



# SURAT GAS PROJECT

---

## Off-tenement Terrestrial Ecological Assessment Report

PREPARED FOR ARROW ENERGY PTY LTD  
March 2018



## **Surat Gas Project**

### **Off-tenement      Terrestrial      Ecological Assessment Report**

March 2018

---

**ECOSMART ECOLOGY  
48 Streeton Parade  
Everton Park QLD 4053 Australia**

**Tel: +61 7 3162 1161**

---

**COPYRIGHT:** The concepts, information, photos, schedules, annexures and/or appendices contained in this document are the property of EcoSmart Ecology and subject to copyright pursuant to the *Copyright Act 1968*. Reproduction, publication or communication of this document, in whole or in part, without the written permission of EcoSmart Ecology constitutes an infringement of copyright.

**INTENDED USE:** EcoSmart Ecology has prepared this report at the request of Arrow Energy Pty Ltd. Information and recommendations contain herein are purpose and project specific and EcoSmart Ecology accepts no liability for the use or interpretation of any information contained in this report for any other purposes other than intended.

The report should be read in its entirety. No responsibility is accepted for portions of text taken out of context. This report does not provide legal advice. Legal advice should only be sort from qualified practitioners.

---

DOCUMENT CONTROL

<b>Name of Project:</b>	Arrow Off-tenement Terrestrial Ecological Assessment
<b>Project Number:</b>	ARW_1701
<b>Project Manager:</b>	Mark Sanders/David Stanton
<b>Document Author(s):</b>	Mark Sanders and David Stanton
<b>Name of Document:</b>	Off-tenement Terrestrial Ecology Report
<b>File Name:</b>	Off-tenement_Terr_Eco_Ass_Report.docx
<b>Version:</b>	Version 1.0

---

## **TABLE OF CONTENTS**

<b>1.0 INTRODUCTION.....</b>	<b>2</b>
<b>2.0 SURVEY METHODS.....</b>	<b>3</b>
2.1 PRE-FIELD SURVEY DESKTOP ASSESSMENT.....	3
2.2 FLORA FIELD SURVEY METHODS.....	3
2.2.1 Flora Survey Techniques.....	3
2.2.2 Mapping Scale and Attributes.....	4
2.3 FAUNA SURVEY TECHNIQUES.....	4
2.4 THREATENED SPECIES HABITAT MAPPING.....	4
<b>3.0 ASSESSMENT RESULTS.....</b>	<b>6</b>
3.1 FLORA.....	6
3.2 FAUNA.....	12
<b>4.0 REFERENCES.....</b>	<b>17</b>

## 1.0 INTRODUCTION

Arrow Energy (Arrow) has received Federal and State government approval for its Environmental Impact Statement (EIS) for the Surat Gas Project (SGP). The approval includes Federal conditions requiring flora and fauna surveys in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) survey guidelines (or as otherwise agreed with the Commonwealth Department of the Environment and Energy) and State (Department of Environment and Heritage Protection) survey guidelines. To facilitate the SGP, additional linear infrastructure is required to be installed and operated in areas that are not covered by the existing SGP EPBC approval. Arrow Energy will be submitting a new Referral to the Federal Government to accommodate this additional infrastructure.

EcoSmart Ecology, in conjunction with 3D Environmental, was contracted to complete terrestrial ecological surveys sampling the range of habitats within the areas of this additional infrastructure. The surveys targeted likely Threatened species, Threatened Ecological Communities (TECs) and Regional Ecosystems (REs).

Properties assessed during the field survey are listed in Table 1.1.

**Table 1.1. List of properties included in the Off-tenement survey works**

Lot/Plan	Owners	Area (ha)
10DY490	HELEN LOUISE & GARY JAMES & JESSE COLYER NEILL	263.67
119SP227731	ORIGIN ENERGY DARLING DOWNS SOLAR FARM PTY LTD	152.58
120DY1050	JACEN PATRICK & EMMA KATE CHAPMAN	263.92
130DY762**	QGC PTY LIMITED	192.83
13SP226733	QGC PTY LIMITED	222.51
1SP227731	ORIGIN ENERGY POWER LIMITED	73.71
22SP274308	AUSTRALIA PACIFIC LNG PTY LIMITED	119.35
27DY81	BG INTERNATIONAL LIMITED; QGC PTY LIMITED	59.78
32DY75	QGC PTY LIMITED	108.97
34DY75	QGC PTY LIMITED	344.26
35DY76	MICHAEL JOHN VON PEIN	97.93
37DY81	CHRISTOPHER GAETANO CIELO	22.81
4FTY475	QCLNG PIPELINES PTY LIMITED	649.44
5RP190989	QGC PTY LIMITED	25.75
6DY86	QGC PTY LIMITED	97.36
6RP205405	FRANK ELI MAHNKOPF	250.93
7RP205405**	GERRIT WESTRA	260.4 ha
93DY473	SCOTT ROBERT SORLEY	77.29
	<b>TOTAL</b>	<b>3283.49</b>

\*\* Property's outside the area likely to be impacted by Arrow's infrastructure.

## 2.0 SURVEY METHODS

The survey was completed over of a 7-day period from the 8<sup>th</sup> to the 14<sup>th</sup> December 2017 with the team comprising Paul Williams (flora ecologist) and Mark Sanders (fauna ecologist). The study area for the survey comprised those properties that contain remnant vegetation within the areas proposed to accommodate the additional linear infrastructure required to support the SGP.

### 2.1 PRE-FIELD SURVEY DESKTOP ASSESSMENT

A detailed desktop review of available ecological information was undertaken as part of the Surat Gas Project Terrestrial Ecology Assessment (EcoSmart Ecology 2017). Much of this data is relevant to the off-tenement areas and was utilised during this assessment as required. Desktop data sources included:

- Birdlife atlas database, including geo-referenced data for threatened taxa,
- Wildnet database, including inspecting threatened species profile data to gather geo-referenced locations (where possible),
- The EPBC Act Protected Matters Search Tool,
- Queensland Herbarium HerbreCs database of vouchered specimen collections within a 50km buffer surrounding the assessment area,
- *Vegetation Management Act 1999* (VM Act) Status and Biodiversity Status of Pre-clearing and Remnant Regional Ecosystems Queensland - Version 10.0 (EHP 2015),
- Queensland Wetland Data Version 4.0 (EHP 2016),
- Matters of State Environmental Significance datasets (EHP 2014),
- Australia's Virtual Herbarium (AVH 2016) for vouchered specimen records sourced from a number of Australian Herbarium, and
- Nature Conservation Act protected plants flora survey trigger map spatial layer – Version 4.1 (EHP 2016).

### 2.2 FLORA FIELD SURVEY METHODS

#### 2.2.1 Flora Survey Techniques

Surveys collected floristic data consistent with Queensland Herbarium standards (Neldner *et al* 2012) and included secondary, tertiary and quaternary sites. The location of these sites was selected using aerial photograph analysis, or opportunistically during traverse, to ensure that the field survey targeted a representative range of habitats.

Secondary sites consisting of 50 m x 10 m plots were located within the vegetation to avoid sampling across community boundaries. Crown intercept transects were extended to 100 m for the purpose of providing sufficient data for reference sites where an assessment of remnant / non-remnant status was required. Full species lists for all strata were established during the secondary sampling procedure and supplemented by a detailed search of the

nearby vicinity. The abundance of all species within the plot was recorded by stem counts, or by visual assessment as a 1-5 cover-abundance ranking using the braun-blanquet method (Neldner *et al.* 2012). Groundcover was assessed using five 1x1 m subplots placed at 10 m intervals along transects with visual cover estimations of dominant species. Ecological and structural data together with full species lists were compiled. In some instances identification to species level was not possible due to the lack of fertile material, particularly for grasses. Unidentified species were classified to the next highest denominator (typically genus level) and would account for <1% of all identifications.

Quaternary sites included a description of floristic structure, composition, and associated landform, and were used specifically for the purpose of mapping unit verification. Observation sites identify regional ecosystem type, dominant species and structure.

A total of 376 flora survey sites were recorded during the assessment including 28 secondary floristic survey sites and a balance of quaternary and observation sites.

### **2.2.2 Mapping Scale and Attributes**

Vegetation linework was established at a scale of 1:25,000 providing an accuracy of hard boundaries of +/-25 m and a minimum polygon size of 0.5 ha. A polygon of 0.5 ha represents the minimum patch size threshold for both the Brigalow and Weeping Myall Woodlands Ecological Communities, listed as Endangered under the EPBC Act.

A seamless GIS dataset has been produced to incorporate mapped REs, TECs and habitat mapping for all threatened species (flora and fauna) known from the off-tenement area including the mapping of Core Habitat Known and Possible. This dataset has been combined with datasets produced in previous ecological assessments to ensure consistency.

GIS shapefiles of all floristic survey sites within the surveyed area have been provided to Arrow in a separate package to accompany this report, which also includes the locations and findings of previous and current survey efforts.

### **2.3 FAUNA SURVEY TECHNIQUES**

The fauna survey did not include detailed trapping methods but rather included bird survey, area searches and habitat assessment targeting those EPBC listed threatened species identified from the Protected Matters Search Tool query (see Appendix A for the query report). In addition to rolling rocks, logs and searching through other debris (e.g., raking dense leaf litter), area searches included assessment for scats, tracks and scratches on the trunks of smooth-barked trees. Specifically, this included searching for Glossy Black Cockatoo feeding remains (orts) and koala scats under suitable tree species. Fauna survey methods were undertaken at random locations that support remnant vegetation throughout the off-tenement areas and were conducted at various times during the day.

### **2.4 THREATENED SPECIES HABITAT MAPPING**

Habitat mapping was undertaken for each flora and fauna species known from the off-tenement areas or considered possible or likely to occur. Habitat mapping for unlikely or transient species was not undertaken.

Remnant vegetation, and areas of selected re-growth, were categorised for each species as 'Core Habitat Known' (based around known records), Core Habitat Possible, General Habitat, or Absence Suspected. In assigning these categories the mapping product considered:

- Known records (based on database searches and field investigations),
- Preferred habitat attributed on an RE level, and
- Behaviour/movement potential (e.g., the removal of small isolated patches of suitable habitat for immobile species, or increasing the buffer size of 'Core Habitat Known' for highly mobile taxa).

This approach was consistent with, and extended the work commenced, in the SGP Supplementary EIS (3d Environmental 2013).



### 3.0 ASSESSMENT RESULTS

#### 3.1 FLORA

The assessment identified the following Matters of National and State Environmental Significance (MNES and MSES) within the off-tenement areas:

- 1,770 ha of remnant vegetation was mapped including 35.8 ha of Endangered and 8.7 ha of 'Of Concern' RE's. A summary of REs mapped is included in Table 3.1,
- The Brigalow EPBC Threatened Ecological Community (TEC) was identified and mapped on Lot 93DY473, Lot 130DY762 and Lot 34DY75. In total, 39.1 ha of the ecological community was mapped within the study area, which includes 3.3 ha of advanced brigalow regrowth (see Figure 3.1), and
- Several populations of the EPBC Listed threatened species, Kogan wax flower (*Philotheca sporadica*), were identified during the assessment. Survey records have been incorporated into the project geodatabase and areas of 'Core Habitat Known' have been mapped (see Figure 3.2) and calculated as per the rules provided in Appendix B.

A list of flora species known, or possibly occurring, within a distance of 50km of the off-tenement areas is provided in Table 3.2. Based on habitat suitability and experience gained during detailed ecological surveys of the adjacent Surat Gas Project area, the likelihood of each species occurring within the off-tenement area has been assessed for individual property blocks (Table 3.2). One species is known to occur one species may possibly occur. The extent of habitat for each known or possible species is provided in Table 3.3.

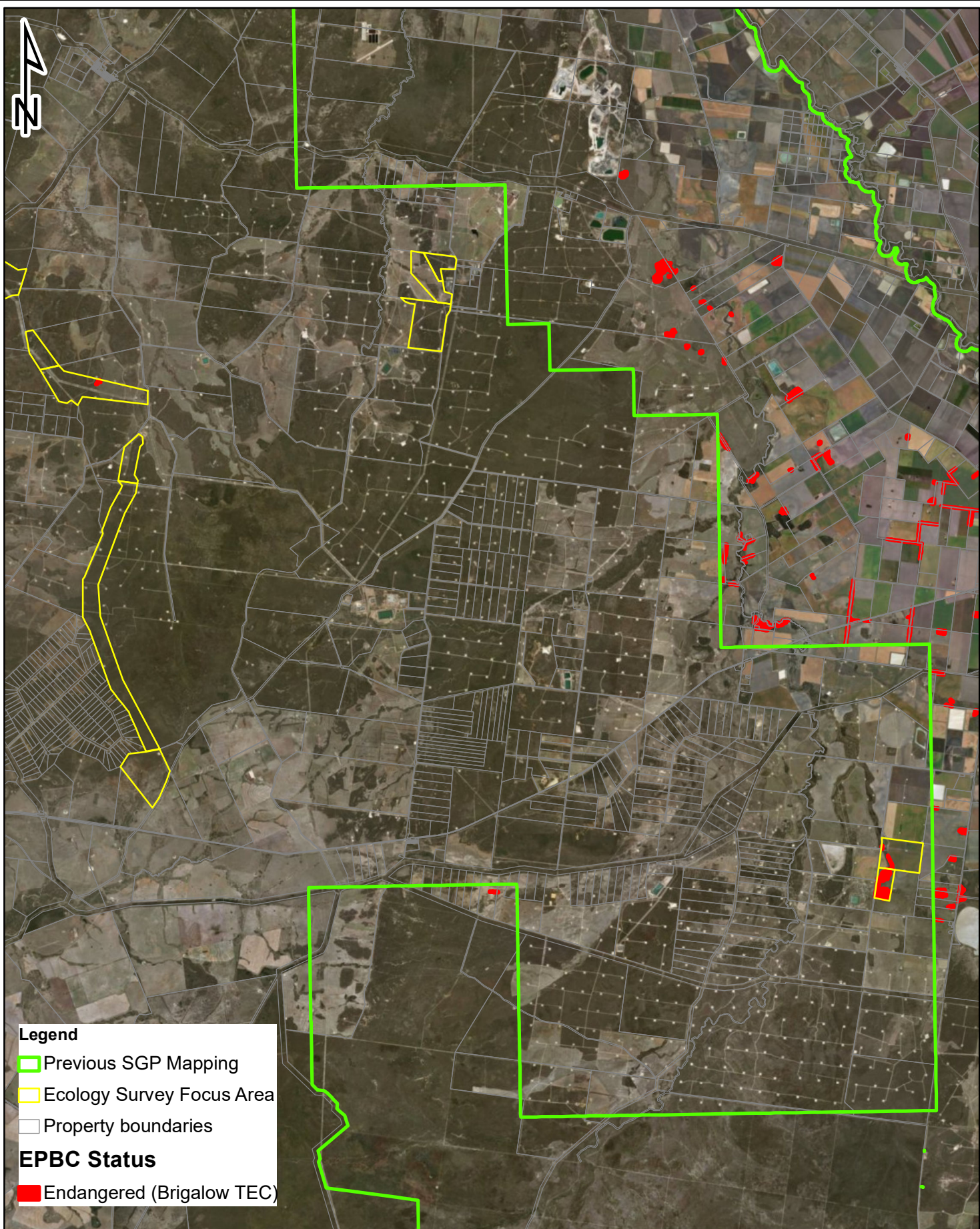
**Table 3.1.** Regional Ecosystem extent within Off-tenement areas of the study area.

RE	Description	Status			Area (ha)
		EPBC*	VM Act	Bio. Status	
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains.	-	OC	OC	3.5
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains.	-	OC	OC	5.2
11.3.18	<i>Eucalyptus populnea</i> , <i>Callitris glaucophylla</i> , <i>Allocasuarina luehmannii</i> shrubby woodland on alluvium.	-	LC	NCAP	75.8
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	-	LC	OC	33.8
	11.3.25g: Seasonal vegetation associated with larger waterholes and areas of open water.	-			
11.3.27	11.3.27a: Palustrine wetland (e.g. vegetated swamp). Mixed grassland or sedgeland with areas of open water +/- aquatic species.	-	LC	OC	12.6
	11.3.27d: Palustrine wetland <i>Eucalyptus camaldulensis</i> and/or <i>Eucalyptus tereticornis</i> woodland	-			
	11.3.27f: <i>Eucalyptus coolabah</i> and/or <i>E. tereticornis</i> open woodland to woodland fringing swamps.	-			

RE	Description	Status			Area (ha)
11.4.3	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains	End			35.8
	11.4.3a: Palustrine wetland (e.g. vegetated swamp). <i>Melaleuca bracteata</i> woodland associated with <i>Acacia harpophylla</i> communities.	-	End	End	
11.5.1	11.5.1: <i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>Angophora leiocarpa</i> , <i>Allocasuarina luehmannii</i> woodland on Cainozoic sand plains/remnant surfaces	-	LC	NCAP	633.3
	11.5.1a: <i>Eucalyptus populnea</i> woodland with <i>Allocasuarina luehmannii</i> low tree layer.	-			
11.5.20	<i>Eucalyptus moluccana</i> and/or <i>E. microcarpa</i> / <i>E. pilligaensis</i> ± <i>E. crebra</i> woodland on Cainozoic sand plains.	-	LC	NCAP	22.2
11.7.4	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on Cainozoic lateritic duricrust.	-	LC	NCAP	232.5
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks.	-	LC	NCAP	17.8
	11.7.5b: <i>Acacia aprepta</i> shrubland.	-			
11.7.6	<i>Corymbia citriodora</i> or <i>Eucalyptus crebra</i> woodland on Cainozoic lateritic duricrust.	-	LC	NCAP	348.5
11.7.7	<i>Eucalyptus fibrosa</i> subsp. <i>nubila</i> ± <i>Corymbia</i> spp. ± <i>Eucalyptus</i> spp. on Cainozoic lateritic duricrust.	-	LC	NCAP	417.7

E = Endangered, OC = Of Concern, LC = Least Concern, NCAP = No Concern at Present

\*Listed as an Endangered Threatened Ecological Community (TEC) under the EPBC Act.



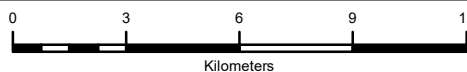
**Legend**

- Previous SGP Mapping
  - Ecology Survey Focus Area
  - Property boundaries
- EPBC Status**
- Endangered (Brigalow TEC)

**Figure 3.1.** Threatened Ecological Communities in Off-tenement areas.

**Client**

ARROW ENERGY



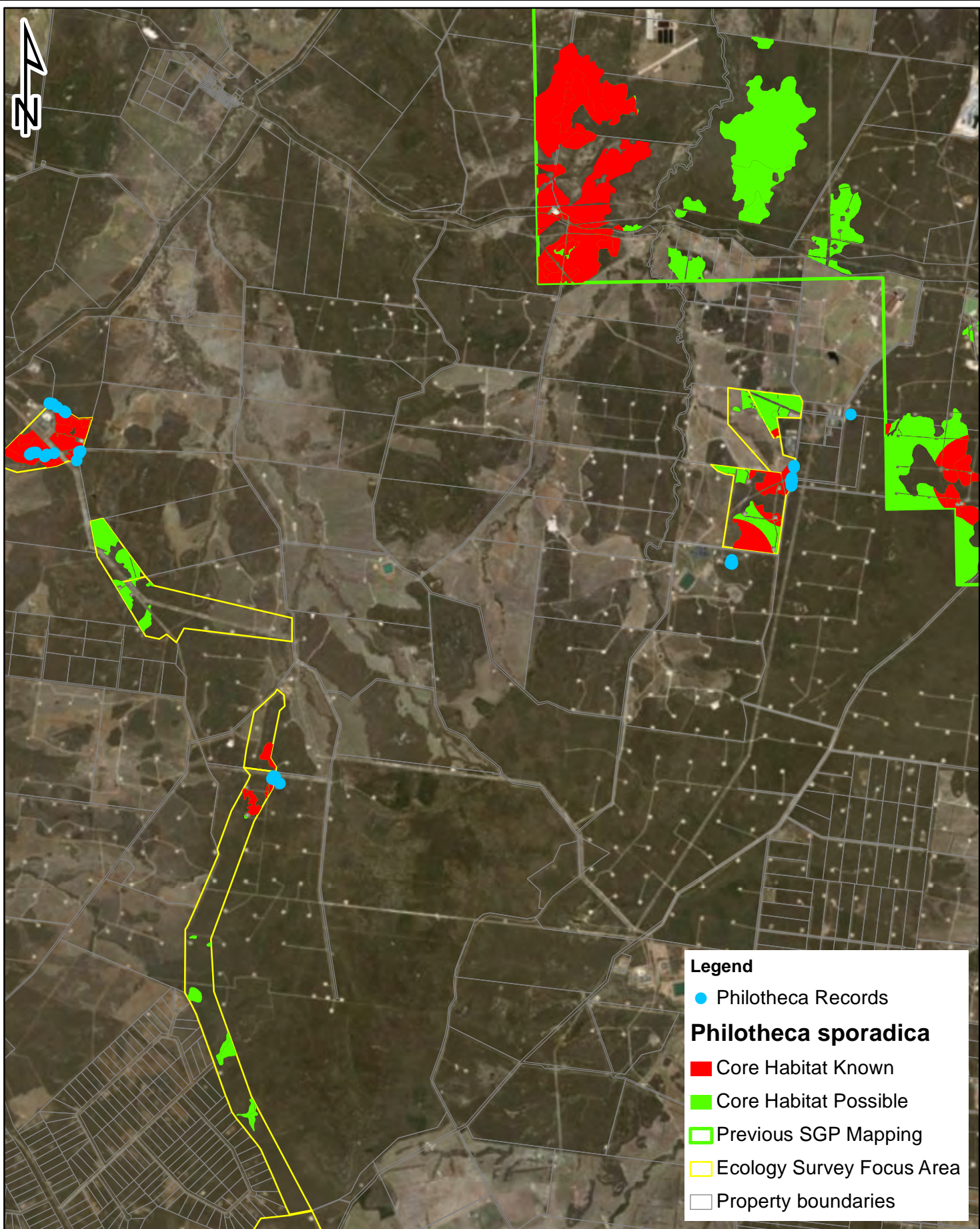
Scale 1:200,000    Drawn By DG    Date 31-Jan-18    A4

**3D Environmental**

Vegetation Assessment & Mapping Specialists

P. O. Box 959  
Kenmore, Qld 4069  
Mobile: 0447 8227 119  
www.3denvironmental.com.au

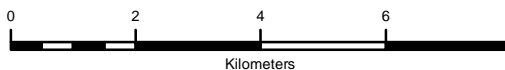




**Figure 3.2.** Species records, Core Habitat Known and Core Habitat Possible in off-tenement areas.

Client

ARROW ENERGY



Scale 1:121,020 Drawn By DG Date 06-Mar-18 A4

**Legend**

- Philotheca Records
- Philotheca sporadica**
- Core Habitat Known
- Core Habitat Possible
- Previous SGP Mapping
- Ecology Survey Focus Area
- Property boundaries

**3D Environmental**

Vegetation Assessment & Mapping Specialists

P. O. Box 959  
Kenmore, Qld 4069  
Mobile: 0447 8227 119  
www.3denvironmental.com.au



**Table 3.2.** Likelihood assessment for Threatened flora species in the Off-tenement assessment area.

Scientific Name	Common Name	NC Act Status	EPBC Status	Property						
				7RP205405 6RP205405 5RP190989 22SP274308	27DY81 37DY81 6DY86	37DY81 13SP226733	35DY76 32DY75 34DY75	4FTY475 10DY490	120DY1050 119SP227731 1SP227731	93DY473 130DY762
<i>Acacia barakulensis</i>	Waaje wattle	V	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Acacia curranii</i> **	Curly-bark wattle	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Acacia handonis</i>	Hando's wattle	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Acacia lauta</i> **	Tara wattle	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Acacia wardellii</i>	Wardell's wattle	NT	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Cadellia pentastylis</i> **	Ooline	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Callitris baileyi</i>	Bailey's cypress	NT	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Calytrix gurulmundensis</i> **	Gurulmundi fringe myrtle	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Cryptandra ciliata</i>	-	NT	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Cymbonotus maidenii</i>	-	E	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Cyperus clarus</i>	-	V	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Denhamia parviflora</i>	Small-leaved denhamia	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Dicanthium queenslandicum</i> **	King Blue Grass	V	E	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Dicanthium setosum</i> **		-	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Digitaria porrecta</i>	Finger panic grass	NT	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Eucalyptus argophloia</i>	Chinchilla white gum	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Eucalyptus curtisii</i>	Plunkett mallee	NT	-	Possible	Possible	Possible	Possible	Possible	Possible	Unlikely
<i>Eucalyptus virens</i> **	Shiny-leaved ironbark	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Fimbristylis vagans</i>	NA	E	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely

Scientific Name	Common Name	NC Act Status	EPBC Status	Property						
				7RP205405 6RP205405 5RP190989 22SP274308	27DY81 37DY81 6DY86	37DY81 13SP226733	35DY76 32DY75 34DY75	4FTY475 10DY490	120DY1050 119SP227731 1SP227731	93DY473 130DY762
<i>Homopholis belsonii</i> **	Belson's panic	E	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Homoranthus decumbens</i> **		E	E	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Micromyrtus carinata</i>	-	E	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Philotheca sporadica</i> **	Kogan wax flower	NT	V	Possible	Possible	Known	Likely	Known	Known	Unlikely
<i>Picris barbarorum</i>	-	V	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Pomaderris coomingalensis</i>	-	E	-	Unlikely	Unlikely	Unlikely	Unlikely	Possible	Unlikely	Unlikely
<i>Rhaponticum australe</i> **	Austral Corn Flower	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Rutidosia lanata</i>	-	V	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Solanum papaverifolium</i>	-	E	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Solanum stenopterum</i>	-	V	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Thesium australe</i> **	Austral toadflax	V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Tylophora linearis</i> **		E	E	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Westringia parviflora</i> **		V	V	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Xerothamnella herbacea</i>	Xerothamnella	E	E	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely

\*\* = Species identified in Protected Matters Search Tool; E = Endangered; V = Vulnerable; NT = Near Threatened

**Table 3.3.** The extent of mapped habitat for Threatened flora species present or possibly occurring within Off-tenement areas of interest in the study area.

Scientific Name	Common Name	Status		Habitat extent in Off-tenement areas of interest (ha)*		
		NCA	EPBC	CHK	CHP	GH
<i>Eucalyptus curtisii</i>	Plunkett mallee	NT	-	0	0	1016.0
<i>Philotheca sporadica</i>	Kogan waxflower	NT	V	334.9	314.9	17.8
<i>Pomaderris coomingalensis</i>	NA	E	-	0	0	243.3

\*CHN = Core Habitat Known, CHP = Core Habitat Possible and GH = General Habitat

### 3.2 FAUNA

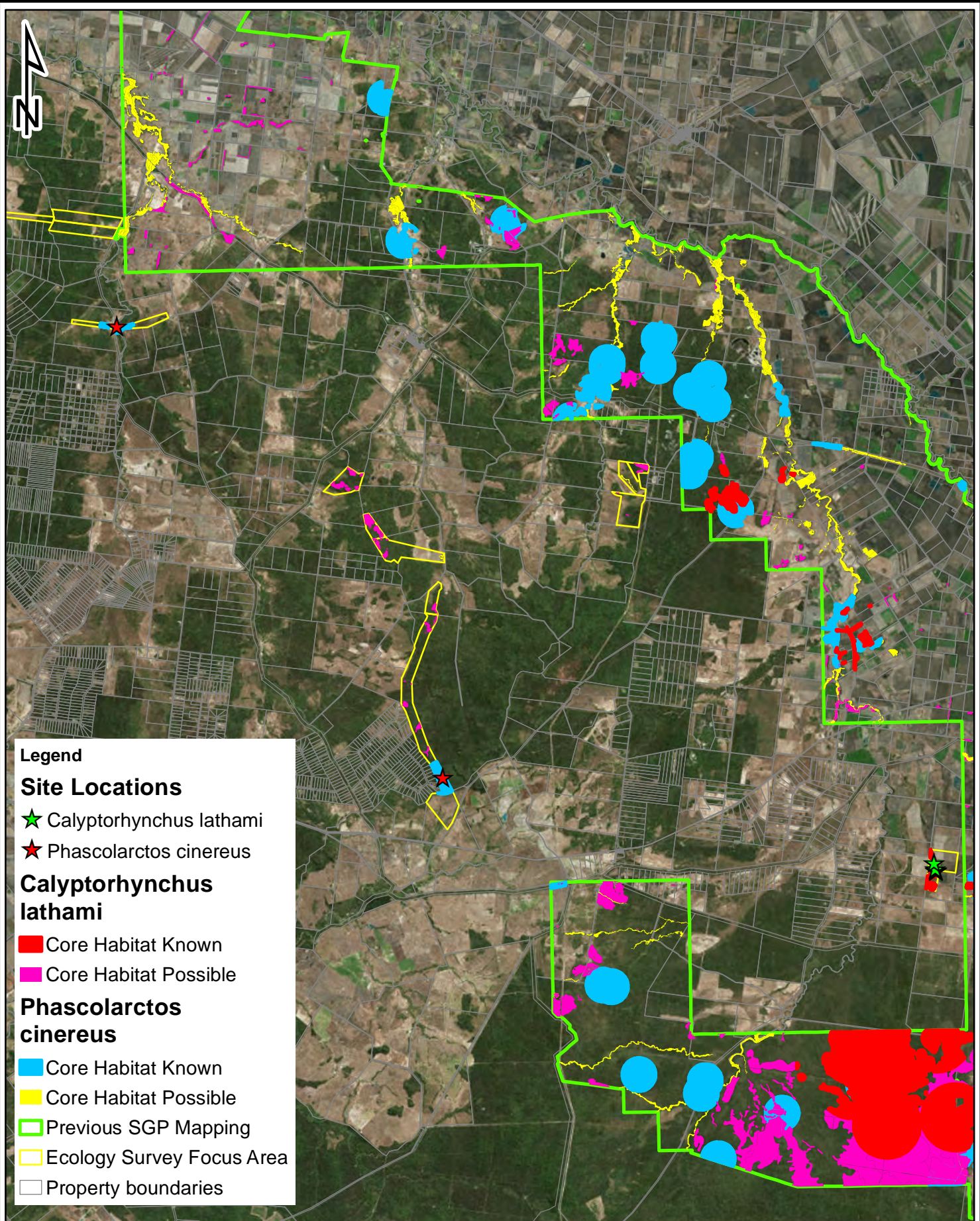
Field investigations confirmed the presence of the following MNES (EPBC listed) and MSES (NC Act listed) species:

- EPBC listed Koala (*Phascolarctos cinereus*), confirmed present by scats in Lot 37DY81 and 4FTY475, and
- NC Act listed Glossy Black Cockatoo (*Calyptorhynchus lathamii*), located within Lot 130DY762 and 93DY473.

Records and mapped 'Core Habitat Known' for these two species shown in Figure 3.3. The likely occurrence of other Threatened fauna taxa within the off-tenement area is provided in Table 3.4, with the extent of Core Habitat known, Core Habitat Possible and General habitat for possible, likely, or known fauna provided in Table 3.5. Mapping has not been completed, or no habitat is present, for transient or unlikely fauna species.

Fauna mapping follows rules provided in Appendix B with the exception of RE 11.3.27d on 130DY762 and 93DY473. The value of this area has been designated as Core Habitat Known for Glossy Black Cockatoo due to the presence of feeding remains (orts) under scattered large *Allocasuarina cristata*. The presence of these trees in this community is probably due to proximity of RE 11.4.3, where *A. cristata* was common.

C:\Users\Owner\Documents\Clients\3D Environmental\Arrow\_Aug\_2016\3d\_Arrow\_A4PJan\_18.mxd



**Legend**

**Site Locations**

- ★ *Calyptorhynchus lathami*
- ★ *Phascolarctos cinereus*

***Calyptorhynchus lathami***

- Core Habitat Known
- Core Habitat Possible

***Phascolarctos cinereus***

- Core Habitat Known
- Core Habitat Possible
- ▭ Previous SGP Mapping
- ▭ Ecology Survey Focus Area
- ▭ Property boundaries

**Figure 3.3.** Species records, Core Habitat Known and Core Habitat Possible for *Phascolarctos cinereus* and *Calyptorhynchus lathami* in off-tenement areas.

**Client**  
ARROW ENERGY

0 5 10 15 20  
Kilometers

Scale 1:300,000 Drawn By DG Date 06-Mar-18 A4

**3D Environmental**  
Vegetation Assessment & Mapping Specialists

P. O. Box 959  
Kenmore, Qld 4069  
Mobile: 0447 8227 119  
www.3denvironmental.com.au





**Table 3.4.** Likelihood assessment for Threatened fauna species in the Off-tenement assessment areas

Scientific Name	Common Name	Status		Property						
		NCA	EPBC	7RP205405 6RP205405 5SRP190989 22SP274308	27DY81 37DY81 6DY86	37DY81 13SP22673 3	35DY76 32DY75 34DY75	4FTY47 5 10DY49 0	120DY1050 119SP227731 1SP227731	93DY473 130DY762
<i>Jalmenus eubulus</i>	Pale Imperial Hairstreak	Vul	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Likely
<i>Strophurus taenicauda</i>	Golden-tailed Gecko	NT	-	Likely	Likely	Likely	Likely	Likely	Likely	Likely
<i>Delma torquata</i>	Collared Delma	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Anomalopus mackayi</i>		End	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Egernia rugosa</i>	Yakka Skink	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Tympanocryptis condaminensis</i>	Condamine Earless Dragon	End	End	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Acanthophis antarcticus</i>	Common Death Adder	Vul	-	Possible	Possible	Possible	Possible	Possible	Possible	Unlikely
<i>Furina dunmalli</i>	Dunmall's Snake	Vul	Vul	Possible	Possible	Possible	Possible	Possible	Possible	Possible
<i>Denisonia maculata</i>	Ornamental Snake	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Hemiaspis daemeli</i>	Grey Snake	End	-	Possible	Possible	Unlikely	Possible	Possible	Possible	Likely
<i>Turnix melanogaster</i>	Black-breasted Button-quail	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Calidris ferruginea</i>	Curlew Sandpiper	End	C End	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Rostratula australis</i>	Australian Painted Snipe	End	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Botaurus poiciloptilus</i>	Australasian Bittern	LC	End	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Erythroriorchis radiates</i>	Red Goshawk	End	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	Vul	Vul	Transient	Transient	Transient	Transient	Transient	Transient	Transient
<i>Lophochroa leadbeateri</i>	Major Mitchell's Cockatoo	Vul	-	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	Vul	-	Unlikely	Unlikely	Possible	Possible	Possible	Possible	Known

Scientific Name	Common Name	Status		Property						
		NCA	EPBC	7RP205405 6RP205405 5RP190989 22SP274308	27DY81 37DY81 6DY86	37DY81 13SP22673 3	35DY76 32DY75 34DY75	4FTY47 5 10DY49 0	120DY1050 119SP227731 1SP227731	93DY473 130DY762
<i>Anthochaera Phrygia</i>	Regent Honeyeater	End	C End	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Grantiella picta</i>	Painted Honeyeater	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Possible
<i>Lathamus discolour</i>	Swift Parrot	End	C End	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Poephila cincta cincta</i>	Black-throated Finch	End	End	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Dasyurus hallucatus</i>	Northern Quoll	LC	End	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Phascolarctos cinereus</i>	Koala	Vul	Vul	Likely	Known	Possible	Possible	Known	Possible	Possible
<i>Petauroides volans</i>	Greater Glider	Vul	Vul	Unlikely	Likely	Unlikely	Possible	Possible	Unlikely	Possible
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	LC	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vul	Vul	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely
<i>Nyctophilus corbeni</i>	South-eastern Long-eared Bat	Vul	Vul	Possible	Possible	Possible	Possible	Possible	Possible	Unlikely

C End = Critically Endangered; E = Endangered; V = Vulnerable; NT = Near Threatened; LC = Least Concern

**Table 3.5.** The extent of mapped habitat for Threatened fauna species known or possibly occurring within off-tenement areas.

Scientific Name	Common Name	Status		Habitat extent in Off-tenement areas of interest (ha)*		
		EPBC	NCA	CHK	CHP	GH
<i>Jalmenus eubulus</i>	Pale Imperial Hairstreak	-	Vul	0	35.8	0
<i>Strophurus taenicauda</i>	Golden-tailed Gecko	-	NT	0	1735.0	17.8
<i>Acanthophis antarcticus</i>	Common Death Adder	-	Vul	0	1494.6	195.7
<i>Furina dunmalli</i>	Dunmall's Snake	Vul	Vul	0	1631.6	11.6
<i>Hemiaspis daemeli</i>	Grey Snake	-	End	0	101.8	655.5
<i>Calyptrorhynchus lathami</i>	Glossy Black-Cockatoo	-	Vul	48,4	232.1	0
<i>Grantiella picta</i>	Painted Honeyeater	Vul	Vul	0	35.8	3.3
<i>Phascolarctos cinereus</i>	Koala	Vul	Vul	551.32	51.1	2129.7
<i>Petauroides volans</i>	Greater Glider	Vul	Vul	0	51.1	359.6
<i>Nyctophilus corbeni</i>	South-eastern Long-eared Bat	Vul	Vul	0	475	998.3

\*CHN = Core Habitat Known, CHP = Core Habitat Possible and GH = General Habitat.; \*\* Excludes 11.95 Ha mapped in 130DY762; # Excludes 66.8 ha from 7RP205405

## **4.0 REFERENCES**

3D Environmental (2013). Surat Gas Project Supplementary Terrestrial Ecology Assessment. Prepared for Coffey Environments Australia Pty Ltd on behalf of Arrow Pty Ltd by 3D Environmental and EcoSmart Ecology, 2013.

EcoSmart Ecology (2017). Surat Gas Project Terrestrial Ecology Report. Report prepared for Arrow Energy Pty Ltd, June 2017.

**Appendix A.**  
**EBPC Protected Matters Search**  
**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: 18/05/17 14:34:31

[Summary](#)

[Details](#)

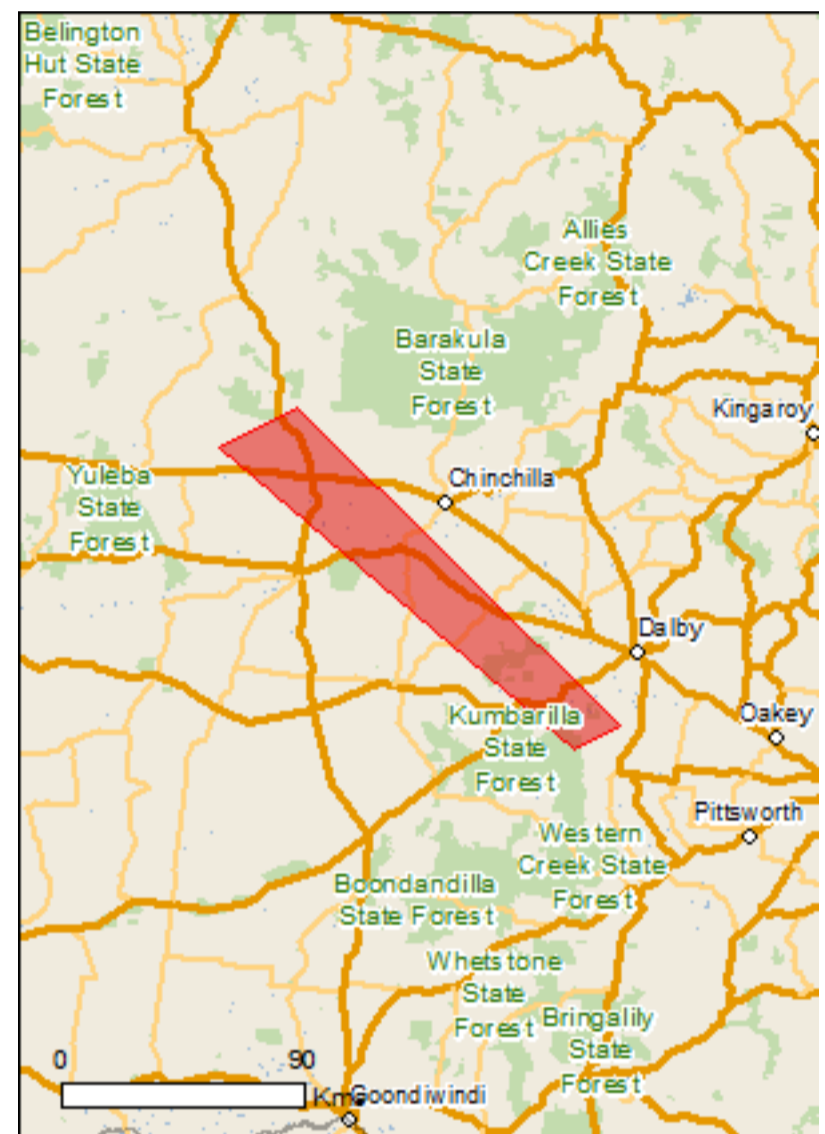
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

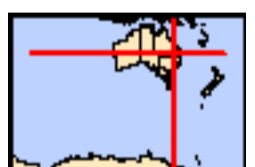
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

[Buffer: 1.0Km](#)



# 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	4
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	4
<a href="#">Listed Threatened Species:</a>	40
<a href="#">Listed Migratory Species:</a>	16

## 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.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	25
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Commonwealth Reserves Marine:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	2
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	35
<a href="#">Nationally Important Wetlands:</a>	1
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[ Resource Information ]
Name	Proximity
<a href="#">Banrock station wetland complex</a>	1200 - 1300km
<a href="#">Narran lake nature reserve</a>	400 - 500km upstream
<a href="#">Riverland</a>	1100 - 1200km
<a href="#">The coorong, and lakes alexandrina and albert wetland</a>	1300 - 1400km

## 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
<a href="#">Brigalow (Acacia harpophylla dominant and co-dominant)</a>	Endangered	Community known to occur within area
<a href="#">Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions</a>	Endangered	Community likely to occur within area
<a href="#">Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland</a>	Critically Endangered	Community likely to occur within area
<a href="#">Weeping Myall Woodlands</a>	Endangered	Community likely to occur within area

## Listed Threatened Species [ Resource Information ]

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Erythrorchis radiatus</a> Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Geophaps scripta scripta</a> Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area



Name	Status	Type of Presence
<a href="#">Poephila cincta cincta</a> Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
<a href="#">Turnix melanogaster</a> Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
<b>Fish</b>		
<a href="#">Maccullochella peelii</a> Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Chalinolobus dwyeri</a> Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Dasyurus hallucatus</a> Northern Quoll, Digul [331]	Endangered	Species or species habitat may occur within area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
<a href="#">Nyctophilus corbeni</a> Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Petauroides volans</a> Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<b>Other</b>		
<a href="#">Adclarkia cameroni</a> Brigalow Woodland Snail [83886]	Endangered	Species or species habitat known to occur within area
<a href="#">Adclarkia dulacca</a> Dulacca Woodland Snail [83885]	Endangered	Species or species habitat known to occur within area
<b>Plants</b>		
<a href="#">Acacia curranii</a> Curly-bark Wattle [3908]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Acacia lauta</a> Tara Wattle [4165]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Cadellia pentastylis</a> Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Calytrix gurulmundensis</a> [24241]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
<a href="#">Dichanthium queenslandicum</a> King Blue-grass [5481]	Endangered	Species or species habitat may occur within area
<a href="#">Dichanthium setosum</a> bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eucalyptus virens</a> [10181]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Homopholis belsonii</a> Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area
<a href="#">Homoranthus decumbens</a> a shrub [55186]	Endangered	Species or species habitat may occur within area
<a href="#">Philothea sporadica</a> Kogan Waxflower [64944]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Rhaponticum australe</a> Austral Cornflower, Native Thistle [22647]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Tylophora linearis</a> [55231]	Endangered	Species or species habitat may occur within area
<a href="#">Westringia parvifolia</a> [4822]	Vulnerable	Species or species habitat likely to occur within area

## Reptiles

<a href="#">Anomalopus mackayi</a> Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat may occur within area
<a href="#">Delma torquata</a> Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
<a href="#">Denisonia maculata</a> Ornamental Snake [1193]	Vulnerable	Species or species habitat may occur within area
<a href="#">Egernia rugosa</a> Yakka Skink [1420]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Furina dunmali</a> Dunmall's Snake [59254]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Tymanocryptis condaminensis</a> Condamine Earless Dragon [87888]	Endangered	Species or species habitat may 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
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Cuculus optatus</a> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Other Matters Protected by the EPBC Act

### 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
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a>		
Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Anseranas semipalmata</a>		
Magpie Goose [978]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a>		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a>		
Great Egret, White Egret [59541]		Breeding known to occur within area
<a href="#">Ardea ibis</a>		
Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a>		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a>		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a>		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Cuculus saturatus</a>		
Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
<a href="#">Gallinago hardwickii</a>		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
<a href="#">Haliaeetus leucogaster</a>		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Himantopus himantopus</a>		
Black-winged Stilt [870]		Species or species habitat known to occur within area
<a href="#">Hirundapus caudacutus</a>		
White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a>		
Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Limosa limosa</a>		
Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Merops ornatus</a>		
Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Lake Broadwater 1	QLD
Lake Broadwater 2	QLD

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 Resources Audit, 2001.	

Name	Status	Type of Presence
<b>Birds</b>		
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

Name	Status	Type of Presence
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
<b>Frogs</b>		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
<b>Mammals</b>		
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
Equus caballus Horse [5]		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
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		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 rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
<b>Plants</b>		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to 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
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Prosopis spp. Mesquite, Algaroba [68407]		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
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

<b>Nationally Important Wetlands</b>		<b>[ Resource Information ]</b>
Name	State	
<a href="#">Lake Broadwater</a>	QLD	

# 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 locations 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 resolutions.

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 distributions 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 methods are used to update these 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 communities 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 the protection of the Commonwealth Marine environment.

# Coordinates

-26.574851 149.874054,-26.454424 150.132233,-27.389893 151.200653,-27.463029 151.046845,-26.574851 149.874054



# 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.

**Appendix B.**  
**Known, Likely or Possible Species**  
**Profiles**

## **Kogan Waxflower (*Philotheca sporadica*)**

### Status

Near Threatened (NC Act); Vulnerable (EPBC Act)

### Distribution and Habitat

*Philotheca sporadica* is a Queensland and bioregional endemic known from south-east Queensland, from just north of Tara, to approximately 12 km east of Kogan (TSSC 2008). Of the 11 known populations, seven occur on road verges, seven extend onto freehold land and one population is within Braemar State Forest (Halford 1995c in TSSC 2008).

The majority of records are in low open forest and woodland of *Acacia burrowii*, *Eucalyptus exserta*, *Eucalyptus crebra*, *Eucalyptus fibrosa* subsp. *nubila* and *Callitris glaucophylla* (Halford 1995 in TSSC 2008), and also on residual hills which are remnants of laterised Cretaceous sandstones, where the soils are shallow, uniform sandy loams to clay loams of extremely low fertility and poor condition (TSSC 2008). Field survey indicates that the species occurs almost exclusively within RE 11.7.4 (*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* on lateritic duricrust) and possibly RE11.7.5 with a few individual plants overlapping with RE11.7.7. The species has a tendency to form dense, locally restricted populations, particularly on scalded areas with limited soil

### Known Threats to the Species

This species is threatened by clearing, particularly localised populations that might be impacted by well pads and linear infrastructure.

### Rule(s) for Habitat Mapping:

1. The species will most likely occur within a 25km wide buffer surrounding Kogan although cannot be discounted as occurring within suitable habitats throughout the off-tenement area.
2. REs 11.7.4 and 11.7.7 are classified as "Core habitat Possible" within 25km from Kogan.
3. Regrowth habits (non-remnant) derived from RE11.7.4 within 25km from Kogan are classified as "General Habitat".
4. All "Core Habitat Possible" and "General Habitat" within 1km of a recent (1980+), accurate ( $\pm 100m$ ) record is reclassified as "Core Habitat Known".
5. The remaining areas of RE11.7.4 throughout the off-tenement area are classified as "General Habitat".
6. All other areas are classified as "Absence Suspected".

### Mapping Confidence

The detailed ground surveys undertaken throughout habitats for this species in the off-tenement area and highly localised populations gives habitat mapping is presented with high confidence.

## References

Threatened Species Scientific Committee (TSSC) (2008). Commonwealth Conservation Advice on *Philotheca sporadica*. Department of the Environment, Water, Heritage and the Arts, Canberra.



Photograph: David Stanton

## **Plunkett Mallee (*Eucalyptus curtisii*)**

### Status

Near Threatened (NC Act)

### Distribution and Habitat

The plant is scattered but nowhere common occurring on coastal hinterland to 80 km north and south of Brisbane and inland over 300 km north west to the Dalby and Miles districts (DNR 2000). Occurs in the Burnett, Leichhardt, Moreton and Darling Downs pastoral districts (Bostock and Holland 2016). Conserved in Expedition Range, Robinson Gorge and Isla Gorge National Parks (Brooker and Kleinig 2004).

DEHP (2017a) suggests *Eucalyptus curtisii* has two growth forms that occur in different habitats with a shorter shorter mallee associated with shrublands dominated by banksia in poorly drained lowland sites with a larger growth occurring as scattered individuals on better drained soils in the more open areas of mixed eucalypt forests. The species is most typically associated with lateritised landscapes within regional ecosystems 11.7.4 and 11.7.5. Commonly associated species include *C. trachyphloia*, *Eucalyptus exserta* and *Callitris endlicheri* and less commonly associated with *E. fibrosa*.

### Ecology

Flowering of *Eucalyptus curtisii* has been recorded between the months of September and November, and fruiting occurs throughout the year (Queensland Herbarium, 2012 cited in DEHP 2017a). Response to fire is not documented.

### Known Threats to the Species

Known threatening process related largely to clearing, timber harvesting and inappropriate grazing and fire regimes.

### Rule(s) for Habitat Mapping:

*Eucalyptus curtisii* may occur throughout the entire off-tenement area. Through the assessment area, REs 11.7.2, 11.7.4, 11.7.5, 11.7.6 and 11.7.7 should be classified as "General Habitat" in recognition of the extensive survey effort undertaken. All other REs and non-remnant vegetation should be classified as "Absence Suspected".

### Mapping Confidence

Due to the extensive survey effort and known habitat preferences, mapping of *Eucalyptus curtisii* is attributed as having a high degree of confidence.

### References

- Bostock P. D & Holland A. E. (2016). *Census of the Queensland Flora 2016*. Queensland Department of Science, Information Technology and Innovation: Brisbane.
- Brooker M. I. H. and Kleinig D. A. (2004) Field guide to the eucalypts. Volume 3 Northern Australia. Bloomings Books Melbourne.

Department of Environment and Heritage Protection (2017a) ,*Plunkett mallee – Eucalyptus curtisii*, *WetlandInfo*, Queensland, viewed 6 May 2017,

---

<<https://wetlandinfo.ehp.qld.gov.au/wetlands/ecology/components/species/?eucalyptus-curtisii>>.

Department of Natural Resources (Qld DNR) (2000). Species Management Manual. Queensland Department of Natural Resources. Forest & Fauna Conservation and Ecology Section.

## ***Pomaderris coomingalensis***

### Status

Endangered (NC Act)

### Distribution and Habitat

*Pomaderris coomingalensis* has a broad distribution with scattered records between Coomingleh in the north and Inglewood in the south, a range of over 700 km. The largest known populations occur in the Coomingleh State Forest near Monto with other records near Kingaroy, Proston, Warwick and a single record west of Dalby.

The species is recorded from Eucalypt dominant woodlands dominated by *Corymbia citriodora* subsp. *variegata* and *E. crebra* / *Eucalyptus fibrosa* subsp. *nubila* woodland on stony brown clay loam (DEHP 2017b) which typify regional ecosystems 11.7.5, 11.7.6 and 11.7.7 in the off-tenement and SGP assessment area.

### Ecology

A small understory shrub growing from 3 – 5m tall with from 3 to 5m. *Pomaderris coomingalensis* flowers from October to December (DEHP 2017b).

### Known Threats to the Species

Known threatening process relate largely to land clearing, grazing, invasion of grassy weeds and inappropriate fire regimes which result in death of individual plants (clearing, timber harvesting and inappropriate grazing and fire regimes (DERM, 2010).

### Rule(s) for Habitat Mapping:

Within 10km of herbarium verified recent (post 1980) high precision records, regional ecosystems 11.7.4, 11.7.5, 11.7.6 and 11.7.7 should be mapped as general habitat. All other REs and non-remnant vegetation should be classified as "Absence Suspected".

### Mapping Confidence

Due to the extensive survey effort and known habitat preferences, mapping of *Pomaderris coomingalensis* is attributed as having a high degree of confidence.

### References

Department of Environment and Heritage Protection (2017b), *Pomaderris coomingalensis*, *WetlandInfo*, Queensland, viewed 21 January 2017,

Queensland Department of Environment and Resource Management (DERM) (2010). Burnett Mary Natural Resource Management Region Back on Track Actions for Biodiversity. Department of Environment and Resource Management, Brisbane.

## **Pale Imperial Hairstreak (*Jalmenus eubulus*)**

### Status

Vulnerable (NC Act)

### Distribution and Habitat

*Jalmenus eubulus* is restricted to the eastern Brigalow Belt Bioregion. The northern limit of its distribution appears to be around the latitude of Mackay and ranges south to around Boggabilla in northern NSW. The eastern limit of its distribution is roughly designated by the Great Dividing Range, being found near Kroombit Tops, Binjour Plateau, Bunya Mountains and Jondaryan (Eastwood et al. 2008). It may be found as far west as Carnarvon (Sands and New 2002).

The species is restricted to Brigalow (*Acacia harpophylla*)-dominated woodlands and open-forests. Its core habitat is old-growth Brigalow, particularly those areas with Belah (*Casuarina cristata*), emergent eucalypts such as *Eucalyptus populnea* and understorey shrubs and adults are always observed in association with old-growth (remnant) *A. harpophylla* communities (Breitfuss and Hill 2003; Eastwood et al. 2008). Being highly mobile, isolated patches may also provide suitable habitat.

### Ecology

*Jalmenus eubulus* feeds exclusively on Brigalow (*A. harpophylla*) shrubs ranging in height from 0.5 to 5m and (Braby 2000; Breitfuss and Hill 2003; Eastwood et al. 2008). The species has also been documented as feeding on other *Acacia* species (Sands and New 2002), but this has been discarded as erroneous in recent reviews (Eastwood et al. 2008).

It is likely that eggs enter diapause shortly after being laid. Emergence is triggered by summer rainfall, which may fall irregularly throughout the species' range, resulting in apparent different activity patterns between populations and years. Adults have been recorded between October and April, with peak activity in February and March. Peak activity appears to occur approximately two months after the wettest months of the year (December and January) (Eastwood et al. 2008).

Larvae feed singly, or occasionally in small groups of up to three individuals (Braby 2000). As in many lycaenid butterflies, the larvae are always attended by ants of the *Iridomyrmex* group, on which they are likely to be reliant for survival (Braby 2000; Sands and New 2002; Eastwood et al. 2008).

### Known Threats to the Species

This species is threatened by clearing of suitably sized stands of old-growth Brigalow woodland (Sands and New 2000).

### Rule(s) for Habitat Mapping:

1. The species may occur throughout the off-tenement area.
2. Within the off-tenement area, all remnant Brigalow (11.3.1, 11.3.17, 11.4.3 11.4.3a, 11.9.5) is classed as "Core Habitat Possible".



3. All "Core Habitat Possible" within 2km of a recent (1980+), accurate ( $\pm$  500m) record is reclassified as "Core Habitat Known".
4. The remaining Regional Ecosystems and non-remnant areas are classed as "Absence Suspected".

#### Specific Map Modifications

None.

#### Mapping Confidence

The life-cycle and habitat requirements for the Pale Imperial Hairstreak is well documented and understood. Correlation between important habitat characteristics and Regional Ecosystem descriptions is high. The habitat mapping for this species is expected to be highly accurate.

#### References

- Braby, M. F. (2000). The butterflies of Australia: their identification, biology and distribution. CSIRO Publishing, Collingwood.
- Breitfuss, M. J. and Hill, C. J. (2003). Field observations on the life history and behaviour of *Jalmenus evagoras eubulus* Miskin (Lepidoptera: Lycaenidae) in the southern brigalow belt of Queensland. Australian Entomologist 30. 135–138.
- Eastwood, R., Braby, M. F., Schmidt, D. J. and Hughes, J. M. (2008). Taxonomy, ecology, genetics and conservation status of the pale imperial hairstreak (*Jalmenus eubulus*) (Lepidoptera : Lycaenidae): a threatened butterfly from the Brigalow Belt, Australia. Invertebrate Systematics 22. 407-423.
- Sands, D. P. A and New, T. R. (2002). The action plan for Australian butterflies. Environment Australia, Canberra. pp. 254-255

## **Golden-tailed Gecko (*Strophurus taenicauda*)**

### Status

Near Threatened (NC Act)

### Distribution and Habitat

Golden-tailed geckoes are distributed from the western slopes of the Great Dividing Range to Carnarvon, and from Emerald in the north to Inglewood/Millmerran in the south. Areas within and surrounding Barakula State Forest may represent a stronghold for this species (Richardson 2006).

This species is a Brigalow Belt endemic. They are found in a wide variety of woodland and forest habitats, mainly in association with brigalow (*Acacia harpophylla*), cypress (*Callitris* spp.) and ironbark (*Eucalyptus* spp.). They can also be common in areas with a shrubby understorey (particularly *Acacia* spp. and *Callitris* spp, including regrowth). Ground cover, tree hollows and loose or peeling bark on standing trees and tree stumps may be important shelter sites for this species (Richardson 2006).

### Ecology

During the daytime, golden-tailed geckos shelter under loose bark and in tree hollows (Wilson 2015). They may also bask during the daytime. In Spring/Summer, females lay a clutch of two eggs. Females may lay more than one clutch in a season.

Movement patterns of the species have not been documented. However, individuals have been recorded crossing dual lane roads during warm summer nights.

### Known Threats to the Species

Habitat loss and degradation including inappropriate roadside management, inappropriate fire regimes, clearing and thinning of vegetation for agriculture appear to be the species main threats (Richardson 2006). Deaths on roads and predation from introduced carnivores (e.g., foxes and cats) may also affect populations.

### General Rule(s) for Habitat Mapping:

1. The species may occur throughout the entire off-tenement area.
2. Within the off-tenement area, RE's 11.3.1, 11.3.14, 11.3.17, 11.3.18, 11.4.3 11.4.3a, 11.5.1, 11.5.1a, 11.5.4, 11.5.4a, 11.5.20, 11.5.21, 11.7.2, 11.7.4, 11.7.6, 11.7.7, 11.9.2, 11.9.5 are mapped as "Core Habitat Possible".
3. Within the off-tenement area, RE's 11.3.2, 11.3.4, 11.3.26, 11.7.5, 11.7.5b, and 11.7.5x are mapped as "General Habitat".
4. All areas of advanced regrowth (10+) should be treated as remnant vegetation and classed according to the above rules.
5. Core Habitat Possible and General Habitat within 1km of a recent (1980+), accurate ( $\pm$  500m) record is classed as "Core Habitat Known".
6. Habitat patches <5ha and not adjacent or near other remnant vegetation (i.e., isolated) are reclassified as "Absence Suspected".

7. "Core Habitat Possible" or "General Habitat" between 5ha and 10ha in size and not adjacent or near other remnant vegetation (i.e., isolated) are reclassified as "General Habitat" and "Absence Suspected" respectively.
8. Remaining regrowth and RE's are classed as "Absence Suspected".
9. Cleared agricultural, grazing land and palustrine and lacustrine wetlands (RE 11.3.3c, 11.3.27c) is classed as "Absence Likely".

#### Specific Map Modifications

None.

#### Mapping Confidence

Golden-tailed Geckos appear to be unevenly distributed throughout suitable habitat. However, they can also inhabit regrowth or cleared habitats with abundant shrubs. As such, the mapped habitat area is likely to have a moderate accuracy.

#### References

- Richardson, R. (2006). Queensland Brigalow Belt Reptile Recovery Plan 2008 – 2012. Report to the Department of the Environment, Water, Heritage and the Arts, Canberra. WWF-Australia, Brisbane.
- Wilson, S. (2015). A Field Guide to the Reptiles of Queensland. Second Edition. Reed New Holland Publishers Pty Ltd, Sydney.

## **Common Death Adder (*Acanthophis antarcticus*)**

### Status

Vulnerable (NC Act)

### Distribution and Habitat

This species is widespread throughout Queensland, with the exception of Cape York Peninsula and the Mulga Lands in the south-west (Wilson 2015). Once abundant in the Brigalow Belt, it is now rarely observed and in the southern Brigalow belt the species seems to be particularly aligned with large contiguous tracts of vegetation (e.g. state forests around Inglewood and Southwood National Park may represent strongholds) which maintains a healthy ground strata (and in particular ground debris) (EPA 2008).

It is found in a wide variety of habitats, including rainforest, open woodland, shrubland and heath (Ehmann 1992; Wilson and Swan 2013).

### Ecology

The Common Death Adder is a slow-moving, sedentary snake that lies motionless while partially buried in leaf litter, vegetation or soil. Breeding takes place in spring and autumn (Ehmann 1992).

Diet consists of lizards and small mammals, and to a lesser extent, birds and frogs. However, diet changes with age, young animals consuming more reptiles and frogs, whilst adults feed predominantly on small mammals and birds (Shine 1980).

### Known Threats to the Species

Threats to this species are poorly known. Land clearing and fragmentation are likely to have extensively affected the occurrence of this species in the Brigalow Belt. Alteration to microhabitats is also likely to detrimentally affected ambush snakes such as death adders, as they require ground cover to ambush their prey. Grazing, agriculture, urbanisation and inappropriate fire regimes modify ground cover considerably, reducing potential ambush sites (Ehmann 1992; Reed and Shine 2002; EPA 2008). Similar patterns of decline have been seen in other ambush snake species (Shine 1994). The species is also at risk from Cane Toad ingestion in areas where toad abundance is high.

### General Rule(s) for Habitat Mapping:

1. The species could occur throughout the entire off-tenement area.
2. Vegetation with a combined extent >5,000ha should be classed as "Core Habitat Possible".
3. Core Habitat Possible within 1km of a recent (1980+), accurate ( $\pm 500$ m) record is classed as "Core Habitat Known".
4. Vegetation not connected to larger patches, but within close proximity (<500m) can be classed as "General Habitat".
5. Regrowth and cleared areas are mapped as "Absence Suspected".
6. Cleared farmland or tilled crops are classed "Absence Likely".

### Specific Map Modifications

None.

### Mapping Confidence

Habitat use by Death Adders is difficult to predict; they may occur in any remnant habitat, yet are absent from seemingly good habitats within their range. This may reflect historic land use or events that have affected ground structure. Historical fires, for example, may have reduced ground cover and resulted in local extinctions. Following fire, recolonisation may only occur if remaining patches are large or well connected to nearby populations. Due to these difficulties, the habitat map for this species is considered to have a low accuracy.

### References

- Ehmann, H (1992). Encyclopedia of Australian animals: reptiles. Angus and Robertson, Sydney. p395
- EPA (2008). BPA BRB South Fauna Expert Panel in Brigalow Belt South Biodiversity Planning Assessment. EPA. Brisbane
- Reed, R. N. and Shine, R. (2002). Lying in wait for extinction: Ecological correlates of conservation status among Australian elapid snakes. Conservation Biology 16. 451-461.
- Shine, R. (1980) Ecology of the Australian death adder *Acanthophis antarcticus* (Elapidae): evidence for convergence with the viperidae. Herpetologica, 36(4):281-289.
- Shine, R. (1994). The biology and management of the diamond python (*Morelia spilota spilota*) and carpet python (*M. s. variegata*) in NSW. New South Wales National Parks and Wildlife Service, Hurstville.
- Wilson, S. (2015). A Field Guide to the Reptiles of Queensland. Second Edition. Reed New Holland Publishers Pty Ltd, Sydney.
- Wilson, S. and Swan, G. (2013). A complete guide to reptiles of Australia. Fourth Edition. New Holland Publishers, Sydney.

## **Dunmall's Snake (*Furina dunmalli*)**

### Status

Vulnerable (NC Act); Vulnerable (EPBC Act Act)

### Distribution and Habitat

Dunmall's snake (*Furina dunmalli*) is confined to the Brigalow Belt bioregion of south-eastern Queensland and north-eastern New South Wales, occurring north to Clermont and near Rockhampton. Most records are from the Dalby-Tara area of the Darling Downs (Hobson 2012a).

The species has been found in a wide range of habitats, including forests and woodlands dominated by brigalow (*Acacia harpophylla*) and other acacias (*A. burowii*, *A. deanii*, *A. leiocalyx*), cypress (*Callitris* spp.) or bullock (*Allocasuarina luehmannii*) on black alluvial cracking clay and clay loams (Covacevich *et al.* 1988; Stephenson and Schmida 2008; Brigalow Belt Reptiles Workshop 2010; Hobson 2012a). It also occurs in spotted gum (*Corymbia citriodora*) and ironbark (*Eucalyptus crebra* and *E. melanophloia*) on sandstone-derived soils and there is a record from the edge of dry vine scrub (Stephenson and Schmida 2008; Brigalow Belt Reptiles Workshop 2010). However, preferred habitat appears to be brigalow growing on cracking black clay and clay loams (Cogger *et al.* 1993), with the majority of records from between 200 to 500 m elevation (Hobson 2012a). The species can, on rare occasions, inexplicably appear in in sub-optimal vegetation. Advanced regrowth habitat should not be excluded, particularly when adjacent or linking areas of suitable habitat. It is unlikely to occur in highly fragmented vegetation, particularly narrow linear strips.

### Ecology

Dunmall's snake is a nocturnal, cryptic, secretive species that is possibly genuinely scarce and very rarely encountered (Wilson 2015; Hobson 2012a). The species has been found sheltering under fallen timber and ground litter (Cogger *et al.* 1993; Brigalow Belt Reptiles Workshop 2010) and may use cracks in alluvial clay soils (Ehmann 1992). Little is known of its ecology, but it reportedly preys on lizards and geckoes (Gow and Swanson 1977; Shine 1981). Nothing is known of its breeding biology other than that it lays eggs (Wilson and Swan 2013).

### Known Threats to the Species

Due to the paucity of records and secretive nature of Dunmall's snake, it is not known if the species has declined, although records suggest a decline in eastern parts of its range. Its distribution, however, is confined to the Brigalow Belt bioregion, an area that has been highly modified for agriculture, the timber industry, natural gas and coal extraction, and urban development. Much of its habitat has been cleared or fragmented, particularly in its core area on the Darling Downs (Hobson 2012a). The main threats to the local populations of Dunmall's snake are thought to be:

- Predation by feral animals,
- Pasture improvement practices,
- Livestock grazing,

- Inappropriate roadside management, because much of its core habitat now only exists as linear fragments along roads and in stock routes (Richardson 2006; Hobson 2012a), and
- Increased mortality from vehicle strike.

Other possible threats include loss of fallen timber and ground litter (e.g., fuel reduction burns, firewood collection), weed invasion and drainage of swamps (DoE 2018).

#### Rule(s) for Habitat Mapping:

1. The species could occur throughout the entire off-tenement area.
2. All remnant vegetation >50ha in extent and within 500m of a larger vegetation patch of RE 11.3.1, 11.3.14, 11.3.17, 11.3.18, 11.4.3, 11.4.3a, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.5.21, 11.7.2, 11.7.4, 11.7.6, and 11.7.7 should be classed as "Core Habitat Possible".
3. Smaller vegetation patches of the above RE's may be mapped as "General Habitat" if they are in close proximity to large areas of "Core Habitat Possible".
4. Core Habitat Possible within 1km of a recent (1980+), accurate ( $\pm 500$ m) record is classed as "Core Habitat Known".
5. Advanced regrowth of all the above RE's are mapped as "General Habitat" if they are adjacent to or connect large areas of "Core Habitat Possible" or "General Habitat".
6. Remaining regrowth is mapped as "Absence Suspected".

#### Specific Map Modifications

None.

#### Mapping Confidence

This species is very poorly understood and records are scarce. Predicting its occurrence is extremely difficult and the mapping is likely to have low accuracy.

#### References

- Brigalow Belt Reptiles Workshop (2010). Proceedings from the workshop for the nine listed reptiles of the Brigalow Belt bioregions. 18-19 August 2010. Brisbane: Queensland Herbarium.
- Cogger, H. G., Cameron, E. E., Sadler, R. A. and Egger, P. (1993). The action plan for Australian reptiles. Australian Nature Conservation Agency, Canberra. p153-155
- Covacevich, J. A., Couper, P. J. and McDonald, K. R. (1998). Reptile diversity at risk in the Brigalow Belt, Queensland. *Memoirs of the Queensland Museum* 42. 475-486.
- Department of Environment (DoE) (2018). Species Profile and Threats Database: *Furina dunmalli* – Dunmall's snake. Available at: [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=59254](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59254). Accessed: January 29, 2018.
- Ehmann, H (1992). Encyclopedia of Australian animals: reptiles. Angus and Robertson, Sydney. p395
- Gow, G. R. and Swanson, S. (1977). Snakes and Lizards of Australia. Angus and Robertson Publishers, Sydney. P 69.

- Hobson, R. (2012a). 'Dunmall's Snake,' in Queensland's threatened animals. eds. L. K. Curtis, A. J. Dennis, K. R. McDonald, P. M. Kyne and S. J. S. Debus, CSIRO Publishing, Collingwood. pp. 243-244.
- Richardson, R. (2006). Queensland Brigalow Belt Reptile Recovery Plan 2008 – 2012. Report to the Department of the Environment, Water, Heritage and the Arts, Canberra. WWF-Australia, Brisbane.
- Shine, R. (1981). Ecology of Australian Elapid Snakes of the Genera *Furina* and *Glyphodon*. *Journal of Herpetology*. 15. 219-224.
- Stephenson, G. and Schmida, G. 2008. A second record of the elapid snake *Furina dunmalli* from New South Wales. *Herpetofauna* 38, 22-23.
- Wilson, S. (2015). *A Field Guide to the Reptiles of Queensland*. Second Edition. Reed New Holland Publishers Pty Ltd, Sydney
- Wilson, S. and Swan, G. (2013). *A complete guide to reptiles of Australia*. Fourth Edition. New Holland Publishers, Sydney.



## **Grey Snake (*Hemiaspis damelii*)**

### Status

Endangered (NC Act)

### Distribution and Habitat

Grey snakes occur throughout the Brigalow Belt, from coastal districts near Rockhampton, south-east to the Lockyer Valley in South East Queensland (Wilson 2015).

Grey snakes inhabit dry eucalypt forest and pasture (Covacevich and Wilson 1995), favouring cracking, flood-prone soils along floodplains and near watercourses within the Brigalow Belt (Hobson 2002; Wilson 2015).

### Ecology

Grey Snakes are nocturnal frog specialists (Wilson and Swan 2013), sheltering during the day under fallen logs, within soil cracks and down in animal burrows. They are known to give birth to up to 10 live young (Covacevich and Wilson 1995), but little else is known of their breeding biology.

### Known Threats to the Species

This species is threatened by habitat loss, habitat degradation and fragmentation. Existing habitats and populations are under threat from agriculture and urban development (Eyre et al. 1997), as well as mining activities and the loss of waterways or wetlands. In addition, ingestion of cane toads and subsequent death from poisoning pose a threat to the species.

### Rule(s) for Habitat Mapping:

1. The species could occur throughout the entire off-tenement area.
2. All remnant vegetation where surface water could collect provides potential habitat for these species. In particular, vegetation on Landzones 3, and 4 should be classed as "Core Habitat Possible". In addition, the following RE's have clay soils, gilgai's or are likely to be subject to temporal ponding and should also be "Core Habitat Possible"; 11.9.5.
3. Any derived Grasslands, which occur in alluvial floodplains, are mapped as "Core Habitat Possible".
4. Larger contiguous areas of RE's 11.5.1, 11.5.1a, 11.5.20, and 11.5.21, or where these are immediately adjacent Core Habitat Possible, are included as "General Habitat".
5. Artificial waterbodies are mapped as "General Habitat".
6. All remnant vegetation, non-remnant vegetation, regrowth or cleared land within 1km of a recent (1980+), accurate ( $\pm 500\text{m}$ ) record is classed as "Core Habitat Known".
7. Regrowth be classed according to its parent regional ecosystem.
8. Cleared farmland or tilled crops are mapped as "Absence Suspected".

### Specific Map Modifications

None.

### Mapping Confidence

This species may occur in a number of habitats, including artificial grazing land. Predicting its occurrence is therefore difficult based on RE mapping. The habitat map for this species is moderately accurate.

### References

- Covacevich, J. and Wilson, S. (1995). Land Snakes. In: M Ryan (ed.), Wildlife of Greater Brisbane. Queensland Museum, Brisbane. p209
- Eyre, T. J. and Krieger, G. and Venz, M. and Haseler, M. and Hines, B. and Hannah, D. and Schulz, M. (1997). Systematic Vertebrate Fauna Survey Project: Stage I – Vertebrate Fauna Survey In The South East Queensland Bioregion. Forest Assessment Unit Queensland Department Of Environment. Garnett, S. T., Szabo, J. K. and Dutson, G. (2011). The action plan for Australian birds 2010. CSIRO Publishing, Collingwood.
- Hobson, R. (2002). Vertebrate Fauna Survey of Remnant Native Grasslands of the Eastern Darling Downs. Queensland Parks and Wildlife Service, Toowoomba.
- Wilson, S. (2015). A Field Guide to the Reptiles of Queensland. Second Edition. Reed New Holland Publishers Pty Ltd, Sydney.
- Wilson, S. and Swan, G. (2013). A complete guide to reptiles of Australia. Fourth Edition. New Holland Publishers, Sydney.

## **Glossy Black-Cockatoo (*Calyptorhynchus lathamii*)**

### Status

Vulnerable (NC Act)

### Distribution and Habitat

Glossy Black-Cockatoos (*Calyptorhynchus lathamii*) have a patchy distribution along the east coast and ranges south from near the Paluma Range to Gippsland in Victoria. An isolated population is located on Kangaroo Island in South Australia. They are uncommon and declining, especially in the south-western parts of its range, and are now extinct in mainland South Australia (Garnett *et al.* 2011). There has been concern for the status of Glossy Black-Cockatoos in the Southern Downs due to the loss of feeding and nesting resources (EPA 2003).

Birds inhabit woodlands and forests that contain abundant *Allocasuarina* spp. and abundant large hollows suitable for nesting. Many populations are restricted to remnant vegetation within hills and gullies surrounded by agricultural land (Higgins 1999); however, some populations move through artificial landscapes such as semi-urban parks, gardens and golf courses to access favoured food resources (Higgins 1999, M. Sanders pers. obs.). Groups are never far from waterbodies, which are visited daily. Being highly mobile, birds may travel considerable distances to isolated fragments in search of food. Advanced regrowth may also provide some foraging opportunity.

### Ecology

Typically encountered in small family parties, Glossy Black-Cockatoos are dietary specialists, feeding exclusively on the seeds of *Allocasuarina* and *Casuarina* spp. Favoured species include *A. torulosa*, *A. littoralis*, *A. luehmannii*, *A. distyla*, *A. diminuta*, *A. gymnanthera* and *A. verticillata* (Chapman 2007). It is poorly documented, but Glossy Black-Cockatoos also feed on *A. inophloia* in and around the Kumberilla to Inglewood area (M. Sanders pers. obs.).

Observations of the species feeding on other resources (e.g., *Callitris* and *Banksia* spp.) are likely to represent food switching during periods of poor *Allocasuarina* cone production (Chapman 2007). It is unclear if the use of *A. inophloia* by local populations reflect food switching, or if local populations rely on stands of *A. inophloia*. However, given the abundance of orts (feeding signs) in some locations, and their repeated observation over consecutive years, the latter seems plausible.

Birds show a preference for productive trees (e.g., higher seed/cone weight ratio), notwithstanding the influence of other factors such as distance from water or breeding hollows (Clout 1989; Pepper *et al.* 2000; Crowley and Garnett 2001; Cameron and Cunningham 2006; Chapman and Paton 2006; Chapman 2007). Stands of *Allocasuarina* spp. are therefore not of uniform value, and the loss of individual stands or trees may have disproportionate impacts.

The production of cones by *Allocasuarina* spp. closely tracks rainfall (Cameron 2006), and hence the availability of resources for resident Glossy Black-Cockatoos fluctuate between years. While resources may be sufficient to support existing birds, drought is likely to reduce breeding success (Cameron 2009).

Pairs breed during winter, mainly from April to July, although breeding has been recorded as late as August or as early as March (Beruldsen 2003). Nests are located in a large vertical hollow extending one or two meters deep. Hollows may be reused over many years (Beruldsen 2003). Females incubate and care for the young alone, but are regularly attended and fed by the male. Only one egg is produced, which hatches in about 30 days. Once hatched the chick fledges in around 60 days, but remains with its parents and is fed for another three months (Garnett et al. 1999).

### Known Threats to the Species

Threats to Glossy Black-Cockatoo populations include:

- Clearing of habitat remains a serious threat. Previous clearing has reduced the species' range in the south and west of the Great Dividing Range (Garnett and Crowley 2000),
- Fire can reduce or remove suitable feed trees from large areas for several years and, if followed by grazing, prevent regeneration of previous habitats.,
- Fragmentation of habitats may also result in an increase in predation of nestlings and eggs or alternatively result in higher competition for hollows (Downes et al. 1997). This threat may be particularly severe where species adapted to altered or open habitats are abundant. These 'edge' species may include Common Brushtail Possum (*Trichosurus vulpecula*), Little Corella (*Cacatua sanguinea*), Galah (*Eolophus roseicapilla*) and Sulphur-crested Cockatoo (*Cacatua galerita*). By out-competing cockatoos for nest hollows, these predators and/or competitors can significantly reduce recruitment of Glossy Black-Cockatoos (Garnett et al. 1999),
- Prolonged and severe drought can significantly reduce *Allocasuarina* cone production, reducing feeding resources and therefore breeding success. Global climate change may therefore negatively impact the species on a broad scale, particularly on the western slopes of the Great Divide (Cameron 2009), and
- The loss of suitable hollow-bearing trees through processes such as fire or logging (Cameron 2006).

### Rule(s) for Habitat Mapping:

1. The species could occur throughout the entire off-tenement area.
2. Regional Ecosystems containing *Casuarina cristata* (11.3.1, 11.3.17, 11.4.3, 11.4.3a, 11.9.5) and *Allocasuarina inophloia* (11.5.4) are classed as "Core Habitat Possible". South of the Warrego Highway areas of RE 11.7.4 may also have *Allocasuarina littoralis* and have been mapped as "Core Habitat Possible".
3. Regrowth of the above RE's, which could contain larger trees with suitable foraging resources, are mapped as "Core Habitat Possible".
4. Core Habitat Possible and General Habitat within 2km of a recent (1980+), accurate ( $\pm$  500m) record is classed as "Core Habitat Known".
5. All remaining Regional Ecosystems are classed "Absence Suspected".

### Specific Map Modifications

Regional Ecosystem 11.3.27d on 130DY762 and 93DY473 has been designated as Core Habitat Known for Glossy Black Cockatoo due to the presence of feeding remains (orts) under scattered large *Allocasuarina cristata*. The presence of these trees in this community is probably due to proximity of RE 11.4.3, where *A. cristata* was common.

### Mapping Confidence

Within the off-tenement area Core Habitat Possible accurately predicts the presence of *Allocasuarina* foraging resources, though it is acknowledged that individual trees can be scattered throughout remnant vegetation or modified landscapes.

General Habitat will be an overestimate as areas of suitable regrowth vegetation (mapped as "General Habitat") will not contain trees of sufficient size to attract foraging birds.

Nests are located in large tree hollows, usually in proximity to foraging resources. Predicting where suitable nest trees might occur is difficult and no attempt has been made to capture possible nest areas in the mapping product.

A supply of water is also important for Glossy Black-cockatoo populations, and suitable locations which may attract birds are likely to be scattered throughout areas of vegetation not mapped.

### References

- Beruldsen, G (2003). Australian birds, their nests and eggs. Phoenix Offset, China. pp240-241.
- Cameron, M. (2006). Distribution and cone production in *Allocasuarina diminuta* and *A. gymnanthera* (Casuarinaceae) in central New South Wales. *Rangeland Journal* 28. 153-161.
- Cameron, M. (2009). The influence of climate on Glossy Black-Cockatoo reproduction. *Pacific Conservation Biology* 15. 65-71.
- Cameron, M. and Cunningham, R. B. (2006). Habitat selection and multiple spatial scales by foraging Glossy Black-Cockatoos. *Austral Ecology* 31. 597-607.
- Clout, M (1989). Foraging behaviour of Glossy Black-Cockatoos. *Australian Wildlife Research* 16. 467-473.
- Chapman, T. F. (2007). Foods of the Glossy Black-Cockatoo *Calyptorhynchus lathami*. *Australian Field Ornithology* 24. 30-36.
- Chapman, T. F. and Paton, D. C. (2006). Aspects of Drooping Sheoaks (*Allocasuarina verticillata*) that influence Glossy Black-Cockatoo (*Calyptorhynchus lathami halmaturinus*) foraging on Kangaroo Island. *Emu* 106. 163–168.
- Crowley, GM and Garnett, ST (2001). Food value and tree selection by Glossy Black-Cockatoos *Calyptorhynchus lathami*. *Austral Ecology* 26. 116-126.
- EPA (2003). BPA BRB South Fauna Expert Panel in Brigalow Belt South Biodiversity Planning Assessment. EPA. Brisbane.

- 
- Garnett, S. T., Szabo, J. K. and Dutson, G. (2011). The action plan for Australian birds 2010. *CSIRO Publishing*, Collingwood.
- Higgins, PJ (ed.) (1999). Handbook of Australian, New Zealand and Antarctic birds, Vol 4, Parrots to dollarbird. Oxford University Press, Melbourne. Pp52-65.
- Pepper, J.W. (2000). Foraging ecology of the South Australian Glossy Black-Cockatoo (*Calyptorhynchus lathami halmaturinus*). *Austral Ecology*. 25:16-24.

## **Painted Honeyeater (*Grantiella picta*)**

### Status

Vulnerable (NC Act); Vulnerable (EPBC Act)

### Distribution and Habitat

Endemic to Australia, the Painted Honeyeater (*Grantiella picta*) may be found from the eastern section of the Northern Territory to Victoria and southern regions of South Australia (Pizzey and Knight 2007). Rare in the Northern Territory, they are widespread throughout Queensland, absent only from Cape York and high rainfall areas.

Painted Honeyeaters occur mainly in dry open woodlands and forests, particularly box-ironbark woodlands. They may also be located in riparian forest, on plains with scattered eucalypts, and in remnant trees on farmland. Their occurrence is strongly associated with mistletoe, on which they feed (Higgins et al. 2001) and fragmented or disturbed *Acacia* communities often have the highest density of Mistletoe. More advanced stands of *Acacia* regrowth may also have abundant mistletoe.

### Ecology

Painted Honeyeaters feed almost exclusively on mistletoe fruit, but may also collect nectar and invertebrates (Oliver *et al.* 2003). Most foraging is undertaken within the canopy of trees (Higgins *et al.* 2001).

Nesting occurs during spring-summer (Sept.-Feb.), predominantly in the south-east of its range north to and around Brisbane. The breeding season coincides with warmer summer months, but actual breeding is cued in relation to the progression of mistletoe fruiting. This ensures that breeding is matched by peak resource availability, avoiding temporal variation inherent in unpredictable environments (Barea and Watson 2007).

Small, frail cup-shape nests with narrow sides are constructed in the outer foliage and branchlets of eucalypts, casuarinas and acacias. However, a disproportionately large number of nests are placed in mistletoe clumps in taller trees (Whitemore and Eller 1983; Beruldsen 2003; Barea 2008).

While not well understood, movement patterns are generally described as a north-south migration (Keast 1968). Populations move north during winter and return south of approximately 26° during spring-summer to breed (Higgins *et al.* 2001).

### Known Threats to the Species

Large areas of suitable woodland habitat have been extensively cleared throughout this species' range. However, increased mistletoe abundance in degraded woodlands and roadside reserves may have benefited the species and alleviated somewhat the impacts of broad-scale habitat loss (Higgins *et al.* 2001; Bowen et al. 2009).

### Rule(s) for Habitat Mapping:

1. The species could occur throughout the entire off-tenement area.
2. RE's 11.3.1, 11.3.17, 11.4.3, 11.4.3a and 11.9.5 (including 'disturbed' communities) are mapped as "Core Habitat Possible".

3. The above RE's and RE's 11.5.20 and 11.5.27 are mapped as "Core Habitat Known" around Lake Broadwater.
4. Regrowth RE 11.3.1, 11.3.17, 11.4.3, 11.4.3a, 11.9.5, and 'Regrowth Brigalow (>15yrs)' are mapped as "General Habitat".
5. All "Core Habitat Possible" within 2km of a recent (1980+), accurate ( $\pm$  500m) record is classed as "Core Habitat Known".
6. All remaining regional ecosystems and non-remnant areas are "Absence Suspected"

#### Specific Map Modifications

None.

#### Mapping Confidence

The presence of abundant mistletoe can only be accurately determined through field assessment, though it can be predicted to occur with moderate accuracy in areas of Core Habitat Possible. The mapped General habitat, to capture more advanced Acacia regrowth, is likely to over evaluate habitat extent and will have a low accuracy.

#### References

- Barea, L. M. (2008). Nest-site selection by the Painted Honeyeater (*Grantiella picta*), a mistletoe specialist. *Emu* 108. 213-220.
- Barea, L. P. and Watson, D. M. (2007). Temporal variation in food resources determines onset of breeding in an Australian mistletoe specialist. *Emu* 107. 203-209.
- Beruldsen, G (2003). Australian birds, their nests and eggs. Phoenix Offset, China. pp322
- Bowen, M. E., McAlpine, C. A., House, A. P. N. and Smith, G. C. (2009). Agricultural landscape modification increases the abundance of an important food resource: Mistletoes, birds and brigalow. *Biological Conservation* 142. 122-133.
- Higgins, PJ, Peter, JM and Steele, WK (eds) (2001). Handbook of Australian, New Zealand and Antarctic birds, Vol 5, Tyrant-flycatchers to chats. Oxford University Press, Melbourne. pp989-998
- Keast, A. (1968). Competitive interactions and the evolution of ecological niches as illustrated by the Australian honeyeater genus *Melithreptus* (Meliphagidae). *Evolution* 22. 762-784.
- Oliver, D. L., Chambers, M. A. and Parker, D. G. (2003). Habitat and resource selection of the Painted Honeyeater (*Grantiella picta*) on the northern floodplains region of New South Wales. *Emu* 103. 171-176.
- Pizzey, G. and Knight, F. (2007). The field guide to the birds of Australia. HarperCollins, Sydney.
- Whitemore, M. J. and Eller, C. M. (1983). Observations at a nest of Painted Honeyeaters. *Emu* 83. 199-202.



## **South-eastern long-eared Bat (*Nyctophilus corbeni*)**

### Status

Vulnerable (NC Act); Vulnerable (EPBC Act)

### Distribution and Habitat

The south-eastern long-eared bat (*Nyctophilus corbeni*) is largely restricted to the Murray-Darling Basin (Churchill 2008; Turbill et al. 2008), with its stronghold in the Pilliga forests of central New South Wales (Turbill and Ellis 2006). In Queensland, the species is mainly recorded in the southern areas of the Brigalow Belt (Reardon 2012). The distributional limits in Queensland are uncertain. McFarland et al. (1999) states that the species is found north to near Duaringa, and Venz et al. (2002) consider that the Dawson River area is at, or close to, its northern range limit. However, Parnaby (2009), in a taxonomic review of Australian greater long-eared bats previously known as *N. timoriensis*, states that the most northerly record of the species is from 80 km west of Taroom. It is unknown if possible misidentifications of the species have resulted in the uncertainty attached to its distribution.

The species is most common in box/ironbark/cypress pine woodland on sandy soils (Turbill and Ellis 2006; Churchill 2008; Turbill et al. 2008), though it also occurs in bullock (*Allocasuarina luehmannii*), brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*) communities (Turbill et al. 2008), dry sclerophyll forests with *Corymbia citriodora*, and semi-evergreen vine thickets. The species prefers areas with a distinct canopy and a dense understorey (Churchill 2008). Most records are from large tracts of vegetation, approximately 5000+ ha in size (e.g., Southwood National Park) (EPA 2008), although the species can be occasionally recorded from smaller vegetation tracts of 600 ha (e.g., Erringibba National Park). Field observations and published literature also suggests it may use riparian habitats, though these habitats may be more important for providing roosting sites (hollow-bearing trees) and water.

### Ecology

Little is known about the ecology of this species and most of what is known comes from research outside of Queensland (Reardon 2012). Roosting has been recorded in hollows of live trees, cracks in tree limbs, occasionally under exfoliating bark and even within foliage (Churchill 2008; Turbill et al. 2008; Reardon 2012).

With broad, short wings, the south-eastern long-eared bat is highly manoeuvrable and well-adapted to its cluttered habitat. They fly close to vegetation, often through the canopy and can drop suddenly to almost ground level after prey (Churchill 2008). Individuals are known to fly more than seven kilometres between roosts and foraging areas. Roosts may be changed frequently, each used for an average of 1.3 days in one study (Reardon 2012).

Mating occurs in autumn and winter. Females are able to store spermatozoa until ovulation and conception in early spring. Two young are usually born in late October to November and lactation continues until January (Turbill et al. 2008).

### Known Threats to the Species

The main threats the south-eastern long-eared bat are:

- Major habitat loss over a large part of its distribution, mostly clearing of brigalow (Reardon 2012),
- Degradation of habitat from grazing,
- Loss of hollows and larger trees from logging and fires (Turbill et al. 2008),
- Increased competition for hollows from other species, and
- Increased exposure to predators (Reardon 2012).

Survey data suggest that large, intact remnants of suitable habitat are required to support populations (Turbill and Ellis 2006; Turbill et al. 2008). With more than 75% of habitat cleared in some parts of its range, land clearing and fragmentation continue to threaten this species (Duncan et al. 1999). Increased competition for hollows is an example of a flow-on impact from fragmentation (Reardon 2012).

### Rule(s) for Habitat Mapping:

1. The species may occur throughout the entire off-tenement area.
2. Only remnant vegetation which contributes to significantly large contiguous vegetation patches (>500ha) is considered suitable. Within these larger continuous vegetation patches:
  - a. RE's 11.3.14, 11.3.25, 11.3.27d, 11.3.27f, 11.5.1, 11.5.1a, 11.5.4, and 11.5.21 are mapped as "Core Habitat Possible", and
  - b. RE's 11.3.1, 11.3.14, 11.3.17, 11.3.18, 11.3.2, 11.3.26, 11.4.3, 11.4.3a, 11.5.20, 11.7.2, 11.7.4, 11.7.6, 11.7.7, 11.9.7, and 11.9.5 are mapped as "General Habitat"
3. All "Core Habitat Possible" or "General Habitat" within 2km of a recent (1980+), accurate ( $\pm$  500m) record is classed as "Core Habitat Known".
4. All remaining remnant and non-remnant vegetation is mapped as "Absence Suspected".

### Specific Map Modifications

None

### Mapping Confidence

While identifying suitably large tracts of remnant vegetation is relatively easy, predicting where the species might occur within this vegetation is more complex. While those RE's listed as "Core Habitat Possible" accurately reflect the best areas of habitat, large tracts of "General Habitat" may have suitable structure and provide good habitat for the species. A precautionary approach would be to consider all areas of Core Habitat Possible *and* General Habitat as suitable.

While several RE's have been excluded as not suitable ("Absence Suspected") in the mapping product, their landscape position often contributes to patch integrity and they may therefore provide an important role in ensuring a populations persistence.

## References

- Churchill, S (1998). Australian bats. Reed New Holland, Sydney. pp 143-144.
- Duncan, A., Baker, G. B. and Montgomery, N. (1999). The Action Plan for Australian Bats. Environment Australia, Canberra. pp42-43.
- EPA (2008). BPA BRB South Fauna Expert Panel in Brigalow Belt South Biodiversity Planning Assessment. EPA. Brisbane.
- McFarland, D., Venz, M. and Reis, T. (1999). Priority Species Summaries. An Attachment to the Report: Terrestrial Vertebrate Fauna of the Brigalow Belt South Bioregion: Assessment and Analysis for Conservation Planning. Queensland Environmental Protection Agency, Brisbane.
- Parnaby, H. E. (2009). A taxonomic review of Australian Greater Long-eared Bats previously known as *Nyctophilus timoriensis* (Chiroptera: Vespertilionidae) and some associated taxa. Australian Zoologist 35, 39-81
- Reardon, T. (2012). 'South-eastern Long-eared Bat,' in Queensland's threatened animals. eds. L. K. Curtis, A. J. Dennis, K. R. McDonald, P. M. Kyne and S. J. S. Debus, CSIRO Publishing, Collingwood. pp. 386-387.
- Turbill, C. and Ellis, M. (2006). Distribution and abundance of the south-eastern form of the greater long-eared bat *Nyctophilus timoriensis*. Australian Mammalogy 28, 1-6
- Turbill, C., Lumsden, L. F. and Ford, G. I. (2008). 'South-eastern & Tasmanian Long-eared Bats *Nyctophilus* spp,' in The mammals of Australia, Third Edition. eds. S. Van Dyck, and R. Strahan, Reed New Holland, Sydney. pp. 527-528.
- Venz, M., Mathieson, M. and Schulz, M. (2002). Fauna of the Dawson River Floodplain. Queensland Parks and Wildlife Service, Brisbane.

## **Greater Glider (*Petauroides volans*)**

### Status

Vulnerable (EPBC Act)

### Distribution and Habitat

The Greater Glider (*Petauroides volans*) is the largest gliding possum in Australia. Its distribution extends from the Windsor Tableland in north Queensland, south to Wombat State Forest in central Victoria (Woinarski et al. 2014). Inland isolated subpopulations are also known from the Gregory Range (west of Townsville) (Winter et al. 2004), and another in the Einasleigh Uplands bioregion of Queensland (Vanderduys et al. 2012).

The species is predominately restricted to eucalypt forests and woodlands. Greater gliders occur in highest abundance in taller, montane, moist eucalypt forests with larger, relatively old trees and abundant hollows (Andrews et al. 1994; Kavanagh 2000; Eyre 2004; van der Ree *et al.* 2004; Vanderduys et al. 2012). In areas west of the Great Dividing Range, they are found in low woodlands (McKay 2008). The species prefers forests with a diverse range of eucalypt species, due to seasonal variation in its favoured tree species (usually one or two species of eucalypt in any particular area) (Kavanagh 1984). Even in suitable habitat, the distribution may be patchy (Kavanagh 2000).

### Ecology

The species is an arboreal nocturnal marsupial which is primarily folivorous, foraging on eucalypt leaves and occasionally flowers (Kehl and Borsboom 1984; Kavanagh and Lambert 1990; van der Ree et al., 2004). It shelters during the day in large tree hollows (Henry 1984; Kehl and Borsboom 1984; Lindenmayer et al., 1991; Smith et al., 2007; Goldingay 2012) and its abundance is often linked to hollow density (Andrews et al. 1994). Research has shown that in southern Queensland, the species require at least 2–4 live den trees for every 2 ha of suitable forest habitat (Eyre 2002).

Home ranges are usually 1-4ha in size (Henry 1984; Kehl and Borsboom 1984; Comport et al. 1996; Gibbons and Lindenmayer 2002; Pope et al. 2005), however in lower productivity forest and more open woodland habitats home ranges can be up to 16 ha (Eyre 2004; Smith et al. 2007). Males have a larger home range size than females and sexes usually share a den when the breeding season commences (Kavanagh and Wheeler 2004; Pope et al. 2005; McKay 2008).

Females give birth to only one young from March to June. Juveniles emerge from the pouch when three to four months old and become independent at around nine months. However, greater gliders do not reach their sexual maturity and start breeding until their second year (Tyndale-Biscoe and Smith 1969; McKay 2008). It is estimated that the species can live up to 15 years (Harris and Maloney 2010).

### Known Threats to the Species

The main threats to the greater glider are:

- Major habitat loss and fragmentation, mostly through clearing, clearfell logging and the loss of senescent trees due to prescribed fire regimes (Eyre 2006; Lindenmayer et al., 2000; Taylor and Goldingay 2009),
- Inappropriate fire regimes (Lindenmayer et al. 2013),
- Effects from climate change such as range contraction (particularly in northern parts of its range) and declines in the health of eucalypt trees (Kearney et al. 2010; Matusick et al. 2013),
- Hyper-predation by owls (McKay 2008; Bilney et al. 2010; Lindenmayer et al. 2011), and
- Increased competition for hollows from other species (e.g. sulphur-crested cockatoos).

### Rule(s) for Habitat Mapping:

1. The species may occur throughout the entire off-tenement area. "Core Habitat Possible" includes RE's 11.3.4, 11.3.25 and 11.3.26.
2. Patches of RE 11.3.2, 11.3.3, 11.3.14, 11.3.17, 11.3.18 and 11.3.26 immediately adjacent the above RE's are mapped as "General Habitat".
3. All Core Habitat Possible within 1km of a recent (1980+), accurate ( $\pm$  500m) record is classed as "Core Habitat Known".
4. All remaining remnant and non-remnant vegetation is mapped as "Absence Suspected".

### Specific Map Modifications

None.

### Mapping Confidence

Important habitat characteristics for this species are well understood and can be matched to regional ecosystem descriptions. The mapping is considered to be highly accurate.

### References

- Andrews, S. P., Gration, G., Quin, D., & Smith, A. P. (1994). Description and assessment of forestry impacts on fauna of the Urbenville Forestry Management Area. Report for State Forests of New South Wales Austeco Environmental Consultants, Armidale.
- Bilney, R., Cooke, R. & White, J. (2010). Underestimated and severe: Small mammal decline from the forests of south-eastern Australia since European settlement, as revealed by a top-order predator. *Biological Conservation* 143, 52-59.
- Comport, S. S., Ward, S. J., & Foley, W. J. (1996). Home ranges, time budgets and food tree use in a high density tropical population of greater gliders, *Petauroides volans minor* (Pseudocheiridae: Marsupialia). *Wildlife Research* 23, 401-419.
- Eyre, T. J. (2002). Habitat preferences and management of large gliding possums in southern Queensland. Ph.D. thesis, Southern Cross University, Lismore.

- Eyre, T. J. (2004). Distribution and conservation status of the possums and gliders of southern Queensland. In *The Biology of Australian Possums and Gliders* (eds R. L. Goldingay & S. M. Jackson), pp. 1-25. Surrey Beatty & Sons, Chipping Norton
- Eyre, T. J. (2006). Regional habitat selection by large gliding possums at forest stand and landscape scales in southern Queensland, Australia. I. Greater Glider (*Petauroides volans*). *Forest Ecology and Management* 235, 270-282.
- Gibbons, P., & Lindenmayer, D. B. (2002). *Tree hollows and wildlife conservation in Australia* CSIRO Publishing, Collingwood.
- Goldingay, R. L. (2012). Characteristics of tree hollows used by Australian arboreal and scansorial mammals. *Australian Journal of Zoology* 59, 277-294.
- Harris, J. M., & Maloney, S. (2010). *Petauroides volans* (Diprodontia:Pseudocheiridae). *Mammalian Species* 42, 207-219.
- Henry, S. R. (1984). Social organisation of the greater glider (*Petauroides volans*) in Victoria. In *Possums and Gliders* (eds A. P. Smith & I. D. Hume), pp. 221-228. Surrey Beatty and Sons, Chipping Norton.
- Kavanagh, R. P. (1984). Seasonal changes in habitat use by gliders and possums in southeastern New South Wales. In *Possums and Gliders* (eds A. P. Smith & I. D. Hume), pp. 527-543. Surrey Beatty and Sons, Chipping Norton.
- Kavanagh, R. P. (2000). Effects of variable-intensity logging and the influence of habitat variables on the distribution of the Greater Glider *Petauroides volans* in montane forest, southeastern New South Wales. *Pacific Conservation Biology* 6, 18-30.
- Kavanagh, R. P., & Lambert, M. (1990). Food selection by the greater glider: is foliar nitrogen a determinant of habitat quality? *Australian Wildlife Research* 17, 285-299.
- Kavanagh, R. P., & Wheeler, R. J. (2004). Home range of the greater glider *Petauroides volans* in tall montane forest of southeastern New South Wales, and changes following logging. In *The Biology of Australian Possums and Gliders* (eds R. L. Goldingay & S. M. Jackson), pp. 413-425. Surrey Beatty and Sons, Sydney.
- Kearney, M. R., Wintle, B. A., & Porter, W. P. (2010). Correlative and mechanistic models of species distribution provide congruent forecasts under climate change. *Conservation Letters* 3, 203-213.
- Kehl, J., & Borsboom, A. (1984). Home range, den tree use and activity patterns in the greater glider (*Petauroides volans*). In *Possums and Gliders* (eds. A. P. Smith & I. D. Hume), pp. 229-236. Surrey Beatty and Sons, Chipping Norton.
- Lindenmayer, D. B., Cunningham, R. B., Tanton, M. T., Smith, A. P., & Nix, H. A. (1991). Characteristics of hollow-bearing trees occupied by arboreal marsupials in the montane ash forests of the Central Highlands of Victoria, south-east Australia. *Forest Ecology and Management* 40, 289-308.
- Lindenmayer, D. B., Lacy, R. C. & Pope, M. L. (2000). Testing a simulation model for population viability analysis. *Ecological Applications* 10, 580-597.

- Lindenmayer, D. B., Wood, J. T., McBurney, L., MacGregor, C., Youngentob, K. & Banks, S. C. (2011). How to make a common species rare: a case against conservation complacency. *Biological Conservation* 144, 1663-1672.
- Lindenmayer, D.B., Blanchard, W., McBurney, L., Blair, D., Driscoll, D., Smith, A.L. & Gill, A.M. (2013) Fire severity and landscape context effects on arboreal marsupials. *Biological Conservation* 167, 137-148.
- Matusick, G., Ruthrof, K.K., Brouwers, N.C., Dell, B. & Hardy, G.E.StJ. (2013). Sudden forest canopy collapse corresponding with extreme drought and heat in a mediterranean-type eucalypt forest in southwestern Australia. *European Journal of Forest Research* 132(3), 497-510
- McKay, G. M. (2008). Greater Glider *Petauroides volans*. In *The Mammals of Australia*. Third edition. (Eds S. Van Dyck & R. Strahan), pp. 240-242. Reed New Holland, Sydney.
- Pope, M. L., Lindenmayer, D. B., & Cunningham, R. B. (2005). Patch use by the greater glider (*Petauroides volans*) in a fragmented forest ecosystem. I. Home range size and movements. *Wildlife Research* 31, 559-568.
- Smith, G. C., Mathieson, M., & Hogan, L. (2007). Home range and habitat use of a low-density population of Greater Glider, *Petauroides volans* (Pseudocheiridae: Marsupialia), in a hollow-limiting environment. *Wildlife Research* 34, 472-483.
- Tyndale-Biscoe, C. H., & Smith, R. F. C. (1969). Studies on the marsupial glider, *Schoinobates volans* (Kerr). II. Population structure and regulatory mechanisms. *Journal of Animal Ecology* 38, 637-650.
- van der Ree, R., Ward, S. J., & Handasyde, K. A. (2004). Distribution and conservation status of possums and gliders in Victoria. In *The Biology of Australian Possums and Gliders* (eds R. L. Goldingay & S. M. Jackson), pp. 91-110. Surrey Beatty and Sons, Sydney.
- Vanderduys, E. P., Kutt, A. S., & Kemp, J. E. (2012). Upland savannas: the vertebrate fauna of largely unknown but significant habitat in north-eastern Queensland. *Australian Zoologist* 36, 59-74.
- Winter, J. W., Dillewaard, H. A., Williams, S. E., & Bolitho, E. E. (2004). Possums and gliders of north Queensland: distribution and conservation status. In *The Biology of Australian Possums and Gliders* (eds R. L. Goldingay & S. M. Jackson.), pp. 26-50. Surrey Beatty and Sons, Sydney.
- Woinarski, J. C. Z., Burbidge, A. A., & Harrison, P. L. (2014). *The Action Plan for Australian Mammals 2012*. CSIRO Publishing, Collingwood.

## **Koala (*Phascolarctos cinereus*)**

### Status

Vulnerable (NC Act); Vulnerable (EPBC Act)

### Distribution and Habitat

Endemic to eastern Australia, the Koala is a solitary species that is widespread across coastal and inland areas from Cooktown, Queensland to the Mt. Lofty ranges, South Australia (Martin et al. 2008). Restricted to altitudes below 800m elevation (Munks et al. 1996),

Koalas occur in a diversity of habitats including temperate, sub-tropical and tropical forest, woodland and semi-arid communities, and sclerophyll forest, on foothills, plains and in coastal areas (Martin and Handasyde 1999; Martin et al. 2008). Koalas on the western side of the Great Dividing Range at the western edges of their range are often associated with water courses though are not restricted to them (Melzer et al. 2000; Sullivan et al. 2003). Favoured feed tree species in these areas include *E. camaldulensis*, *E. coolabah* and *Eucalyptus populnea*.

Koalas have been translocated into a range of areas where they did not occur historically, such as Magnetic, Kangaroo and Phillip Island's.

### Ecology

Koalas are well known to have a preference for eucalypt trees as a food source, though not all eucalypts species are equal and diet varies between regions. Although an arboreal species, preferences for individual trees and the distances between feed trees forces individuals to the ground, this is when they are most vulnerable to predation and human-induced mortalities (Hindell et al. 1985; Martin 1985).

Koalas are not strongly territorial and home ranges will overlap. Home ranges vary in size from 1-2 hectares in optimum habitat, and up to 135 hectares in semi-arid regions (Ellis et al. 2002; Martin et al. 2008). Movements are often as short as the distance between feed trees, however dispersing individuals will move over larger distances. Established individuals have been known to make exploratory movements over larger distances before returning to home ranges (Dique 2003).

The breeding season occurs between October and May with females producing up to one offspring per year (Martin et al. 2008). Juveniles become independent from one year of age with males living for over 12 years and females living for over 15 years (Martin and Handasyde 1999). Breeding occurs from two years of age, and is often determined by the establishment of a male hierarchy as males become vocal and fiercely fight for females (Martin et al. 2008).

### Known Threats to the Species

Significant threats to Koalas include loss and fragmentation of habitat, vehicle strike, and predation by pet dogs (*Canis lupus familiaris*), whilst wildfire, disease, drought and extreme heat can also be damaging to both individual and population health.

Koalas inhabiting the north-western portion of their range are sparse and insufficiently studied. Although threats are similar to those in areas such as South-east Queensland where



more research has been undertaken on Koala populations, it is likely that the severity of some threats is different. In particular, threats such as drought, and extreme heat events, may be more frequent and severe (Munks et al. 1996; Sullivan et al. 2003).

#### Rule(s) for Habitat Mapping:

1. The species may occur throughout the entire off-tenement area.
2. RE's 11.3.2, 11.3.3, 11.3.4, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.3.26, 11.3.27d and 11.3.27f are mapped as "Core Habitat Possible".
3. RE's 11.4.3, 11.4.3a, 11.5.1, 11.5.1a, 11.5.4, 11.5.20, 11.7.2, 11.7.4, 11.7.6, 11.7.7, 11.9.2 and 11.9.7 are mapped as "General Habitat".
4. Regrowth and disturbed vegetation should be mapped as per their parent RE.
5. All Core Habitat Possible and General Habitat within 1km of a recent (1980+), accurate ( $\pm 500\text{m}$ ) record is classed as "Core Habitat Known".
6. All remaining remnant vegetation is mapped as "Absence Suspected".

#### Mapping Confidence

Important habitat for this species is reasonably well understood and can be matched to regional ecosystem descriptions. Core Habitat Possible is likely to closely reflect the species distribution. However, field studies from this work frequently found Koala's in habitats not previously considered high value (mapped as General Habitat), and as such these areas may be more important for the local population than previously understood.

#### References

- Dique, D.S., Thompson, J., Preece, H.J., de Villiers, D.L., Carrick, F.N. (2003) Dispersal patterns in a regional koala population in south east Queensland, *Wildlife Research*, 30, 281-290.
- Ellis, W.A.H., Melzer, A., Carrick, F.N., Hasegawa, M. (2002) Tree use, diet and home range of the Koala (*Phascolarctos cinereus*) at Blair Athol, central Queensland. *Wildlife Research*. 29:303-311.
- Hindell, M.A., Handasyde, K.A. Lee, A.K. (1985) Tree species selection by free-fanging Koala populations. Victoria. *Australian Wildlife Research*. 12:137-144.
- Martin, R., Handasyde, K. (1999) *The Koala: Natural history, conservation and management*. Sydney, NSW: UNSW Press.
- Martin, R.W. (1985). Overbrowsing, and decline of a population of the Koala, *Phascolarctos cinereus*, in Victoria.1. Food preference and food tree defoliation. *Australian Wildlife Research*. 12:355-365.
- Melzer, A., Carrick, F., Menkhorst, P., Lunney, D., John, B.S., (2000) Overview, critical assessment, and conservation implications of Koala distribution and abundance. *Conservation Biology*. 14:619-628.
- Munks, S.A., Corkrey, R., Foley, W.J. (1996) Characteristics of arboreal marsupial habitat in the semi-arid woodlands of northern Queensland. *Wildlife Research*. 23:185-195.

---

Sullivan, B.J., Baxter, G.S., Lisle, A.T. (2003) Low-density Koala (*Phascolarctos cinereus*) populations in the mulgalands of south-west Queensland. III. Broad-scale patterns of habitat use. *Wildlife Research*. 30:583-591.

# **Appendix C: GIS Package Updates**

Geodatabase Dataset	Contents	Notes
<b>Vegetation</b>		
Arrow Vegetation_24_Jan_2018 <b>(Replaces: Arrow_Vegetation)</b>	RE mapping, TEC mapping and Threatened species habitat mapping (Core Habitat Possible, General Habitat) for all Tenement and Off Tenement Surveys.	Primary vegetation mapping database which identifies vegetation type in terms of Regional Ecosystem, Threatened Ecological Community and Conservation Status under relevant state and federal legislation. Provides the basis for mapping of EVNT fauna habitats based on vegetation type.
<b>Core Habitat</b>		
Core_Habitat_Flora_Combined_25_1_2018 <b>(Replaces: Core_Habitat_Flora)</b>	Core Habitat Known for all possible, likely or present flora species for all Tenement and Off Tenement Surveys.	Overlaps the Threatened species mapping in Arrow Vegetation_24_Jan_2018 dataset but takes priority.
Core_Habitat_Fauna_Combined_25_1_2018 <b>(Replaces: Core_Habitat_Fauna)</b>	Core Habitat Known for all possible, likely or Present fauna species for all Tenement and Off Tenement Surveys.	Overlaps the Threatened species mapping in Arrow Vegetation_24_Jan_2018 dataset but takes priority.
<b>Ecological Survey Sites</b>		
Final_Flora_Survey_Sites_Jan_2018 <b>(Replaces; Final_Flora_Survey_Sites)</b>	Compilation of all Secondary, Tertiary, Quaternary and Observation sites collected in floristic ecology surveys commissioned by Arrow Energy since 2009.	Included records from Surat Gas Pipeline Assessments, EIS and Supplementary EIS assessments as well as late 2017 Off Tenement assessments
ESE_Survey_Sites	Location of fauna survey methods completed during current surveys (2016-17)	SGP advanced exploration project works

Geodatabase Dataset	Contents	Notes
Daandine_Trapping_Surveys	Location of fauna survey methods completed during Daandine fauna assessments (2014)	Ecosmart Ecology 2014.
SREIS_Trapping_Surveys	Location of fauna survey methods completed during Surat Gas Project supplementary EIS (2013).	3D Environmental (2013)
<b>EVNT_Flora_and_Fauna_Field_Records</b>		
EVNT_Fauna_Field_Records_Regional  <b>(Replaces; SGP_EVNT_Recs from Additional Datasets)</b>	EVNT Terrestrial Fauna records for the regional area from both database and field surveys.	Error vetted. Includes geo-referenced sightings and opportunistic records without coordinates. Where opportunistic records have been recorded without specific dates the first day of the survey has been attributed.
EVNT_Fauna_All_Records_Tenements  <b>(Replaces; EVNT_Fauna_Field_Records)</b>	Terrestrial fauna survey results collected Arrow commissioned field surveys in tenement areas plus database records.	Error vetted. Includes geo-referenced sightings and opportunistic records without coordinates. Where opportunistic records have been recorded without specific dates the first day of the survey has been attributed.
EVNT_Fauna_Off_Tenement_Dec_2017  <b>(Additional Data Set)</b>	EVNT fauna records for off tenement surveys completed in December 2017	Error vetted. Includes geo-referenced sightings and opportunistic records without coordinates.
EVNT_Flora_Field_Records_All_Surveys  <b>(Replaces; EVNT_Flora_Field_Records)</b>	Terrestrial flora survey results for both recent and historical collections in the SGP study area.	Includes EVNT records for all Arrow commissioned survey works from 2009 onwards plus Queensland Herbarium records within the SGP study area and Off Tenement Surveys.

Geodatabase Dataset	Contents	Notes
Herbreccs_SGP_25km_Buffer	Queensland Herbarium database records for EVNT flora species recorded within a 25+km buffer surrounding the SGP assessment area	Queensland Herbarium records within both the SGP and adjacent areas.
<b>Additional Datasets</b>		
Ecosmart_Ecology_Fauna_Records_All_Surveys)  (Additional Dataset)	All co-ordinate-based fauna records from Ecosmart Ecology Surveys including December 2017 Off Tenement Surveys.	Error vetted with georeferenced field locations
Ecosmart_Ecology_Plus_Database_Records_Tenements  (Replaces; ESE+DB_Reccs_SGP)	All co-ordinate based fauna records from both database sources and this work within the SGP.	No error vetting and duplicate records likely. Includes only geo-references sightings