
<i>Pelargonium capitatum</i>	2	1	1	1
Perennial veldt grass (<i>Ehrharta calycina</i>)	2	2	3	3
Sandplain lupin (<i>Lupinus</i> SP.)	1	2	2	1
Sowthistle (<i>Sonchus</i> SPP.)	1	1	1	1
<i>Trochandra divaricata</i>	1		1	
Wild carrot (<i>Daucus carota</i>)	2	1	2	2
Wild gladioli (<i>Gladiolus caryophyllaceus</i>)	1	1	1	1
Wild oats (<i>Avena barbata</i>)	2	1	2	1
Wild radish (<i>Raphanus raphanistrum</i>)	1			

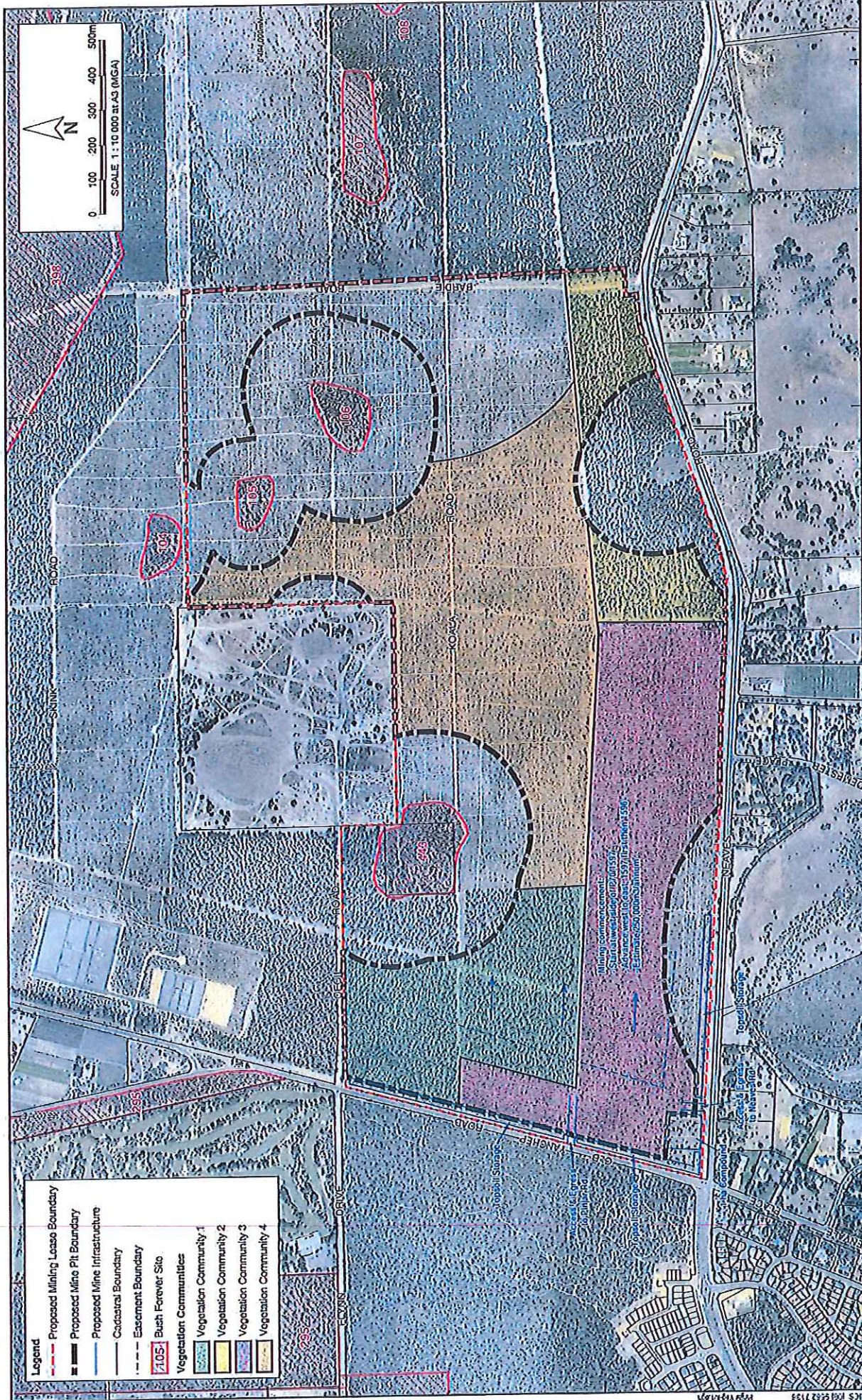
Percentage cover of total area

- 1 0-10%
- 2 10-20%
- 3 20-30%
- 4 30-50%
- 5 >50%

Condition Rating Scale by B.J. Keighery (1994)

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

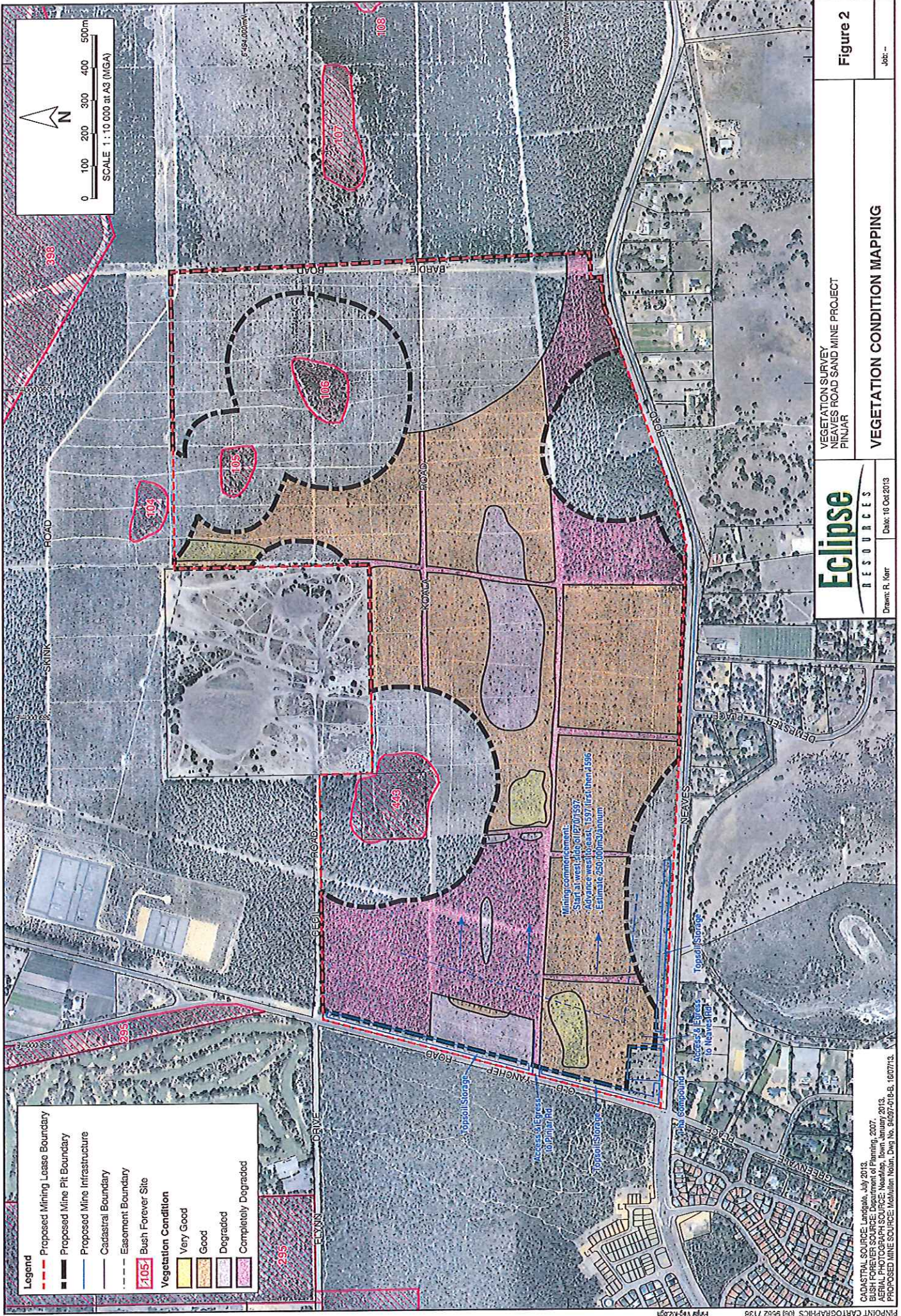
Appendix B: Site plan with vegetation and flora survey areas



Eclipse RESOURCES		VEGETATION SURVEY NEAVES ROAD SAND MINE PROJECT PINJAR	Figure 1
Damer, R. Kerr	Date: 30 Sep 2010	VEGETATION AND FLORA	
		JOB: -	

CADASTRAL SOURCE: Landgate, July 2011.
 BEST PRACTICE SOURCE: Department of Planning, 2007.
 PROPOSED MINE SOURCE: Midulian Nishan, Dept. No. 54027-010-A, 19/07/13.

Appendix C: Vegetation mapping plan



Legend

- Proposed Mining Lease Boundary
- Proposed Mine Pit Boundary
- Proposed Mine Infrastructure
- Cadastral Boundary
- Easement Boundary
- Bush Forever Site

Vegetation Condition

- Very Good
- Good
- Degraded
- Completely Degraded

0 100 200 300 400 500m

SCALE 1:10 000 at A3 (MGA)

N

Eclipse
RESOURCES

VEGETATION SURVEY
NEAVES ROAD SAND MINE PROJECT
PINJAR

VEGETATION CONDITION MAPPING

Figure 2

Drawn: R. Kerr Date: 18 Oct 2013

Job: --

CADASTRAL SOURCE: Landgate, July 2013.
BUSH FOREVER SOURCE: Department of Planning, 2007.
AERIAL PHOTOGRAPHY SOURCE: Nearmap, from January 2013.
PROPOSED MINE SOURCE: Metallium (Nabati, Div. No. 94037-01B-B, 1607713).

Appendix D: NatureMap species report

NatureMap Species Report

Created By Guest user on 16/10/2013

Current Names Only Yes

Core Datasets Only Yes

Method 'By Circle'

Centre 115°49' 45" E,31°41' 21" S

Buffer 5km

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
1.	3237 <i>Acacia benthamii</i>		P2	
2.	3271 <i>Acacia costata</i>			
3.	3374 <i>Acacia huegeli</i>			
4.	3541 <i>Acacia sessilis</i>			
5.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
6.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
7.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
8.	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
9.	24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
10.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
11.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
12.	42368 <i>Acrifoscincus trilineatus</i>			
13.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
14.	1728 <i>Allocasuarina fraseriana</i> (Sheoak, Kondii)			
15.	200 <i>Amphipogon turbinatus</i>			
16.	24312 <i>Anas gracilis</i> (Grey Teal)			
17.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
18.	6311 <i>Andersonia heterophylla</i>			
19.	11434 <i>Anigozanthos humilis</i> subsp. <i>humilis</i>			
20.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
21.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
22.	25554 <i>Apus pacificus</i> (Fork-tailed Swift)		IA	
23.	41324 <i>Ardea modesta</i> (Eastern Great Egret)		IA	
24.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
25.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
26.	20283 <i>Astartea scoparia</i>			
27.	17234 <i>Austrostipa compressa</i>			
28.	5382 <i>Beaufortia elegans</i>			
29.	24319 <i>Biziura lobata</i> (Musk Duck)			
30.	11564 <i>Boronia ramosa</i> subsp. <i>ramosa</i>			
31.	42381 <i>Brachyurophils semifasciatus</i>			
32.	2993 <i>Brassica fruticulosa</i> (Twiggy Turnip)	Y		
33.	3000 <i>Brassica tournefortii</i> (Mediterranean Turnip)	Y		
34.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
35.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
36.	15348 <i>Caladenia flava</i> subsp. <i>flava</i>			
37.	2848 <i>Calandrinia corrigioloides</i> (Strap Purslane)			
38.	29103 <i>Calectasia</i> sp. <i>Pinjar</i> (C. Tauss 557)		P1	
39.	5429 <i>Calothamnus sanguineus</i> (Silky-leaved Blood flower, Pindak)			
40.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)		T	
41.	5439 <i>Calytrix angulata</i> (Yellow Starflower)			
42.	5460 <i>Calytrix fraseri</i> (Pink Summer Calytrix)			
43.	1162 <i>Cartonema philydroides</i>			
44.	2951 <i>Cassytha flava</i> (Dodder Laurel)			
45.	1131 <i>Centrolepis inconspicua</i>			
46.	1134 <i>Centrolepis polygyna</i> (Wiry Centrolepis)			
47.	11299 <i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>			
48.	25337 <i>Chelodina oblonga</i> (Oblong Turtle)			
49.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
50.	24288 <i>Circus approximans</i> (Swamp Harrier)			
51.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
52.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
53.	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
54.	15511 <i>Conospermum boreale</i>			
55.	1876 <i>Conospermum incurvum</i> (Plume Smokebush)			
56.	1885 <i>Conospermum tripinervium</i> (Tree Smokebush)			
57.	6347 <i>Conostephium minus</i> (Pink-tipped Pearl flower)			
58.	6348 <i>Conostephium pendulum</i> (Pearl Flower)			
59.	11826 <i>Conostylis aculeata</i> subsp. <i>aculeata</i>			
60.	11552 <i>Conostylis aculeata</i> subsp. <i>bromelioides</i>			
61.	11513 <i>Conostylis aculeata</i> subsp. <i>cygnorum</i>			
62.	1423 <i>Conostylis aurea</i> (Golden Conostylis)			
63.	11870 <i>Conostylis teretifolia</i> subsp. <i>teretifolia</i>			
64.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
65.	-1683 <i>Cormocephalus strigosus</i>			
66.	25592 <i>Corvus coronoides</i> (Australian Raven)			
67.	17104 <i>Corymbia calophylla</i> (Marr)			
68.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
69.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
70.	11563 <i>Crassula colorata</i> var. <i>colorata</i>			
71.	30893 <i>Cryptoblepharus buchananii</i>			
72.	30899 <i>Ctenophorus adelaidensis</i> (Southern Heath Dragon, Western Heath Dragon)			
73.	30900 <i>Ctenophorus adelaidensis</i> subsp. <i>adelaidensis</i> (Southern Heath Dragon, Western Heath Dragon)			
74.	25040 <i>Ctenotus gemmula</i> (Jewelled South-west Ctenotus (Swan Coastal Plain pop P3), skink)			
75.	16245 <i>Cyathochaeta teretifolia</i>		P3	
76.	25087 <i>Cyclodomorphus celatus</i>			
77.	24322 <i>Cygnus atratus</i> (Black Swan)			
78.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
79.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
80.	25766 <i>Delma fraseri</i> (Fraser's Legless Lizard)			
81.	13216 <i>Drosera menziesii</i> subsp. <i>penicillaris</i>			
82.	3118 <i>Drosera pallida</i> (Pale Rainbow)			
83.	31233 <i>Drosera patens</i>			
84.	30712 <i>Drosera x sidjamesii</i>		P1	
85.	25100 <i>Egernia napoleonis</i>			
86.	347 <i>Ehrharta calycina</i> (Perennial Veldt Grass)	Y		
87.	1643 <i>Elythranthera brunonis</i> (Purple Enamel Orchid)			
88.	24567 <i>Epthianura albiglans</i> (White-fronted Chat)			
89.	14104 <i>Eremaea pauciflora</i> var. <i>pauciflora</i>			
90.	-12821 <i>Eriophora biapicata</i>			
91.	25622 <i>Falco cenchroides</i> (Australian Kestrel)			
92.	25623 <i>Falco longipennis</i> (Australian Hobby)			
93.	24475 <i>Falco peregrinus</i> subsp. <i>macropus</i> (Australian Peregrine Falcon)		S	
94.	20475 <i>Gastrolobium capitatum</i>			
95.	25530 <i>Gerygone fusca</i> (Western Gerygone)			
96.	24735 <i>Glossopsitta porphyrocephala</i> (Purple-crowned Lorikeet)			
97.	3957 <i>Gompholobium lomentosum</i> (Hairy Yellow Pea)			
98.	6161 <i>Gonocarpus pithyoides</i>			
99.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
100.	24295 <i>Haliastur sphenurus</i> (Whistling Kite)			
101.	25410 <i>Heleophorus eyrei</i> (Moaning Frog)			
102.	6838 <i>Hemiandra linearis</i> (Speckled Snakebush)			
103.	6839 <i>Hemiandra pungens</i> (Snakebush)			
104.	25119 <i>Hemiergis quadrilineata</i>			
105.	5112 <i>Hibbertia aurea</i>			
106.	5134 <i>Hibbertia huegelii</i>			
107.	20034 <i>Hibbertia</i> sp. <i>Gnangara</i> (J.R. Wheeler 2329)			
108.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
109.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
110.	12859 <i>Hovea trisperma</i> var. <i>trisperma</i>			
111.	12741 <i>Hyalosperma cotula</i>			
112.	5216 <i>Hybanthus calycinus</i> (Wild Violet)			
113.	33977 <i>Hylaeus globuliferus</i> (bee)		P3	
114.	5825 <i>Hypocalymma robustum</i> (Swan River Myrtle)			
115.	1070 <i>Hypolaena exsulca</i>			
116.	921 <i>Isolepis producta</i>			
117.	24153 <i>Isodon obesulus</i> subsp. <i>fusciventer</i> (Quenda, Southern Brown Bandicoot)		P5	
118.	7398 <i>Isoloma pusilla</i> (Small Isolome)			
119.	4010 <i>Jacksonia floribunda</i> (Holly Pea)			
120.	1309 <i>Laxmannia squarrosa</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
121.	33982 <i>Leoproctus contrarius</i> (bee)		P3	
122.	2344 <i>Leptomeria empetriformis</i>			
123.	25133 <i>Lerista elegans</i>			
124.	25165 <i>Lerista praepedita</i>			
125.	6374 <i>Leucopogon conostephioides</i>			
126.	6425 <i>Leucopogon oxycedrus</i>			
127.	40803 <i>Leucopogon squarrosus</i> subsp. <i>squarrosus</i>			
128.	7677 <i>Levenhookia stipitata</i> (Common Styrewort)			
129.	25005 <i>Lialis burtonis</i>			
130.	25659 <i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
131.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
132.	1228 <i>Lomandra hermaphrodita</i>			
133.	1239 <i>Lomandra preissii</i>			
134.	1243 <i>Lomandra sericea</i> (Silky Mat Rush)			
135.	24133 <i>Macropus irma</i> (Western Brush Wallaby)		P4	
136.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
137.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
138.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
139.	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
140.	13271 <i>Melaleuca huegelii</i> subsp. <i>huegelii</i>			
141.	5964 <i>Melaleuca seriata</i>			
142.	5983 <i>Melaleuca trichophylla</i>			
143.	25184 <i>Menelia greyii</i>			
144.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)		IA	
145.	955 <i>Mesomelaena pseudoslygia</i>			
146.	25693 <i>Microeca fascians</i> (Jacky Winter)			
147.	25191 <i>Morethia lineocellata</i>			
148.	25192 <i>Morethia obscura</i>			
149.	6199 <i>Myriophyllum lillaeoides</i>			
150.	25249 <i>Neelaps calonotos</i> (Black-striped Snake)		P3	
151.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
152.	25748 <i>Ninox novaeseelandiae</i> (Boobook Owl)			
153.	25252 <i>Notechis scutatus</i> (Tiger Snake)			
154.	24194 <i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)			
155.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
156.	32716 <i>Olearia lehmanniana</i>			
157.	-12391 <i>Ommatolulus moreletii</i>			
158.	18255 <i>Opercularia vaginata</i> (Dog Weed)			
159.	-12804 <i>Oratemnus curtus</i>			
160.	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
161.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
162.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
163.	40423 <i>Pentameris airoides</i> (False Hairgrass)	Y		
164.	2273 <i>Persoonia saccata</i> (Snottygobble)			
165.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
166.	18529 <i>Phillotheca spicata</i> (Pepper and Salt)			
167.	24596 <i>Phytodonyris novaehollandiae</i> (New Holland Honeyeater)			
168.	<i>Phytophthora cinnamomi</i>			
169.	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
170.	25720 <i>Platycercus icterotis</i> (Western Rosella)			
171.	8183 <i>Podolthea chrysantha</i> (Yellow Podolthea)			
172.	8184 <i>Podolthea gnaphalioides</i> (Golden Long-heads)			
173.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
174.	25259 <i>Pseudonaja affinis</i> subsp. <i>affinis</i> (Dugite)			
175.	12217 <i>Pterostylis sanguinea</i>			
176.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
177.	8195 <i>Quinella urvillei</i>			
178.	3061 <i>Raphanus raphanistrum</i> (Wild Radish)	Y		
179.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
180.	6929 <i>Salvia verbenaca</i> (Wild Sage)	Y		
181.	1018 <i>Schoenus subfascicularis</i>			
182.	-1669 <i>Scolopendra laeta</i>			
183.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
184.	30948 <i>Smicromis brevirostris</i> (Weebill)			
185.	4713 <i>Stachystemon axillaris</i> (Leafy Stachystemon)			
186.	19704 <i>Stenanthemum sublineare</i>		P2	
187.	2316 <i>Stirlingia latifolia</i> (Blueboy)			
188.	25589 <i>Streptopelia chinensis</i> (Spotted Turtle-Dove)	Y		
189.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
190.	25831 <i>Stylidium araeophyllum</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
191.	7709 <i>Stylidium crossocephalum</i> (Posy Triggerplant)			
192.	7716 <i>Stylidium diuroides</i> (Donkey Triggerplant)			
193.	7717 <i>Stylidium divaricatum</i> (Daddy-long-legs)			
194.	7774 <i>Stylidium ptiliferum</i> (Common Butterfly Triggerplant)			
195.	20521 <i>Stylidium rigidulum</i>			
196.	7798 <i>Stylidium schoenoides</i> (Cow Kicks)			
197.	33992 <i>Synemon graliosa</i> (Graceful Sunmoth)		P4	
198.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
199.	24167 <i>Tarsipes rostratus</i> (Honey Possum, Noolbenger)			
200.	1702 <i>Thelymitra campanulata</i> (Shirt Orchid)			
201.	24844 <i>Threskiornis molucca</i> (Australian White Ibis)			
202.	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
203.	1338 <i>Thysanotus manglesianus</i> (Fringed Lily)			
204.	1357 <i>Thysanotus thyrsoides</i>			
205.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
206.	25723 <i>Trichoglossus haematodus</i> (Rainbow Lorikeet)			
207.	1361 <i>Tricoryne elatior</i> (Yellow Autumn Lily)			
208.	1363 <i>Tricoryne tenella</i>			
209.	38388 <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i>	Y		
210.	12493 <i>Utricularia gibba</i>			
211.	6101 <i>Verticordia nitens</i> (Morrison Featherflower, Kodjeningara)			
212.	7389 <i>Wahlenbergia preissii</i>			
213.	25765 <i>Zosterops lateralis</i> (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 wholly 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.