

Annex A

EPBC Act Field Survey Methodology

Summary of the EPBC Act Green and Golden Bell Frog Survey requirements

A habitat assessment should be the first step in assessing green and golden bell frog habitat and/or presence. This should be followed up with targeted field survey for the species.

Where possible, surveys should include use of a nearby reference site. This reference site should be a site where green and golden bell frogs are known to occur and should be visited before the survey of the site of interest to confirm that green and golden bell frogs are active and calling on that particular night.

A.1 HABITAT ASSESSMENT

The following questions should be asked during habitat assessment to determine and support whether a site contains or is likely to contain suitable habitat for the green and golden bell frog: Is the site within the

- Expected range of the species?
- Are there records of the species within the local area/catchment?
- Does the site support potentially suitable habitat for the species?
- Are there other frog species on site? If so, what species?
- What vegetation occurs on and around the site?
- How close is the nearest water body?
- How many water bodies occur within 10 kilometres?
- Is there habitat connectivity (terrestrial or aquatic) between water bodies on site, and between on-site water bodies and those on neighbouring sites?
- Is there any evidence of disturbance on site?
- Has this habitat been modified as a result of previous development actions?
- Are water bodies infested with mosquito fish or other predatory species that prey on green and golden bell frogs?
- Are there other threats to green and golden bell frogs occurring on site

A.2

FIELD SURVEYS

Field surveys for the green and golden bell frog should be done either in conjunction with or after a habitat assessment and should be done:

- over a minimum of four nights to increase the detection rate
- between September and March, at the time of peak activity for the species
- during warm and windless weather conditions following rainfall, and
- using a combination of diurnal surveys for basking frogs, nocturnal spotlight surveys, call detection, call playback and tadpole surveys.

Where possible, surveys should include use of a nearby reference site. This reference site should be a site where green and golden bell frogs are known to occur and should be visited before the survey of the site of interest to confirm that green and golden bell frogs are active and calling on that particular night.

Small wetlands (less than 50 metres at greatest length) should be covered in a period of about one hour by searching banks and emergent vegetation. Larger wetlands (more than 50 metres) should be searched by sampling multiple units systematically. The multiple units should be stratified by some ecological feature, and sampling based on equitable sampling of each of the units. Green and golden bell frogs use a series of water bodies, not all of which will be permanently occupied. The presence of the species in neighbouring water bodies provides an indicator of the likely use of on site water bodies. Surveys should therefore try to include connected and surrounding suitable habitats during field surveys.

Table A.1 *Comparison of the DECC 2009 and EPBC Act Guidelines for assessing green and Golden Bell Frog*

Topic	EPBC	DECC
Use of a reference site	yes	yes
General surveying info	yes	no
Nocturnal searches methodology	no	yes
Call survey methodology	no	yes
Tadpole survey methodology	no	yes
Pitfall traps	no	Yes (brief)

Annex B

Targeted Green and Golden
Bell Frog (*Litoria aurea*)
Surveys: NRE No. 1 Colliery



**Targeted Green and Golden Bell
Frog (*Litoria aurea*) Surveys:
NRE No. 1 Colliery**

FINAL REPORT

May 2010

Wollongong:

8 Tate Street Wollongong 2500

Ph: (02) 4229 5222 Fax: (02) 4229 5500

email: wollongong@biosisresearch.com.au

Sydney:

18-20 Mandible Street, Alexandria, NSW 2015

Ph: (02) 9690 2777 Fax: (02) 9690 2577

email: sydney@biosisresearch.com.au

Melbourne:

38 Bertie Street Port Melbourne 3207

Ph: (03) 9646 9499 Fax: (03) 9646 9242

email: melbourne@biosisresearch.com.au

Canberra:

Unit 16 / 2 Yallourn Street, Fyshwick ACT 2609

Ph: (02) 6228 1599 Fax: (02) 6280 8752

email: canberra@biosisresearch.com.au

Ballarat:

449 Doveton Street North Ballarat 3350

Ph: (03) 5331 7000 Fax: (03) 5331 7033

email: ballarat@biosisresearch.com.au

Wangaratta:

26a Reid Street, Wangaratta

Ph: (03) 5721 9453 Fax: (03) 5721 9454

Email: Wangaratta@biosisresearch.com.au

Project no: s11659

Authors:

Michael Roberts

Review:

Brendan Ryan

Mapping:

Ashleigh Pritchard

DOCUMENT CONTROL SHEET

PROJECT	Targeted Green and Golden Bell Frog (<i>Litoria aurea</i>) Surveys at the Gujarat NRE Coking Coal Limited NRE No.1 Colliery, Russell Vale
----------------	---



BIOSIS PROJECT NO	S11659
--------------------------	--------

REPORT FOR	Gujarat NRE Coking Coal Limited
-------------------	---------------------------------

REPORT TITLE:	Targeted Green and Golden Bell Frog (<i>Litoria aurea</i>) Surveys: NRE No.1 Colliery
----------------------	---

AUTHOR(S):	Michael Roberts
-------------------	-----------------

REVISION	PREPARED	INTERNAL REVIEW	EXTERNAL REVIEW	AMENDED
Draft V1	Michael Roberts	Brendan Ryan	Danyil Skora/Chris Harvey (NRE)	13/05/2010
Final	Michael Roberts	Melanie Thomson		

REVISION	ISSUED	NAME	SIGNED
Draft	7/05/2010	Michael Roberts	
Final Draft	12/05/2010	Melanie Thomson	

ACKNOWLEDGMENTS

Biosis Research acknowledges the contribution of the following people and organisations in preparing this report:

- Danyil Skora, Don Jephcott and Kamlesh Prajapati (Gujarat NRE Coking Coal Limited)
- Melissa Karam (ERM)
- Melanie Thomson (Wollongong Resource Group Manager, Biosis Research)

ABBREVIATIONS AND COMMON TERMS

Biodiversity	The variety of biological life (plants and animals)
DECCW	NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Climate Change)
DEWHA	Department of the Environment, Water, Heritage and the Arts (formerly Department of Environment and Water Resources)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental Planning Instrument
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
Locality	10 km radius of Subject Site
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Study Area	Area where survey occurred (in this case Gujarat NRE Coking Coal Limited Russell Vale Pit Top, Russell Vale)
TSC Act	<i>Threatened Species Conservation Act 1995</i>
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

CONTENTS

1.0	INTRODUCTION	1
1.1	Green and Golden Bell Frog	1
2.0	METHODS	4
2.1	Contributors, qualifications and licences	4
2.2	Field Surveys	4
3.0	RESULTS	6
3.1	Description of habitat	6
3.2	Animal Species	6
4.0	CONCLUSIONS AND RECOMMENDATIONS	8

TABLES

<i>Table 1: Contributors, qualifications and their roles</i>	4
<i>Table 2: Survey techniques and survey effort</i>	4
<i>Table 3: Weather conditions immediately before and during the survey</i>	5
<i>Table 4: Amphibian species recorded during the field surveys</i>	7

FIGURES

<i>Figure 1: The location of the Study Area in a regional context</i>	2
<i>Figure 2: Location of previous Green and Golden Bell Frog records in the locality</i>	3

PLATES

<i>Plate 1: Aquatic vegetation within Dam 6</i>	6
---	---

1.0 INTRODUCTION

Biosis Research has been engaged by Gujarat NRE Coking Coal Limited to undertake targeted Green and Golden Bell Frog (*Litoria aurea*) surveys at Dam 6 located at their NRE No.1 Colliery, Russell Vale, in the Wollongong Local Government Area (LGA), herein referred to as the Study Area (Figure 1). Dam 6 has been used previously to supplement water usage at NRE No.1 Colliery, however for quite some time (i.e. since early 80's), the dam level has been fed only by rainfall.

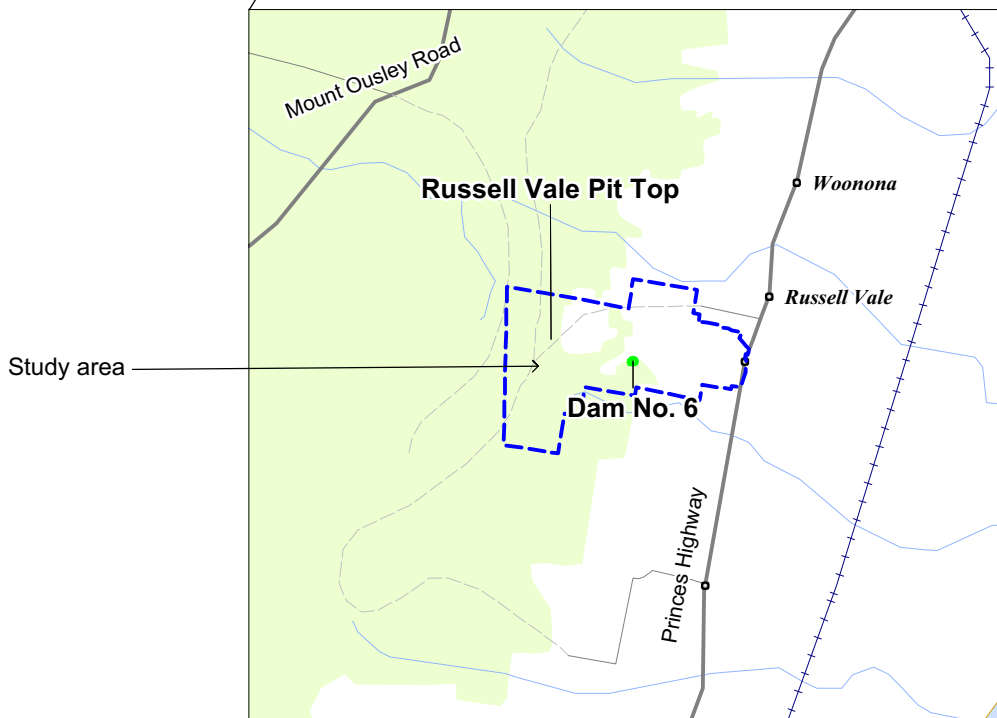
Gujarat NRE Coking Coal Limited (hereafter referred to as NRE) is currently seeking approval for the upgrade of surface facilities at the NRE Colliery and to facilitate part of this upgrade, it has been identified that Dam 6 will require de-commissioning. The removal of this dam will allow for an appropriately battered slope to be constructed above NRE's proposed re-alignment of Bellambi Gully via an open channel. This project requires approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Environmental Resources Management Australia Pty Ltd (ERM) has been commissioned by NRE to undertake an Environmental Assessment and prepare the associated report. As a component of the Environmental Assessment, ERM identified potential habitat for the Green and Golden Bell Frog (hereafter referred to as GGBF) at Dam 6. This species is listed as Endangered under the *Threatened Species Conservation Act 1995* (TSC Act) and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As such, a significance assessment in accordance with section 5A of the EP&A Act and the *EPBC Act - Principal Significant Impact Guidelines 1.1. Matters of National Environmental Significance* for assessment under the EPBC Act is required for the proposal.

This report provides the results of targeted GGBF surveys at Dam 6 and aims to inform the aforementioned assessments that will undertaken by ERM.

1.1 Green and Golden Bell Frog

Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC (NSW Government 2009). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (NPWS 1999; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 6 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species (DEC 2005).

Previous records of GGBF within the locality are presented in Figure 2. The nearest record is approximately 650 m to the west of Dam 6 (recorded 19 November 1997 – Central CRA Survey Dataset) within the Study Area. This is suggestive that suitable dams located on the Colliery site could form part of a corridor for the GGBF in the locality.



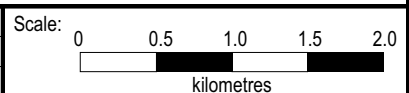
This product incorporates data which is copyright to the Commonwealth of Australia (c.2003-)

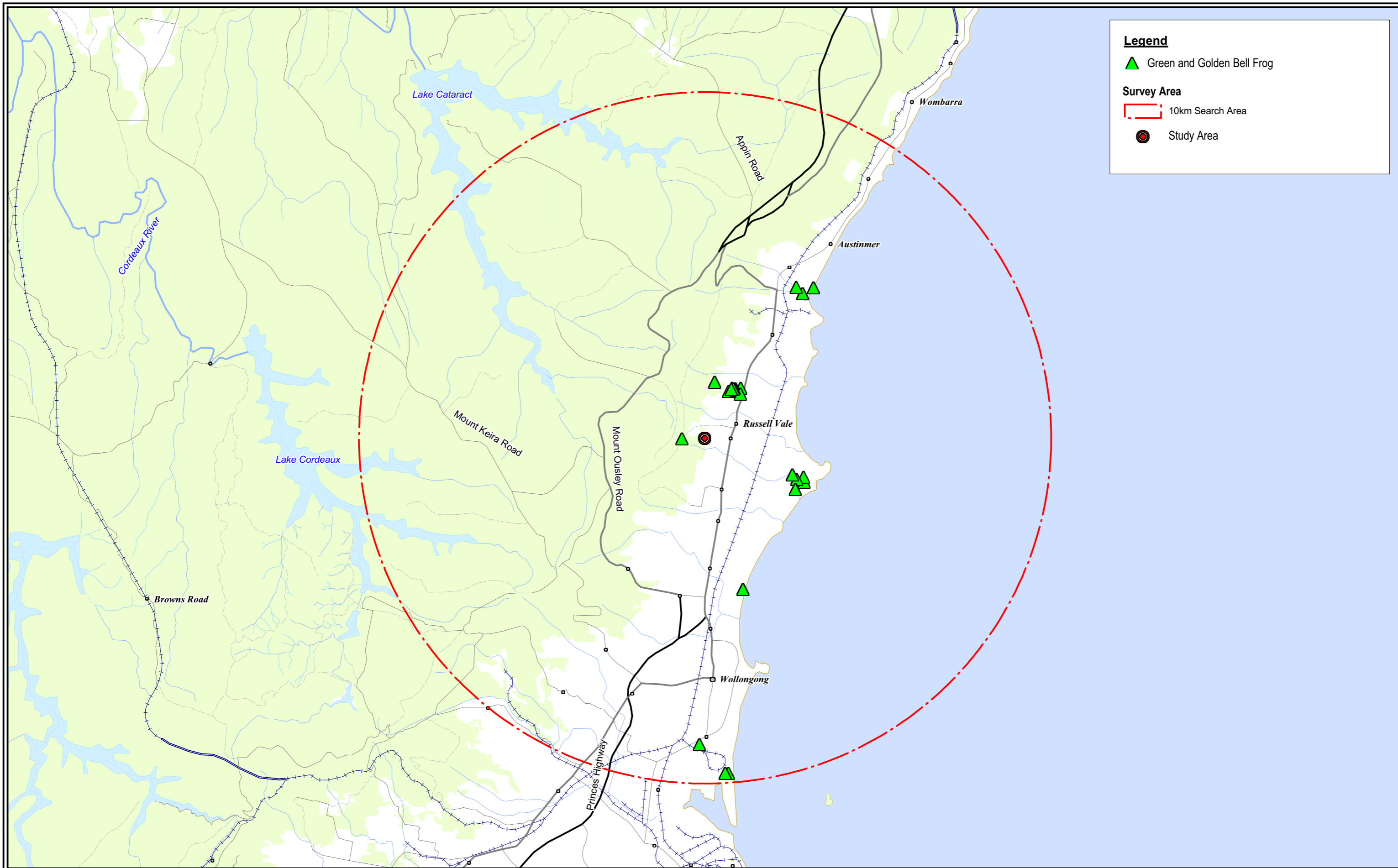


BIOSIS RESEARCH Pty. Ltd.
 8 Tate Street
 Wollongong
 NEW SOUTH WALES 2500

Figure 1: Location of the Study Area in a regional context

Date: 6 May 2010	Drawn by: ANP
File number: 11659	Checked by: MWR
Location: P:\11600s\11659\Mapping\11659_F1_Locality.WOR	





Legend

▲ Green and Golden Bell Frog

Survey Area

○ 10km Search Area

● Study Area

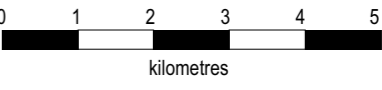


BIOSIS RESEARCH Pty. Ltd.
 8 Tate Street
 Wollongong
 NEW SOUTH WALES 2500

Figure 2 - Location of previous Green and Golden Bell Frog records in the locality

Date: 6 May 2010	Drawn by: ANP
File number: 11659	Checked by: MWR
Location: ..P:\11600s\11659\Mapping\11659 F2_Green and Golden Bell Frog.WOR	

Acknowledgements:
 Species data from DECCW/NPWS and Biosis Research Pty Ltd
 This product incorporates Data which is copyright to
 the Commonwealth of Australia (c.2003-)



Scale: 1:100,000 at A3
 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid of Australia, Zone 56




Figure 2

2.0 METHODS

The targeted GGBF survey included searches of databases and historical records in addition to a field survey of the Study Area. This section outlines the specific methods used during the survey.

2.1 Contributors, qualifications and licences

The contributors to the preparation of this report, their qualifications and roles are outlined in Table 1.

Table 1: Contributors, qualifications and their roles

Name	Qualification	Role
Michael Roberts	B. Env Sc (Hons)	Consultant Zoologist – field surveys, report preparation
Brendan Ryan	BSc MSc	Sydney Resource Group Manager and Senior Zoologist – report review

2.2 Field Surveys

Targeted GGBF surveys were carried out at Dam 6 and immediate surrounds between 4th and 6th of May 2010. The level of survey effort used during the survey was based on that described for GGBF in *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna (Amphibians)* (DECC 2009). Dam 6 was defined as small areas of habitat as it was less than 0.3 ha in size (DECC 2009). It should be noted that the most suitable time of year to survey this species is between August and February, when this species is known to be most active (DECC 2009). Thus, a precautionary approach has been utilised and the species was assumed to be present if suitable habitat was identified.

A combination of diurnal and nocturnal field techniques were utilised during the survey and these are described in Table 2.

Table 2: Survey techniques and survey effort

Survey technique	Time of day	Survey effort
Active searches of dam and surrounding vegetation	Diurnal	3 person hours over three (3) separate days
Active searches (spotlighting) of dam and surrounding vegetation	Nocturnal	3 person hours over three (3) separate nights
Call playback, listening and follow-up searches	Diurnal	1.5 person hours over three (3) separate days

Call playback, listening and follow-up spotlighting	Nocturnal	1.5 person hours over three (3) separate nights
Tadpole surveys	Opportunistic	Not applicable

Temperature, relative humidity and rainfall immediately before and during the survey are presented in Table 3.

Table 3: Weather conditions immediately before and during the survey

Date	Temperature (°C)		Relative Humidity at 3 pm	Rainfall (mm)
	Min	Max		
1/5/2010	15.5	21.6	77	0
2/5/2010	14.9	25.1	61	0
3/5/2010	15.9	21.4	79	0
4/5/2010	17	24.1	64	0
5/5/2010	16.7	21.3	36	0
6/5/2010	11.4	20.8	34	0.2

Notes_source: Bureau of Meteorology (2010) – temperature, humidity and rainfall data collected from Bellambi Weather Station. Survey dates are in bold.

3.0 RESULTS

3.1 Description of habitat

The aquatic habitat within Dam 6 consisted of approximately 60% vegetation cover and was moderately disturbed by surrounding landuses, including coal wash stockpiles, road ways and associated runoff. Dam 6 was dominated by *Typha domingensis* Narrow-leaved Cumbungi, *Schoenoplectus validus* and *Triglochin striata* Streaked Arrowgrass (Plate 1). The vegetation surrounding the dam comprised *Paspalum distichum* Water Couch, *Pennisetum clandestinum* Kikuyu, *Paspalum dilatatum* Paspalum, *Ageratina adenophora* Crofton Weed, *Bothriochloa macra* Red-leg Grass, *Setaria parviflora* Pigeon Grass, *Conyza* spp. Tall Fleabane and *Verbena bonariensis* Purpletop. Scattered shrubs surrounding the dam predominantly consisted of *Acacia longifolia* subsp. *longifolia* Sydney Golden Wattle.

Dam 6 would provide good quality habitat for GGBF.



Plate 1: Aquatic vegetation within Dam 6

3.2 Animal Species

There were no GGBF recorded during the field surveys. Incidental observations of other amphibian species utilising the Study Area during the field survey are listed in Table 4. The most abundant amphibian species recorded was the Eastern Common Froglet (*Crinia signifera*), followed by the Southern Brown Tree Frog (*Litoria ewingi*) and the Emerald

Spotted Tree Frog (*Litoria peroni*). Tadpoles of the Southern Brown Tree Frog were also recorded.

Table 4: Amphibian species recorded during the field surveys

Common Name	Scientific Name	Observation Type
Emerald Spotted Tree Frog	<i>Litoria peroni</i>	Observed, heard
Eastern Common Froglet	<i>Crinia signifera</i>	Heard
Striped Marsh Frog	<i>Limnodynastes peroni</i>	Heard
Verreaux's Tree Frog	<i>Litoria verreauxi</i>	Observed, heard
Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>	Heard
Southern Brown Tree Frog	<i>Litoria ewingi</i>	Observed (adults and tadpoles), heard
Eastern Dwarf Tree Frog	<i>Litoria fallax</i>	Heard

4.0 CONCLUSIONS AND RECOMMENDATIONS

This report provides the results of targeted GGBF surveys conducted at NRE. These results will be used to formulate assessments of significance for this species as required under the EP&A Act and the EPBC Act for the Part 3A application being sought by NRE.

Dam 6 was found to provide good quality habitat for GGBF due to the presence of healthy stands of Cumbungi, lack of any predatory fish and the availability of other key fauna habitat elements (NPWS 1999; White and Pyke 1996).

GGBF was not recorded during field surveys. However, Dam 6 was found to be occupied by six other species of amphibians, including Eastern Common Froglet, Emerald Spotted Tree Frog and Southern Brown Tree Frog. Tadpoles of the Southern Brown Tree Frog were also recorded during field surveys.

As a result of this survey occurring outside the most suitable time to investigate this species, the presence of good quality potential habitat provided by Dam 6 and nearby previous records within the Study Area, it could be assumed that GGBF may periodically, utilise the Study Area for the purposes of the assessments. Consequently, the following recommendations are made to inform the assessments of significance and the future operations of NRE:

- Targeted surveys should be conducted using the same techniques described in this report between August and February across the NRE Colliery to accurately determine the presence of the species and to determine the extent of their utilisation (e.g. breeding, foraging, over-winter sites) of the Study Area before any proposal might modify these environments;
- If present, determine whether GGBF move between the NRE Colliery and other surrounding properties (e.g. Russell Vale Golf Course) to establish the potential access/egress corridors that are utilised; and
- Assess the threats to the survival of GGBF across the Study Area.

Finally, should the GGBF be identified, a plan of management be developed to identify and outline the long term goals and objectives for the conservation of the species within the Study Area. This will be imperative as the GGBF is currently rare in the Illawarra region and any location where it occurs is of critical conservation significance.

Further to this, investigations for the utilisation of adjacent dams eg. Dam No.5, should be undertaken to determine their suitability for potential habitat for future translocation of the GGBF species.

REFERENCES

- DEC (2005). Green and Golden Bell Frog: Threatened Species Profile, <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10483>, Department of Environment and Conservation
- DECC (2009) 'Threatened species survey and assessment guidelines: Field survey methods for fauna - Amphibians.' Department of Environment and Climate Change NSW.
- NPWS (1999). Green and Golden Bell Frog: Threatened Species Information, http://www.nationalparks.nsw.gov.au/PDFs/tsprofile_green_golden_bell_frog.pdf, National Parks and Wildlife Service
- NSW Government (2009). BioNet, <http://www.bionet.nsw.gov.au/Area.cfm>, NSW Government
- White AW and Pyke GH (1996) Distribution and conservation status of the Green and Golden Bell Frog *Litoria aurea* in New South Wales. *Australian Zoologist* 30, 177-189.

Annex C

Additional Green and Golden
Bell Frog Surveys No.1
Colliery



**Additional Green and Golden
Bell Frog (*Litoria aurea*)
Surveys: NRE No. 1 Colliery**

FINAL REPORT

September 2010

Wollongong:

8 Tate Street Wollongong 2500

Ph: (02) 4229 5222 Fax: (02) 4229 5500

email: wollongong@biosisresearch.com.au

Sydney:

18-20 Mandible Street, Alexandria, NSW 2015

Ph: (02) 9690 2777 Fax: (02) 9690 2577

email: sydney@biosisresearch.com.au

Melbourne:

38 Bertie Street Port Melbourne 3207

Ph: (03) 9646 9499 Fax: (03) 9646 9242

email: melbourne@biosisresearch.com.au

Canberra:

Unit 16 / 2 Yallourn Street, Fyshwick ACT 2609

Ph: (02) 6228 1599 Fax: (02) 6280 8752

email: canberra@biosisresearch.com.au

Ballarat:

449 Doveton Street North Ballarat 3350

Ph: (03) 5331 7000 Fax: (03) 5331 7033

email: ballarat@biosisresearch.com.au

Wangaratta:

26a Reid Street, Wangaratta

Ph: (03) 5721 9453 Fax: (03) 5721 9454

Email: Wangaratta@biosisresearch.com.au

Project no: s12294

Authors:

Michael Roberts

Review:

Jennifer Charlton

Mapping:

Ashleigh Pritchard

DOCUMENT CONTROL SHEET

PROJECT	Green and Golden Bell Frog (<i>Litoria aurea</i>) Surveys at the Gujarat NRE Coking Coal Limited NRE No.1 Colliery, Russell Vale
----------------	--



BIOSIS PROJECT NO	S12294
--------------------------	--------

REPORT FOR	Gujarat NRE Coking Coal Limited
-------------------	---------------------------------

REPORT TITLE:	Additional Green and Golden Bell Frog (<i>Litoria aurea</i>) Surveys: NRE No.1 Colliery
----------------------	---

AUTHOR(S):	Michael Roberts
-------------------	-----------------

REVISION	PREPARED	INTERNAL REVIEW	EXTERNAL REVIEW	AMENDED
Draft V1	Michael Roberts	Jennifer Charlton	Danyil Skora/Chris Harvey (NRE)	22/9/2010
Final	Michael Roberts			22/09/2010

REVISION	ISSUED	NAME	SIGNED
Draft	20/09/2010	Michael Roberts	
Final	22/09/2010	Michael Roberts	

ACKNOWLEDGMENTS

Biosis Research acknowledges the contribution of the following people and organisations in preparing this report:

- Danyil Skora, Don Jephcott and Kamlesh Prajapati (Gujarat NRE Coking Coal Limited)
- Gary Leonard (Wollongong City Council)
- Melanie Thomson (Wollongong Resource Group Manager, Biosis Research)

ABBREVIATIONS AND COMMON TERMS

Biodiversity	The variety of biological life (plants and animals)
DECCW	NSW Department of Environment, Climate Change and Water (formerly NSW Department of Environment and Climate Change)
DEWHA	Department of the Environment, Water, Heritage and the Arts (formerly Department of Environment and Water Resources)
ERM	Environmental Resources Management
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPI	Environmental Planning Instrument
GGBF	Green and Golden Bell Frog
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
Locality	10 km radius of Subject Site
NPWS	NSW National Parks and Wildlife Service (now part of the DECCW)
Proposal	Removal of Dam 6 from the NRE No. 1 Colliery, Russell Vale Pit Top
Subject Site	The area of direct likely impact. In this case, Dam 6 - previously identified by ERM to contain potential habitat for the GGBF.
Study Area	Area of possible direct impact and any areas subject to potential indirect impacts. In this case, the Study Area includes an additional 650 m buffer around the Subject Site.
TSC Act	<i>Threatened Species Conservation Act 1995</i>
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety
WCC	Wollongong City Council

CONTENTS

1.0	INTRODUCTION	7
1.1	Green and Golden Bell Frog	10
1.2	Aims	12
2.0	METHODS	13
2.1	Contributors, qualifications and licences	13
2.2	Field surveys	13
3.0	RESULTS	17
3.1	Targeted surveys at Dam 6	17
3.2	Pit Top Dam	19
3.3	Habitat assessments	20
4.0	IMPACT ASSESSMENT	27
4.1	Part 3A (EP&A Act) impact assessment	27
4.2	Significant impact assessment under the EPBC Act	32
5.0	CONCLUSIONS AND RECOMMENDATIONS	36
6.0	REFERENCES	38

TABLES

Table 1:	Contributors, qualifications and their roles	13
Table 2:	Survey techniques and survey effort	13
Table 3:	Weather conditions immediately before and during the survey	14
Table 4:	Location details of the sites assessed for habitat condition in the Study Area	14
Table 5:	Amphibian species recorded at Dam 6 during September targeted GGBF field surveys	18
Table 6:	Amphibian species recorded at the Pit Top Dam during preliminary surveys	20
Table 7:	Habitat characteristics and condition of various sites in the Study Area	21

FIGURES

Figure 1:	The location of the Subject Site and Study Area in a regional context	8
Figure 2:	Location of Dam 6 and Pit Top Dam in the Study Area	9
Figure 3:	Location of previous Green and Golden Bell Frog records in the locality	11
Figure 4:	Location of sites assessed for Green and Golden Bell Frog habitat quality	16
Figure 5:	Potential habitat corridors and movement pathways that may be utilised by the Green and Golden Bell Frog in the Study Area.	26
Figure 6:	Location of previous Green and Golden Bell Frogs and potential habitat in the Study Area.	28

PLATES

Plate 1: Dam 6 _____ 18
Plate 2: Pit Top Dam (red circle indicates the location of the previous GGBF record) _____ 19

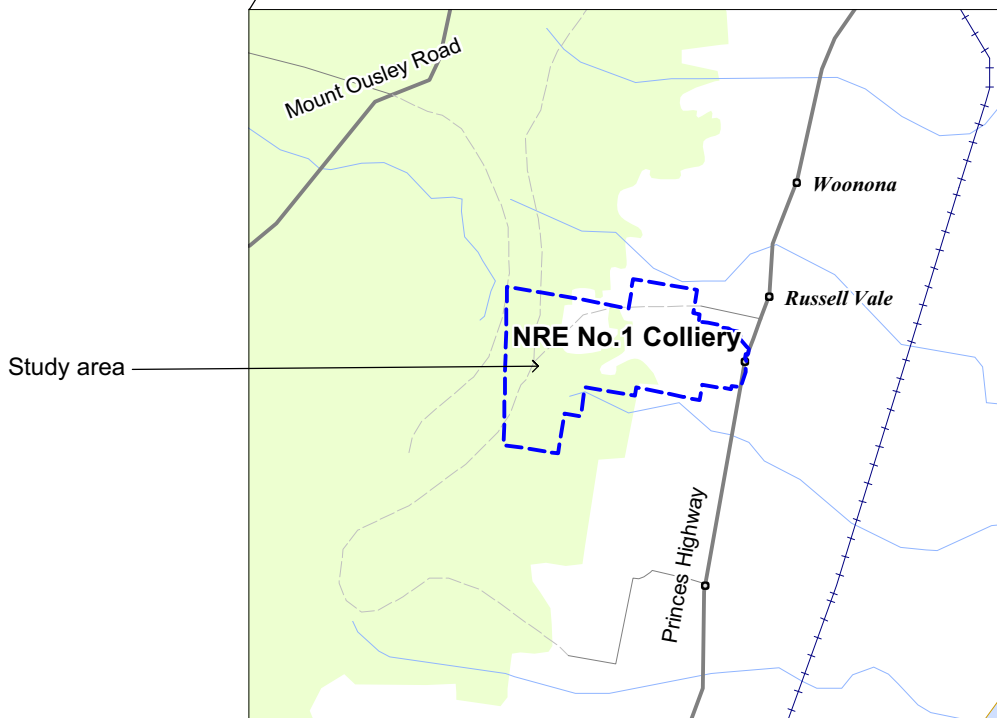
1.0 INTRODUCTION

Biosis Research has been engaged by Gujarat NRE Coking Coal Limited to undertake further targeted Green and Golden Bell Frog (*Litoria aurea*) surveys at Dam 6 located at their NRE No.1 Colliery, Russell Vale, in the Wollongong Local Government Area (LGA), herein referred to as the Subject Site (Figure 1). Dam 6 has been used previously to supplement water usage at NRE No.1 Colliery, however for quite some time (i.e. since early 1980s) the dam level has been influenced only by rainfall.

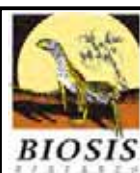
Gujarat NRE Coking Coal Limited (hereafter referred to as NRE) is currently seeking approval for the upgrade of surface facilities at the NRE Colliery and to facilitate part of this upgrade, it has been identified that Dam 6 will require de-commissioning. The removal of this dam will allow for an appropriately battered slope to be constructed above NRE's proposed re-alignment of Bellambi Gully Creek via an open channel. The drainage system will focus on ensuring that Bellambi Gully Creek bypasses the stockpile area in normal and extreme weather conditions.

The upgrade of the surface facilities at the NRE Colliery requires approval under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Environmental Resources Management Australia Pty Ltd (ERM) has prepared the Environmental Assessment and during habitat assessments of the Study Area identified potential habitat for the Green and Golden Bell Frog (hereafter referred to as GGBF) at Dam 6. This species is listed as Endangered under the *Threatened Species Conservation Act 1995* (TSC Act) and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As such, significance assessments following the Draft *Guidelines for Threatened Species Assessment* (DEC & DPI 2005) and the *EPBC Act - Matters of National Environmental Significance Significant Impact Guidelines 1.1*. (DEWHA 2009) are required for the proposal.

Biosis Research was commissioned by NRE in May 2010 to undertake follow-up surveys to ERM's habitat assessment of Dam 6 (Figure 2). The level of survey effort used during the survey was based on *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna (Amphibians)* (DECC 2009). Dam 6 was defined as 'small areas of habitat' as it was less than 0.3 hectares in size (DECC 2009). It was acknowledged in this report that surveys did not occur at the optimum time for the detection of the GGBF, which is between August and February when this species is known to be most active (DECC 2009). Hence, further targeted surveys were recommended, and form the basis of the current report, to accurately inform the impact assessments required for the proposal.



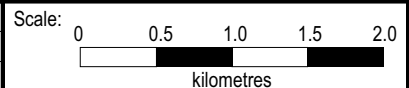
This product incorporates data which is copyright to the Commonwealth of Australia (c.2003-)

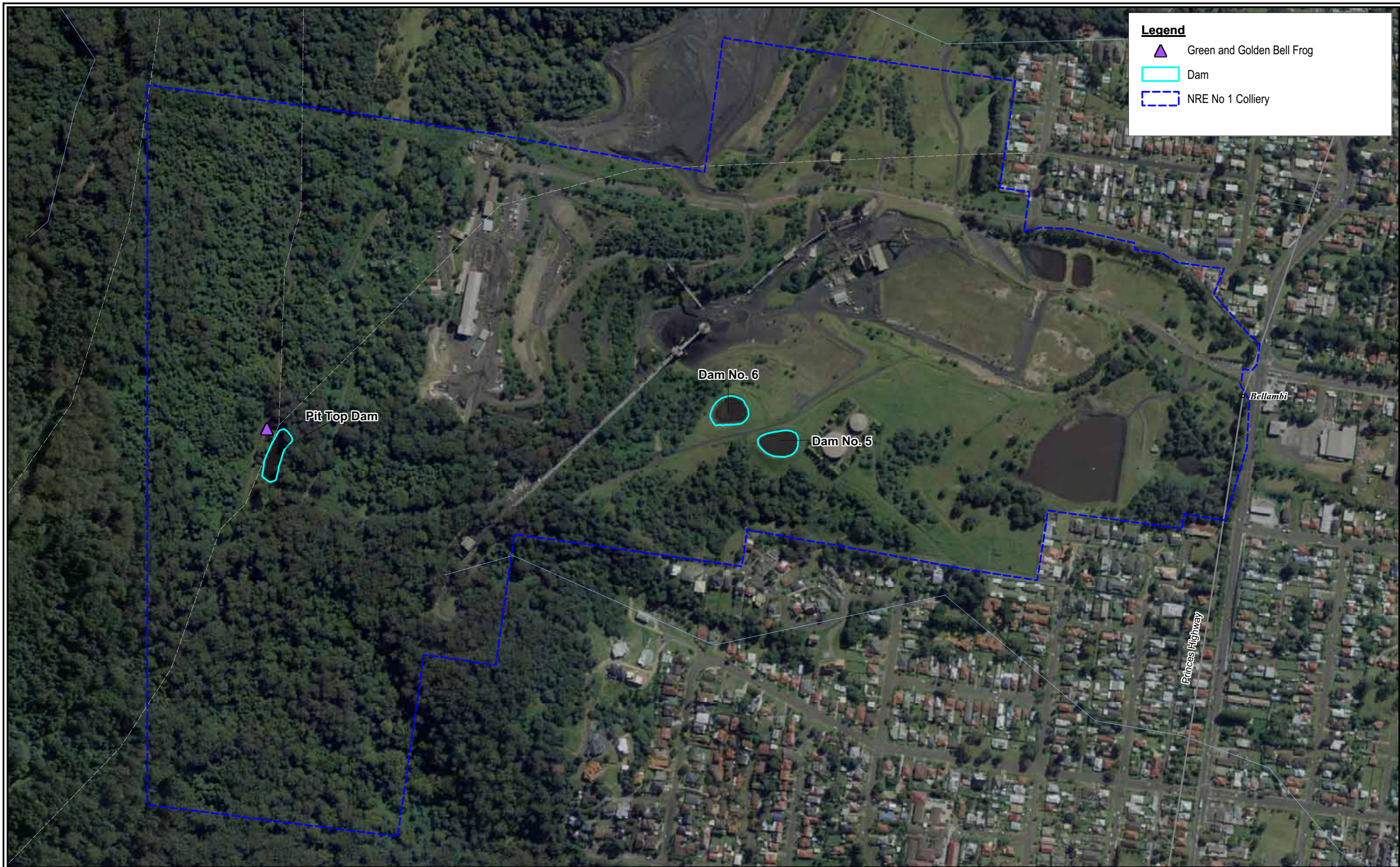


BIOSIS RESEARCH Pty. Ltd.
 8 Tate Street
 Wollongong
 NEW SOUTH WALES 2500




Figure 1: Location of the Study Area in a regional context

Date: 17 September 2010	Drawn by: ANP
File number: 11659	Checked by: MWR
Location: P:\12200s\12294\Mapping\Report Figures\12294 F1_Locality.WOR	





Legend

-  Green and Golden Bell Frog
-  Dam
-  NRE No 1 Colliery



BIOSIS RESEARCH Pty. Ltd.
 8 Tate Street
 Wollongong
 NEW SOUTH WALES 2500

Figure 2 - Location of Pit Top Dam, Dam No. 6 and previous record of Green and Golden Bell Frog.

Date: 17 September 2010	Drawn by: ANP
File number: 12294	Checked by: MWR
Location: ..P:\12200s\12294\Mapping\Report Figures\12294 F2 Dam Overview. WOR	

Acknowledgements:
 Species data from DECCW/NPWS and Biosis Research Pty Ltd
 This product incorporates Data which is copyright to
 the Commonwealth of Australia (c.2003-)

Source: (c) Land and Property Management Authority
 Panorama Avenue Bathurst NSW 2795
www.lpma.nsw.gov.au

0 50 100 150 200 300
 metres

Scale: 1:5,000 at A3
 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid of Australia, Zone 56




Figure 2

1.1 Green and Golden Bell Frog

Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern Victoria (NSW Government 2009). The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area and diurnal sheltering sites nearby such as vegetation or rocks (NPWS 1999; White and Pyke 1996), although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 6 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species (DEC 2005).

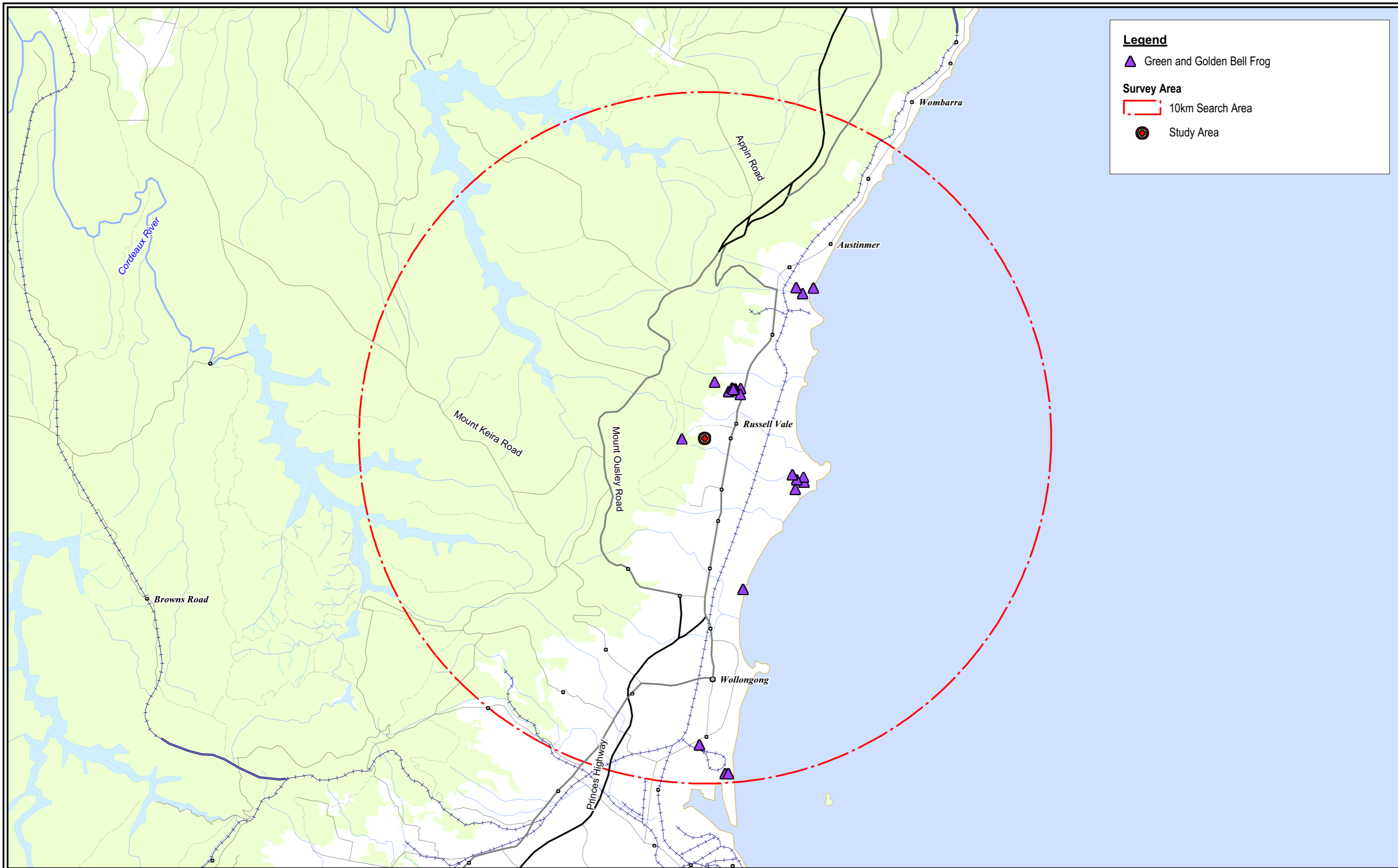
Previous records of GGBF within the locality are presented in Figure 3. The nearest record is approximately 650 m to the west of Dam 6 (recorded 19 November 1997 – Central CRA Survey Dataset) in the Study Area (Pit Top Dam). This record together with the presence of key habitat features suggests that suitable dams located in the Study Area could form part of a corridor for the GGBF in the locality.

The Draft Recovery Plan for the GGBF (Department of Environment and Conservation NSW 2005) refers to four ‘Key Populations’ in the Illawarra region, one of which occurs in the Study Area. A ‘Key Population’ is defined as the following:

“.....those populations considered to have significant measures of viability (regularly sighted at a locality, 10 or more adult individuals having been detected on more than one occasion over the last 5 years, breeding events having been observed over the last 10 years) and/or have a regional distribution considered essential or vital to the state-wide conservation of the species. The maintenance of the species representation within and across these regions is considered critical to the overall conservation of the species and in particular fundamental to conserving the widest genetic diversity possible and thus maximising the species evolutionary potential”

The key population that occurs in the Study Area and that is referred to in the Draft recovery plan includes the environments of the Russell Vale Site and is considered to be the northern most Illawarra population currently known (Department of Environment and Conservation NSW 2005):

“Woonona where a population occurs associated with the old Boral brickpit and the drainage lines of Collins Creek and the Bellambi Creek system (Farrahers, Hollymount, Cawley, Russell Vale and Rixon’s Pass Creeks) north of Wollongong. This population appears to utilise the coastal lagoons and wetland remnants and these drainage lines as connective corridors to other required habitat components towards the escarpment. This is the northern most Illawarra population currently known”.

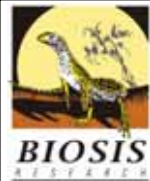


Legend

- ▲ Green and Golden Bell Frog

Survey Area

- 10km Search Area
- Study Area



BIOSIS RESEARCH Pty. Ltd.
8 Tate Street
Wollongong
NEW SOUTH WALES 2500

Figure 3 - Location of previous Green and Golden Bell Frog records in the locality.

Date: 17 September 2010	Drawn by: ANP
File number: 12294	Checked by: MWR
Location: ..P:\12200s\12294\Mapping\Report Figures\12294 F3_Green and Golden Bell Frog.WOR	

Acknowledgements:
Species data from DECCW/NPWS and Biosis Research Pty Ltd
This product incorporates Data which is copyright to
the Commonwealth of Australia (c.2003-)



Scale: 1:100,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

Figure 3

1.2 Aims

The general aim of this report is to provide the methodology and results of subsequent targeted GGBF surveys carried out on the Subject Site in September 2010. This information has been used to carry out impact assessments (EP&A Act and EPBC Act) for the decommissioning of Dam 6 on the GGBF (Section 4.0 of this report). Habitat assessments were also carried out to identify other areas of potential habitat occurring in the wider Study Area. In addition, preliminary GGBF surveys (comprising nocturnal and diurnal techniques) were conducted at the Pit Top Dam in an attempt to confirm the presence of the species in the Study Area (Figure 2).

2.0 METHODS

The targeted GGBF survey and habitat assessments included searches of databases and historical records in addition to a field survey of the Study Area. This section outlines the specific methods used during the survey.

2.1 Contributors, qualifications and licences

The contributors to the preparation of this report, their qualifications and roles are outlined in Table 1.

Table 1: Contributors, qualifications and their roles

Name	Qualification	Role
Michael Roberts	B. Env Sc (Hons)	Consultant Zoologist – field surveys, report preparation
Jennifer Charlton	BSc (Zoology)	Consultant Zoologist – report review

2.2 Field surveys

2.2.1 Targeted surveys of GGBF

Targeted GGBF surveys were carried out at Dam 6 and immediate surrounds between 7th and 9th September 2010. The level of survey effort used during the survey was based on that described for GGBF in *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna (Amphibians)* (DECC 2009).

A combination of diurnal and nocturnal field techniques were utilised during the survey of Dam 6 and these are described in Table 2. Due to safety concerns at the Pit Top Dam (deep water), preliminary surveys were restricted to using call playback and spotlighting from the edge of the dam.

Table 2: Survey techniques and survey effort

Survey technique	Time of day	Survey effort
Active searches of dam and surrounding vegetation	Diurnal	3 person hours over three (3) separate days
Active searches (spotlighting) of dam and surrounding vegetation	Nocturnal	3 person hours over three (3) separate nights
Call playback, listening and follow-up searches	Diurnal	1.5 person hours over three (3) separate days
Call playback, listening and follow-up spotlighting	Nocturnal	1.5 person hours over three (3) separate nights
Tadpole surveys	Opportunistic	Not applicable

Temperature, relative humidity and rainfall immediately before and during the survey are presented in Table 3.

Table 3: Weather conditions immediately before and during the survey

Date	Temperature (°C)		Relative Humidity at 3 pm	Rainfall (mm)
	Min	Max		
4/9/2010	12.2	19.7	91.0	0
5/9/2010	16.3	21.3	35.0	0
6/9/2010	11.4	20.6	33.0	0
7/9/2010	10.6	14.8	62.0	0
8/9/2010	7.3	15.6	67.0	0
9/9/2010	10.0	20.6	65.0	0.8
10/9/2010	12.7	22.6	53.0	0

Notes_source: Bureau of Meteorology (2010) – temperature, humidity and rainfall data collected from Bellambi Weather Station. Survey dates are in bold.

2.2.2 Habitat assessments

Diurnal habitat assessments were carried out in the Study Area to identify GGBF habitat and potential movement corridors utilised by the species. A total of seven sites were assessed in the Study Area and the locations of these are presented in Table 4 and Figure 4.

Table 4: Location details of the sites assessed for habitat condition in the Study Area

Site name	Easting	Northing	Details
Corrimal Spring	305297	6195511	North-east of the Study Area and north of the Pit Top Dam
Rixson's Pass Dam	305388	6196692	South of Rixson's Pass and north of the Pit Top Dam
Basin No.1	305995	6196655	East of the Pit Top Dam and north of the Dam 6
Basin No.2 (Filter bed Dam)	306399	6196236	East of Basin No. 1
RV Emplacement – northern pond	306346	6196421	South of Russell Vale Golf Course and north of the emplacement area
Don's Dam	306639	6195866	North of the Stormwater Control Dam and adjacent to Bellambi Gully Creek
Stormwater control dam wetland	306678	6195679	South of Bellambi Gully Creek and approx west of Roadside Dam
Roadside Dam	306787	6195766	West of Princes Highway and north of Bellambi Gully Creek

The following criteria were used to evaluate habitat values at each location:

Good: good condition vegetation (e.g. *Typha* spp.) and water bodies supporting habitat components required by the GGBF for foraging, sheltering, breeding and movement.

Moderate: some key fauna habitat components required by the GGBF are missing, although linkages with other habitats in the landscape are usually intact, but sometimes degraded.

Poor: many fauna habitat elements required by GGBF in low quality remnants have been lost. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised. However, GGBF may still utilise these habitats on occasion.



3.0 RESULTS

The results of the surveys have been broken up into the three components of the study:

- Targeted surveys at Dam 6 to inform the impact assessments (Section 4.0);
- Preliminary surveys at the Pit Top Dam; and,
- Habitat assessments undertaken of various sites in the Study Area.

3.1 Targeted surveys at Dam 6

The following section describes the results of the targeted surveys undertaken at Dam 6 including a description of the habitat characteristics and an inventory of the frog species recorded.

3.1.1 Habitat characteristics

The vegetation and habitat characteristics of Dam 6 were consistent with the previous survey in May 2010. The aquatic habitat within Dam 6 consisted of approximately 60% vegetation cover and was moderately disturbed by surrounding land uses, including; coal wash stockpiles, road ways and associated runoff. Dam 6 was dominated by senescent and re-growth *Typha domingensis* Narrow-leaved Cumbungi, *Schoenoplectus validus* and *Triglochin striata* Streaked Arrowgrass (Plate 1). The vegetation surrounding the dam comprised *Paspalum distichum* Water Couch, *Pennisetum clandestinum* Kikuyu, *Paspalum dilatatum* Paspalum, *Ageratina adenophora* Crofton Weed, *Bothriochloa macra* Red leg Grass, *Setaria parviflora* Pigeon Grass, *Conyza* spp. Tall Fleabane and *Verbena bonariensis* Purpletop. Scattered shrubs surrounding the dam consisted predominantly of *Acacia longifolia* subsp. *longifolia* Sydney Golden Wattle. Vegetation in Dam 6 has been mapped as Artificial Wetlands in *The Native Vegetation of the Illawarra and Coastal Plain* (NPWS 2002).

Water depth varied from less than 10 cm on the edges of the dam to in excess of one metre in the middle and eastern sections.

On the basis of these habitat characteristics, Dam 6 was considered to provide good quality habitat for the GGBF.



Plate 1: Dam 6

3.1.2 Animal species

There were no GGBF recorded during the field surveys at Dam 6. Incidental observations of other amphibian species utilising the Study Area during the field survey are listed in Table 5. The most abundant amphibian species recorded was the Eastern Common Froglet (*Crinia signifera*), followed by the Southern Brown Tree Frog (*Litoria ewingi*) and the Emerald Spotted Tree Frog (*Litoria peroni*). Tadpoles of the Southern Brown Tree Frog were recorded, as well as one large unidentified tadpole that was foraging in shallow water of the dam edge.

In comparison to the previous survey, frog species diversity was lower (seven species recorded in May 2010). However, the activity levels of frog species (calling and by observations), such as the Emerald Spotted Tree Frog, was significantly higher in the current survey.

Table 5: Amphibian species recorded at Dam 6 during September targeted GGBF field surveys

Common Name	Scientific Name	Observation Type
Emerald Spotted Tree Frog	<i>Litoria peroni</i>	Observed, heard
Eastern Common Froglet	<i>Crinia signifera</i>	Heard
Striped Marsh Frog	<i>Limnodynastes peroni</i>	Heard
Southern Brown Tree Frog	<i>Litoria ewingi</i>	Observed (adults and tadpoles), heard

3.2 Pit Top Dam

A combination of diurnal and nocturnal GGBF surveys was undertaken at the Pit Top Dam. A previous record of this species occurs at this location (recorded in 1997).

3.2.1 Habitat characteristics

The aquatic habitat of the Pit Top Dam was restricted to the western part of the dam and comprised approximately 5% vegetation cover (Plate 2). The dam was disturbed in response to usage of adjacent roads by trail bike riders. Flow was intermittent and maintained by two pipes on the eastern side of the dam to reduce the likelihood of potential algal blooms. Aquatic vegetation consisted of *Typha domingensis* Narrow-leaved Cumbungi and *Schoenoplectus validus* and the edges of the dam was predominantly made up of weeds and exotics such as, *Pennisetum clandestinum* Kikuyu, *Cirsium vulgare* Spear Thistle and *Taraxacum officinale* Dandelion. Regrowth rainforest tree species also bordered the dam including, *Livistona australis* Cabbage-tree Palm, *Toona ciliata* Red Cedar and *Pittosporum undulatum* Native Daphne. *Lantana camara* Lantana was the dominant shrub on the banks of the dam.



Plate 2: Pit Top Dam (red circle indicates the location of the previous GGBF record)

3.2.2 Animal species

The frog species recorded at the Pit Top Dam are presented in Table 6. The most abundant frog species recorded was the Common Eastern Froglet. A potential GGBF call was heard coming from the *Typha/Eleocharis* reedland on the western side of the dam in response to call playback. This individual did not call with the distinct GGBF complete repertoire, and as a result, it is considered to be an unconfirmed record that requires further investigation.

Table 6: Amphibian species recorded at the Pit Top Dam during preliminary surveys

Common Name	Scientific Name	Observation Type
Green and Golden Bell Frog*	<i>Litoria aurea</i>	Heard
Eastern Common Froglet	<i>Crinia signifera</i>	Heard
Striped Marsh Frog	<i>Limnodynastes peroni</i>	Heard
Emerald Spotted Tree Frog	<i>Litoria peroni</i>	Heard

Notes: *unconfirmed – a complete call was not heard from one individual



3.3 Habitat assessments



Descriptions of the habitats surveyed at the NRE Colliery are presented in Table 7. Potential habitat corridors that may be utilised by the GGBF in the Study Area are presented in Figure 5.



A majority of the surveyed sites were found to contain GGBF habitat, which was indicated by the availability of key fauna habitat elements required by the species for survival, including:



- presence of emergent aquatic vegetation such as *Typha domingensis* Narrow-leaved Cumbungi and *Eleocharis sphacelata*;
- presence of ground and shrub layers adjacent to the water body for foraging; and,
- presence of areas that can be utilised by the species for access/egress to sheltering (over-wintering) sites such as drainage lines, culverts, easements and periodically damp areas.


Table 7: Habitat characteristics and condition of various sites in the Study Area

Site name	Habitat characteristics and condition
 <p data-bbox="170 775 331 802">Corrimal Spring</p>	<p data-bbox="857 308 2056 419">Poor condition GGBF habitat – lacked emergent aquatic vegetation and had high levels of disturbance primarily from the run-off of the adjacent roadside. Aquatic vegetation comprised <i>Spirodella</i> spp. Duckweed and <i>Wilffia</i> spp. Tiny Duckweed. <i>Cyperus eragrostis</i> bordered the dam. Rainforest tree species including <i>Ceratopetalum apetalum</i> Coachwood and <i>Cyanthea</i> spp. Tree Fern were located on the western side of the dam.</p> <p data-bbox="857 435 2056 491">The habitat present at this site may provide a marginal corridor for the GGBF to other areas of potential habitat in the Study Area including the Pit Top Dam and Rixson’s Pass Dam.</p>
 <p data-bbox="170 1286 360 1313">Rixson’s Pass Dam</p>	<p data-bbox="857 818 2056 962">Good condition GGBF habitat - comprised the full complement of features required by the species for breeding, foraging and sheltering. Aquatic vegetation was approximately 60% cover and comprised sedges and rushes including <i>Typha domingensis</i> Narrow-leaved Cumbungi and <i>Eleocharis sphacelata</i>. The dam was surrounded by <i>Solanum mauritianum</i> Wild Tobacco Bush, <i>Pittosporum undulatum</i> Native Daphne, <i>Lantana camara</i> Lantana and <i>Acacia binervata</i> Two-veined Hickory.</p> <p data-bbox="857 978 2056 1034">The habitat present at this site also provides potential corridors for the GGBF to the Pit Top Dam and other habitats present in the eastern part of the Study Area.</p>

Site name	Habitat characteristics and condition
 <p data-bbox="170 699 280 724">Basin No.1</p>	<p data-bbox="857 229 2049 316">Poor condition GGBF habitat - highly disturbed as a result of coal wash and upslope catchment run-off. No aquatic vegetation in water bodies. Dominant vegetation surrounding the water body comprised <i>Lantana camara</i> Lantana and <i>Erythrina</i> spp. Coral Tree.</p> <p data-bbox="857 331 1720 357">The water body present at this site may form a potential east-west corridor for the GGBF.</p>
 <p data-bbox="170 1254 448 1279">Basin No.2 (Filter bed Dam)</p>	<p data-bbox="857 743 2049 855">Good condition GGBF habitat – contained full complement of GGBF habitats, particularly sheltering habitat. Aquatic vegetation comprised <i>Typha domingensis</i> Narrow-leaved Cumbungi and <i>Schoenoplectus validus</i>. <i>Lantana camara</i> Lantana and <i>Acacia binervata</i> Two-veined Hickory was common surrounding the dam. <i>Pennisetum clandestinum</i> Kikuyu formed a thick ground cover on slopes surrounding the dam.</p> <p data-bbox="857 871 2049 983">The habitat present at this site also provides potential corridors for the GGBF encompassing the RV Emplacement northern pond, Basin No.1 Dam and Rixson’s Pass Dam to the west and the Stormwater Control Dam Wetland, Don’s Dam, Roadside Dam, and Bellambi Gully Creek to the south and other habitats present in the wider Study Area which are linked by an unnamed tributary of Bellambi Gully Creek.</p>

Site name	Habitat characteristics and condition
 <p data-bbox="170 746 501 772">RV Emplacement – northern pond</p>	<p data-bbox="860 229 2049 316">Moderate condition GGBF habitat – relatively ephemeral, contained aquatic vegetation such as <i>Typha domingensis</i> Narrow-leaved Cumbungi and introduced species such as <i>Hydrocotyle bonariensis</i>. Surrounding areas dominated by <i>Lantana camara</i> Lantana, <i>Andropogon virginicus</i> Whisky Grass and <i>Pennisetum clandestinum</i> Kikuyu.</p> <p data-bbox="860 331 2049 386">The habitat present at this site would provide a potential GGBF corridor between Rixson’s Pass Dam and other habitats in eastern part of the Study Area.</p>
 <p data-bbox="170 1310 282 1335">Don’s Dam</p>	<p data-bbox="860 793 2049 874">Moderate condition GGBF habitat - contained aquatic vegetation such as <i>Typha domingensis</i> Narrow-leaved Cumbungi and slopes of the dam were dominated by <i>Lantana camara</i> Lantana, <i>Ageratina adenophora</i> Crofton Weed and <i>Acacia binervata</i> Two-veined Hickory.</p> <p data-bbox="860 890 2049 944">The habitat present at this site would provide a potential GGBF corridor between the Stormwater Control Dam Wetland, Bellambi Gully Creek and other habitats in eastern part of the Study Area.</p>

Site name	Habitat characteristics and condition
	<p>Good condition GGBF habitat – contained large areas of foraging habitat for the GGBF in the form of <i>Pennisetum clandestinum</i> Kikuyu and <i>Andropogon virginicus</i> Whisky Grass, sheltering habitat in form of <i>Casuarina glauca</i> Swamp Oak and <i>Melaleuca</i> spp. Tea-tree, and breeding habitat consisting of meadows of sedges and rushes dominated by <i>Typha domingensis</i> Narrow-leaved Cumbungi and <i>Eleocharis sphacelata</i>.</p> <p>This habitat forms an important movement corridor for the GGBF to areas of other potential habitat in the eastern part of the Study Area.</p>
<p>Stormwater control dam downstream wetland (southern end)</p>  <p>Stormwater control dam downstream wetland (northern end)</p>	

Site name	Habitat characteristics and condition
 <p data-bbox="170 738 315 762">Roadside Dam</p>	<p data-bbox="864 233 2045 320">Moderate condition GGBF habitat – disturbed as a result road run-off. Contained aquatic vegetation such as <i>Typha domingensis</i> Narrow-leaved Cumbungi, bordered by <i>Ageratina adenophora</i> Crofton Weed and planted shrubs <i>Callistemon</i> spp. Bottlebrush.</p> <p data-bbox="864 331 2045 387">This habitat forms important movement corridors for the GGBF to areas of other potential habitat in the eastern part of the Study Area.</p>



Legend

- Corridor
- Potential Movement Pathways
- Waterbodies
- NRE No 1 Colliery



BIOSIS RESEARCH Pty. Ltd.
 8 Tate Street
 Wollongong
 NEW SOUTH WALES 2500

Figure 5 - Green and Golden Bell Frog habitat corridors and movement pathways.

Date: 22 September 2010	Drawn by: ANP
File number: 12294	Checked by: MWR
Location: ..P:\12200s\12294\Mapping\Report Figures\12294 F5_GGBF Corridors. WOR	

Acknowledgements:
 Species data from DECCW/NPWS and Biosis Research Pty Ltd
 This product incorporates Data which is copyright to
 the Commonwealth of Australia (c.2003-)

Source: (c) Land and Property Management Authority
 Panorama Avenue Bathurst NSW 2795
www.lpma.nsw.gov.au

0 100 200 300 400 500
 metres

Scale: 1:10,000 at A3
 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid of Australia, Zone 56




Figure 5

4.0 IMPACT ASSESSMENT

Clean water flowing into Bellambi Creek from the NRE No. 1 Colliery is currently captured via a pipeline diverting it underneath and past the current stockpiling and coal loading arrangements. NRE have proposed to remove this pipeline and replace it with an appropriately engineered and re-aligned open channel constructed on the southern side of the coal stockpile area. Construction of the open channel will involve the removal of Dam 6.

The GGBF is listed as Endangered under the TSC Act and Vulnerable under the EPBC Act.

4.1 Part 3A (EP&A Act) impact assessment

The proposal will be assessed under Part 3A of the EP&A Act. This section provides an assessment of the impacts of the proposal on the GGBF following Step 3 (and Appendix 3) of the Draft *Guidelines for Threatened Species Assessment* (DEC & DPI 2005).

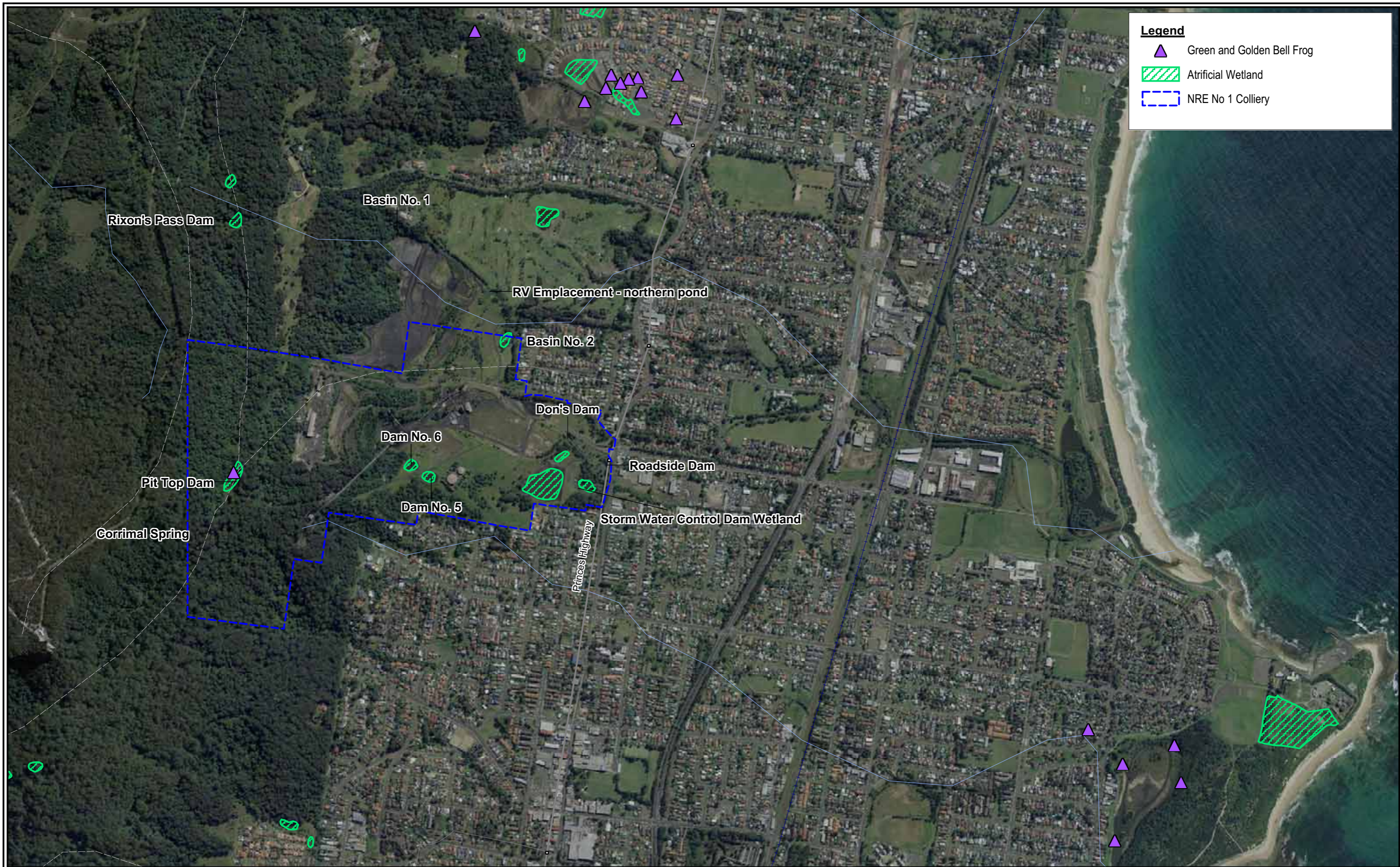
The GGBF is known to occupy areas with a variety of habitat features throughout its range. However, there are important habitat components that the species requires to survive, including ephemeral water bodies, grassy areas for foraging and refuge, shelter sites, basking sites and over-wintering sites (Pyke and White 2001). The presence of exotic predatory fish *Gambusia holbrooki* is considered a crucial limiting factor affecting the long-term survival of the species (Pyke and White 2001). The species breeds in still or slow flowing water bodies with some aquatic emergent vegetation, such as *Typha* spp. (bull-rushes) or *Eleocharis* spp.

The GGBF was assessed to have a high likelihood of occurrence in the Study Area, on the basis of the proximity of previous records and the presence of suitable habitat features.




How is the proposal likely to affect the lifecycle of a threatened species and/or population?

The GGBF spends much of its time amongst emergent aquatic (esp. *Typha* spp.) or riparian vegetation, but also uses and disperses into other areas including fallen timber adjacent to breeding habitat and other vegetation such as grassland, cropland and modified pastures. In addition, GGBF are known to move considerable distances and have been found several kilometres from the nearest breeding habitat (Pyke and White 2001).

The Subject Site and Study Area supports breeding habitat for the GGBF. One previous record of the GGBF occurs in the Study Area at the Pit Top Dam, approximately 650 metres to the west of the Subject Site (collected in 1997). Other proximate records of this species occur in the wider locality including a cluster of records located approximately 1.5 kilometres to the north of the Study Area (Figure 6). In 2004 over 100 individual GGBF were released into six constructed ponds at this location. Recent surveys have indicated that the abundance of individuals within this population are decreasing (Gary Leonard, personal communication, 2010), which may be due to mortality or the dispersal of individuals to suitable areas in the locality.



Legend

-  Green and Golden Bell Frog
-  Artificial Wetland
-  NRE No 1 Colliery



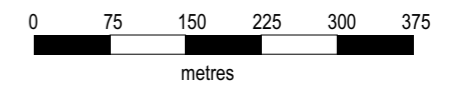
BIOSIS RESEARCH Pty. Ltd.
 8 Tate Street
 Wollongong
 NEW SOUTH WALES 2500

Figure 6 - Location of previous Green and Golden Bell Frogs and potential habitat in the Study Area.

Date: 20 September 2010	Drawn by: ANP
File number: 12294	Checked by: MWR
Location: ..P:\12200s\12294\Mapping\Report Figures\12294 F6_Previous GGBF Records. WOR	

Acknowledgements:
 Species data from DECCW/NPWS and Biosis Research Pty Ltd
 This product incorporates Data which is copyright to
 the Commonwealth of Australia (c.2003-)

Source: (c) Land and Property Management Authority
 Panorama Avenue Bathurst NSW 2795
www.lpma.nsw.gov.au



Scale: 1:7,500 at A3
 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia 1994
 Grid: Map Grid of Australia, Zone 56



Figure 6

Dam 6 provides foraging, breeding and sheltering habitat for the GGBF. The Study Area contains movement corridors (between breeding and sheltering locations), which encompasses Dam 6 (Figure 5). The proposal would remove up to 0.19 ha of breeding, foraging and sheltering habitat and may disrupt the movement of this species between suitable areas of habitat. The removal of habitat from Dam 6 represents 17.0% of similar habitat available in the Study Area and 0.98% available in the locality.

As a component of this assessment, targeted surveys were undertaken for the GGBF at Dam 6 in May and September 2010. No GGBF were recorded. Conditions during these surveys were not ideal for the detection of the species, despite the September survey occurring in the recommended time frame between August and February (*Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna (Amphibians)* (DECC 2009)). Thus, a precautionary approach has been taken and the GGBF is assumed to utilise Dam 6. It is recommended that further surveys be undertaken at Dam 6. The most suitable time to survey for the GGBF is between January and February when this species is known to breed, and preferably after rain (DECC 2009). However, Illawarra populations of the GGBF are known to breed later in this period and into March (Gary Leonard, personal communication, 2010). As such, all attempts should be made to undertake further studies at this time.

In order to mitigate the impacts of removing potential habitat of the GGBF from the Subject Site, translocation of the species (if detected) has been proposed to Dam 5 (Figure 3). Dam 5 occurs approximately 30 metres from Dam 6, but does not contain preferred habitat such as emergent aquatic vegetation, basking areas and sheltering habitat. As such, the enhancement of Dam 5 is required before the implementation of the proposal, in consultation with the DECCW, to a level considered satisfactory to provide ongoing habitat for this species in the Study Area. If the species is detected during subsequent surveys of the site, a translocation plan will also need to be developed and proposed to DECCW. The translocation plan is conditional upon detecting the species at the optimum time period. If the species is not detected at this time, recommendations regarding the formulation of these plans will need to be re-evaluated.

Given the commissioning of further GGBF surveys on the Subject Site during the optimum time period, the enhancement of Dam 5 as an offset for the removal of Dam 6, and the availability of other areas of potential habitat within the Study Area, it is considered unlikely that the proposal would have a major impact on the life cycle of the GGBF.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The GGBF inhabits marshes, dams and streams sides, particularly those containing bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Optimum habitat for this species includes water bodies that are unshaded, free of predatory fish (e.g. Plague Minnow) and that also contain nearby sheltering and basking sites. The species is typically active by day and breeds in summer when conditions are warm and wet. Females produce a raft of eggs that initially float before settling to the bottom amongst aquatic vegetation (Pyke and White 2001).

The proposal would remove 0.19 ha of potential breeding, foraging and sheltering habitat for the GGBF. This represents approximately 17.0% of potential habitat in the Study Area and 0.98% in the locality.

Vegetation community forming habitat	Proposed to be removed (ha)	% Study Area	% Locality
Artificial wetland	0.19	17.0	0.98
Total vegetation (ha)	0.9	1.1	19.2

The wetland habitat present on the Subject Site is likely to be used by the GGBF as a movement corridor to other potential breeding habitats present in the Study Area (Figure 5) and is therefore important for the long-term survival of the species in the locality. The proposed enhancement of Dam 5, located 30 metres from the Subject Site, would help mitigate impacts of the proposal on habitat connectivity for this species.

Given the implementation of further GGBF surveys at the optimum time, translocation plans being developed for Dam 5 if the species is detected, and the availability of other suitable habitats in the Study Area, it is considered unlikely that the proposal would have a major impact on the habitat of the GGBF.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The GGBF mainly occurs in coastal lowland areas of eastern New South Wales and Victoria. The northern most population occurs near Grafton on the New South Wales north coast, whilst the southern most population exists near Lakes Entrance, in south-eastern Victoria (Department of Environment and Conservation NSW 2005).

The extent of occurrence of the GGBF is estimated to be approximately 150,000 km² (Department of Environment and Conservation NSW 2005). However, this species occurs as widely disjunct sub-populations across its range and the loss of any of these populations is likely to increase population fragmentation and widen existing disjunction (Department of Environment and Conservation NSW 2005).

The Illawarra populations have been referred to as ‘Key Populations’ in the Draft Recovery Plan that has been prepared for the GGBF (Department of Environment and Conservation NSW 2005) and specific reference is made to the population located to the north of the Study Area (Boral Brick pit, Woonona). Consequently, it is entirely appropriate to consider the potential population occurring in the Study Area to be a component of this ‘Key Population’ and as such, be within the limit of the known distribution of the GGBF species at a regional level.

How is the proposal likely to affect current disturbance regimes?

The Study Area has been subjected to long-term and ongoing disturbances associated with mining activities, road construction, golf courses and the development of semi-industrial and residential areas. The proposal is likely to increase the level of disturbance within the Study Area, although this is likely to be temporary, and will be mitigated appropriately through the enhancement of Dam 5 and the preservation of other habitats identified in the Study Area (Section 3.3).

How is the proposal likely to affect habitat connectivity?

The removal of Dam 6 would disconnect important habitat corridors utilised by this species and potentially nullify access and egress between the eastern and western parts of the Study Area. As such, removing Dam 6 from the Study Area, and the construction of an open channel creates a barrier to the movement of the GGBF in the Study Area. Barriers in the Study Area already occur in the form of the golf course, mining infrastructure and the stockpiling area.

In order to mitigate the impacts of corridor fragmentation, the enhancement of Dam 5 (immediately adjacent to the Subject Site) is proposed to occur before the decommissioning of Dam 6. It is recommended that further targeted surveys be undertaken to assess the status of the GGBF in the wider Study Area, to confirm the presence of the species in the region, and how it utilises and moves between available habitats in the landscape (e.g. breeding, overwintering sites etc.). Particular attention should be given to the 'Key Population' (refer to the Draft Recovery Plan prepared for the GGBF) identified to the north of the Study Area, as well as an investigation into the status of the individuals that were released into the Edgewood property in 2004 (Gary Leonard, personal communication, 2010). Collectively, this information would inform the future directions undertaken in the Study Area and ensure the preservation of the GGBF in the locality.

Therefore, given an assessment of the status of the species and an examination of how it utilises the available habitats in the Study Area, the appropriate enhancement of Dam 5, further targeted surveys of the GGBF in the optimum time period, and the preservation of existing habitats surrounding the Subject Site, the proposal is considered unlikely to affect habitat connectivity for the GGBF.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the GGBF.

Conclusion

Based on the above assessment the proposal is considered **unlikely** to have a major impact on the GGBF. This assessment is conditional on the following aspects of the proposal being undertaken:

- Further targeted GGBF surveys in the optimum time period (early March for the Illawarra populations);
- Assessments of the other available habitats utilised by this species in the Study Area;
- Assessments of populations known to occur in the locality, which could provide reference information for the future directions undertaken on the Subject Site;
- The preparation of enhancement plans for Dam 5 to ensure that the removal of habitats on the Subject Site are appropriately mitigated; and,
- The preparation of translocation plans, if the species is detected on the Subject Site in future surveys, to re-locate tadpoles and adults to Dam 5 or other appropriate areas in the locality.

4.2 Significant impact assessment under the EPBC Act

The Draft Recovery Plan for the GGBF (Department of Environment and Conservation NSW 2005) refers to four Key Populations, one of which occurs in the vicinity of the Study Area. Thus, the Study Area is considered to contain an ‘*important population*’ of the Green and Golden Bell Frog because:

- i. it is likely to be a key source population either for breeding or dispersal;
- ii. it is likely to be necessary for maintaining genetic diversity; and/or,
- iii. the Study Area is at or near the limit of the species range at a regional level.

An action has, will have, or is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of the species

The wider Study Area supports potential breeding habitat for the GGBF and a previous record occurs west of the Subject Site at the Pit Top Dam (collected in 1997). The artificial wetland present on the Subject Site also represents potential foraging and breeding habitat and is connected to (and forms a potential movement corridor with) other breeding, foraging and sheltering habitat available in the Study Area.

The ‘Key Population’ referred to in the Draft Recovery Plan for the GGBF is located to the north of the Study Area and was believed to be still extant in 2007. In addition, several 100’s

of individuals were released near this area (Edgewood property) in 2004. Given the movement patterns of this species (up to several kilometres) between breeding habitats (Pyke and White 2001), it is entirely appropriate to consider that this population utilises habitats available on the Subject Site and other parts of the Study Area.

The proposal includes the removal of Dam 6 on the Subject Site, which would result in the removal of breeding, foraging and sheltering habitat for the GGBF, and the construction of an open channel, which may disrupt the movement of this species within the Study Area. Mitigation of this impact includes the proposed enhancement of Dam 5 (which currently contains no habitat for the GGBF), located approximately 30 metres from the Subject Site. Given that the mitigation measures are implemented, and other identified corridors within the Study Area (Figure 5) are not compromised, it is unlikely that the proposal would lead to a long-term decrease in the size of the population.

Reduce the area of occupancy of an important population

The status of the population in the Study Area is currently unknown. Further targeted surveys spanning the Subject Site, Study Area and immediate parts of the locality are required at the optimum time period (i.e. early March) to ascertain the area of occupancy of the population. This should comprise targeted surveys at each of the potential habitats identified in this report, concurrently with surveys of known 'reference' populations to the north of the Study Area.

The removal of Dam 6 is proposed to be offset by the enhancement of Dam 5, located approximately 30 metres from the Subject Site. Therefore, following the collection of the information above and with the implementation of appropriate mitigation measures, it is unlikely that the proposal would reduce the area of occupancy of the population.

Fragment an existing important population into two or more populations.

The GGBF is a highly mobile species, capable of moving several kilometres between breeding sites. There are some accounts of the GGBF moving between five and 10 kilometres to breeding sites (Department of Environment and Conservation NSW 2005).

The proposal includes the removal of Dam 6 and the construction of an open channel. The removal of Dam 6 is proposed to be mitigated by the enhancement of Dam 5, whilst the open channel may create a potential barrier to movement for this species. Other barriers in the Study Area include the golf course, coal stockpiling area and residential areas to the east of the Subject Site. To mitigate the impacts associated with the barriers created by the open channel, GGBF crossing structures are recommended to permit the movement of the species within the Study Area.

Further targeted studies are required of the Subject Site, and other suitable habitats in the Study Area, to ascertain the movement corridors utilised by the GGBF. Given the ranging patterns of the species, which may span between the Subject Site and the area occupied by the species to the north of the Study Area, these surveys need to be carried out at a regional scale. Therefore, provided the mitigation measures are implemented and the regional scale surveys of

this species are undertaken to inform future directions, the proposal is considered unlikely to fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. In relation to a threatened species, 'critical habitats' refer to areas that are necessary for activities such as foraging, breeding, roosting, or dispersal and to maintain genetic diversity and long-term evolutionary development (DEWHA 2009). The habitat elements provided by Dam 6 are considered critical to the survival of the GGBF.

In order to mitigate the impacts of removing Dam 6, Dam 5 is proposed to be enhanced as a replacement habitat. Therefore, it is unlikely that the proposal would adversely affect habitat critical to the survival of the GGBF because it would be replaced following the implementation of mitigation measures.

Disrupt the breeding cycle of an important population

The GGBF breeds in any still or slow flowing water bodies with some aquatic emergent vegetation. If the species is detected in further surveys, a translocation plan would be developed (in consultation with the DECCW). This plan would indicate the most appropriate timing of the translocation to ensure that the breeding cycle of the species is not disrupted. Therefore, the proposal is not considered to disrupt the breeding cycle of the GGBF.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal would involve the removal of GGBF habitat from Dam 6 and its replacement at Dam 5 following the development of an enhancement and translocation plan. The enhancement of Dam 5 would occur to a level conducive of it providing breeding, foraging and sheltering habitat for the GGBF. Thus, the proposal is unlikely to decrease the availability or quality of habitat for the GGBF.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat

The presence of the exotic predatory fish, Plague Minnow *Gambusia holbrooki* is considered a factor affecting the long-term survival of the GGBF (Pyke and White 2001). The proposal is considered unlikely to increase the abundance of this species in the Study Area.

Introduce disease that may cause the species to decline, or

Infection by amphibian chytridiomycosis disease is a serious threat to the GGBF. To avoid introducing this disease into areas within the Study Area, all works related to the proposal

nearby or within watercourses of the Study Area should adhere to the guidelines developed by the NPWS, *Hygiene Protocol for the Control of Disease in Frogs* (NPWS 2001).

Interfere substantially with the recovery of the species.

A draft recovery plan has been prepared for the GGBF (Department of Environment and Conservation NSW 2005). The main objectives of the plan are:

- Manage threats impacting on currently known populations so as to stabilise and prevent further decline; and,
- Return the species to its former distribution, abundance and role in the ecosystem wherever possible.

Five specific objectives that aim to achieve the overall recovery objectives above are:

- Increase the security of key GGBF populations by preventing the further loss of habitat of key populations and where possible secure opportunities for increasing protection of habitat areas;
- Ensure extant populations are managed to eliminate threats;
- Implement habitat management initiatives;
- Establish captive populations; and,
- Increase the level of awareness of the conservation status of the GGBF and provide greater opportunity for community involvement in the implementation of the recovery plan.

The proposal will be undertaken in accordance with the guidelines set out in the recovery plan for this species through the implementation of mitigation measures including; the replacement of habitat and further targeted studies of the GGBF in the Study Area and wider locality. This will ensure that the proposal would not interfere with the recovery of the species.

Based on the above assessment, the GGBF is **unlikely** to be significantly impacted by the proposal which is conditional upon the implementation of mitigation measures. However, using the precautionary approach NRE will be submitting a Referral under the provisions of the EPBC Act to ensure that all aspects as appropriate are assessed in respect of the GGBF.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This report provides the results of further targeted GGBF surveys conducted at Dam 6 located within the NRE No.1 Colliery, Russell Vale site. Dam 6 was found to provide good quality habitat for GGBF due to the presence of healthy stands of Cumbungi, lack of any predatory fish and the availability of other key fauna habitat elements required by the species for breeding, foraging and sheltering (NPWS 1999; White and Pyke 1996).

GGBF was not recorded during field surveys at Dam 6. Four other species of amphibians, including Eastern Common Froglet, Emerald Spotted Tree Frog, Striped March Frog and Southern Brown Tree Frog were recorded. Tadpoles of the Southern Brown Tree Frog and one unidentified species were also recorded during field surveys. Frog species, such as the Dwarf Tree Frog (*Litoria fallax*) previously recorded at the site during the May 2010 surveys, was not recorded. However, higher levels of frog activity were noted.

The proposal includes the removal of Dam 6 and the construction of an open channel to manage surface water flow at the NRE No. 1 Colliery Russell Vale site. This would involve the removal of potential GGBF breeding, foraging and sheltering habitat from Dam 6 and the replacement of habitat at Dam 5. Accordingly impact assessments were conducted following the Draft *Guidelines for Threatened Species Assessment* (DEC & DPI 2005) for Part 3A projects, and EPBC *Significant Impact Criteria* for vulnerable species was also undertaken.

These assessments concluded that the proposal would be unlikely to have a significant impact on the GGBF. The nature of this assessment was conditional on the following aspects of the proposal being undertaken:

- The enhancement of Dam 5 (currently containing no suitable GGBF habitat elements) should be conducted using careful planning and in consultation with the DECCW and WCC. This will ensure that the decommissioning of Dam 6 and the subsequent removal of breeding, sheltering and foraging habitat from this location is appropriately mitigated;
- Further targeted surveys should be conducted using the same techniques described in this report in early March (and preferably after rain) across the NRE Colliery (particularly the potential habitats identified in this report) to accurately determine the presence of the species and to determine the extent of their utilisation (e.g. breeding, foraging, over-winter sites) of the Study Area before the proposal might modify these environments;
- Targeted surveys should be recommended to adjacent landholders located to the north of the Study Area to ascertain the extent and movement of the species at a regional scale. These surveys should comprise the population of GGBF located on the Edgewood property. Individuals in this population have been subject to regular assessments and any contemporary information gathered on their extent and

movements may be used for comparative purposes and importantly, as they may also utilise parts of the Study Area; and,

- A translocation plan should be developed in consultation with the DECCW for individual GGBF (if detected) from Dam 6 to Dam 5 to ensure minimal disruption to the species.

Habitat assessments of other potential GGBF habitats in the Study Area were also conducted during these surveys to guide the future operations of NRE. These assessments concluded that a majority of water bodies occurring in the Study Area provide moderate to good quality GGBF habitat and may form components of movement corridors utilised by this species to access breeding and sheltering locations. In addition, preliminary surveys were also carried out at the Pit Top Dam (location of previous record of GGBF in 1997) and an unconfirmed record of the GGBF was made. As such, in conjunction with the recommendations made in relation to the proposal, the following are suggested to inform future operations of NRE:

- Targeted surveys of the identified potential habitat sites should be conducted particularly in areas such as the Rixson's Pass Dam and the Stormwater Control Dam Wetland, which were assessed as good quality GGBF habitat;
- The threats to the survival of GGBF across the Study Area should be assessed. This may include water quality testing at various sites to help ascertain potential limiting factors affecting the colonisation of habitats identified in the Study Area; and,
- Subsequent surveys by boat at the Pit Top Dam should be conducted to permit closer observations of the areas identified to contain potential GGBF (i.e. where the unconfirmed record was taken).

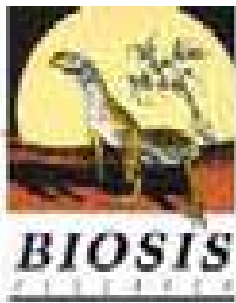
Finally, a plan of management following the guidelines outlined in the Draft Recovery Plan for the GGBF (Department of Environment and Conservation NSW 2005) should be developed to identify and outline the long term goals and objectives for the conservation of the species within the Study Area and broader locality. This will be imperative as the GGBF is currently rare in the Illawarra region and any location where it occurs is of critical conservation significance.

6.0 REFERENCES

- DEC (2005). Green and Golden Bell Frog: Threatened Species Profile, <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10483>, Department of Environment and Conservation
- DEC & DPI (2005) 'Draft Guidelines for Threatened Species Assessment - Part 3A of the Environmental Planning and Assessment Act 1979.' NSW Department of Environment and Conservation and Department of Primary Industries.
- DECC (2009) 'Threatened species survey and assessment guidelines: Field survey methods for fauna - Amphibians.' Department of Environment and Climate Change NSW.
- Department of Environment and Conservation NSW (2005) 'Green and Golden Bell Frog *Litoria aurea* (Lesson 1829) Recovery Plan, Draft.' DEC NSW, Hurstville, NSW.
- DEWHA (2009) 'Matters of National Environmental Significance: Significant Impact Guidelines 1.1.' Commonwealth of Australia, Canberra.
- NPWS (1999). Green and Golden Bell Frog: Threatened Species Information, http://www.nationalparks.nsw.gov.au/PDFs/tsprofile_green_golden_bell_frog.pdf, National Parks and Wildlife Service
- NPWS (2001) 'Hygiene protocol for the control of disease in frogs.' NSW National Parks and Wildlife Service, Hurstville.
- NPWS (2002) 'Native Vegetation of the Illawarra Escarpment and Coastal Plain.' NPWS, Hurstville.
- NSW Government (2009). BioNet, <http://www.bionet.nsw.gov.au/Area.cfm>, NSW Government
- Pyke GH and White A (2001) A review of the biology of the Green and Golden Bell Frog *Litoria aurea* (Anura: Hylidae). *Australian Zoologist* 31(4), 563-598.
- White AW and Pyke GH (1996) Distribution and conservation status of the Green and Golden Bell Frog *Litoria aurea* in New South Wales. *Australian Zoologist* 30, 177-189.

Annex D

November Targeted Surveys
Of Dam 6 For Green And
Golden Bell Frog At No.1
Colliery



26th November 2010

**Danyil Skora
Gujarat NRE Coking Coal Limited**

Our ref: s12586

**Re: November targeted surveys of Dam 6 for Green and Golden Bell Frog
(*Litoria aurea*) at NRE No. 1 Colliery, Russell Vale.**

Dear Danyil,

Further to subsequent surveys for the Green and Golden Bell Frog (*Litoria aurea*) between 16th and 18th November, 2010 of Dam 6 at the NRE No. 1 Colliery, please find below the following report.

This report should be read in conjunction with reports generated from previous surveys of Dam 6 by Biosis Research in May and September, 2010 (Biosis Research 2010b; Biosis Research 2010a).

Background

Gujarat NRE Coking Coal Limited (hereafter referred to as NRE) is currently seeking approval (under Part 3A of the EP& A Act) for the upgrade of surface facilities at the NRE No. 1 Colliery. In order to facilitate this upgrade, it has been identified that Dam 6 will require de-commissioning. Environmental Resources Management Pty Ltd (ERM) prepared the Environmental Assessment for the upgrade and identified that Dam 6 contained potential habitat for the Green and Golden Bell Frog (GGBF).

GGBF has previously been recorded at the NRE Colliery in 1997 and 1998 (see below) and was not recorded in subsequent surveys carried out in 1998 and 1999 (Goldingay and Lewis 1999).

“Six calling bell frogs were detected at a pond within a colliery near Bulli in late 1997 (A. White, pers. comm.). A subadult bell frog was detected there in March 1998 but none was detected in November 1998 or January 1999. We failed to detect bell frogs at one site 1 km north and at two survey sites located

approximately 3 km east and north of the occupied site. However, three bell frogs were detected at a disused brickworks approximately 2 km north-east of the colliery in January 1999 (K. Mills, pers. com.). These observations suggest a very small population is present in the area. White and Pyke (1996) reported three historic locations in this area (Bulli, Thirroul, Woonona) indicating that the area has been an important location for the species over a long period.”

Biosis Research was commissioned by NRE to carry out targeted surveys for the GGBF in May and September, 2010. It was acknowledged that the first surveys in May were not conducted at the optimum time for the detection of the GGBF, which is between August and February when this species is known to be most active (DECC 2009). Hence, further targeted surveys for the species at Dam 6 were carried out in September. GGBF was not detected at Dam 6 in the May or September surveys.

The September surveys were used to inform significance assessments following the *Draft Guidelines for Threatened Species Assessment* (DEC & DPI 2005) and the *EPBC Act – Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DEWHA 2009). The assessments concluded that the decommissioning of Dam 6 would be unlikely to have a significant impact on the GGBF. This outcome was conditional on the following aspects of the proposal being undertaken:

- Further targeted surveys should be conducted towards the end of summer and preferably after rain using the same techniques used in previous surveys across the NRE Colliery to accurately determine the presence of the species and the extent of their utilisation (e.g. breeding, foraging, over-winter sites) of the Study Area before the proposal might modify these environments. Conducting the surveys in early March was based on anecdotal information provided by Wollongong City Council (Gary Leonard) on a population of GGBF that occur to the north of the colliery (Edgewood property and disused brick pit). However, the species has been detected at this property as recent as September and October, 2010 (Arthur White, personal communication, 2010).
- Targeted surveys should be recommended to adjacent landholders located to the north of the Study Area to ascertain the extent and movement of the species at a regional scale. These surveys should comprise the population of GGBF located on the Edgewood property. Individuals in this population have been subject to regular assessments and any contemporary information gathered on their extent and movements may be used for comparative purposes and importantly, as they may also utilise parts of the Study Area;

- A translocation plan should be developed in consultation with the DECCW for individual GGBF (if detected and if required) from Dam 6 to Dam 5 to ensure minimal disruption to the species; and,
- The potential enhancement of Dam 5 (currently containing no suitable GGBF habitat elements) should be conducted using careful planning and in consultation with the DECCW and Wollongong City Council (WCC). This will ensure that the decommissioning of Dam 6 and the subsequent removal of breeding, sheltering and foraging habitat from this location is appropriately mitigated.

In order to continue to address these conditions, NRE commissioned Biosis Research to conduct subsequent targeted surveys of Dam 6 for GGBF in November, which forms the basis of this report.

Methodology

Using a combination of nocturnal and diurnal techniques (active searching and call playback), targeted GGBF surveys were carried out at Dam 6 and immediate surrounds between 16th and 18th November, 2010. The level of survey effort used during the survey was based on that described for GGBF in *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna (Amphibians)* (DECC 2009).

Temperature, relative humidity and rainfall immediately before and during the survey are presented in the Table below. Approximately 90 mm of rainfall was recorded in early November. This was considered to be ideal conditions for the detection of the species following the DECCW guidelines (DECC 2009).

Date	Temperature (°C)		Relative Humidity at 3 pm	Rainfall (mm)
	Min	Max		
13/11/2010	18.3	23.6	84	0
14/11/2010	18.3	23.6	83	0
15/11/2010	18.1	22.7	91	0
16/11/2010	18.7	19.8	80	16.8
17/11/2010	15.2	20.1	79	0.4
18/11/2010	15.4	21.5	77	3.0
19/11/2010	11.6	20.6	68	1.0
20/11/2010	16.3	21.8	66	0

Notes_source: Bureau of Meteorology (2010) – temperature, humidity and rainfall data collected from Bellambi Weather Station. Survey dates are in bold.

Results

Habitat characteristics

The vegetation and habitat characteristics of Dam 6 were mostly consistent with the previous surveys carried out by Biosis Research in May and September, 2010. The only exception was that aquatic vegetation consisted of approximately 75% vegetation cover (previously 60%). The density and height of the dominant vegetation types, *Typha* spp. and *Scheonoplectus validus*, had also increased since the previous surveys. These differences are in response to the re-growth of

Typha spp. and *Scheonoplectus validus* following the senescence of these species over the winter period.

Animal species

There was no GGBF recorded during the field surveys at Dam 6. Incidental observations of other amphibian species utilising Dam 6 during the field survey are listed in the following table.

Common Name	Scientific Name	Observation Type
Emerald Spotted Tree Frog	<i>Litoria peroni</i>	Observed (adults and tadpoles), heard
Eastern Common Froglet	<i>Crinia signifera</i>	Heard
Striped Marsh Frog	<i>Limnodynastes peroni</i>	Heard
Southern Brown Tree Frog	<i>Litoria ewingi</i>	Observed, heard
Tyler's Tree Frog	<i>Litoria tyleri</i>	Observed, heard

Conclusions and Recommendations

The GGBF was not recorded during the current surveys, despite ideal conditions (rainfall and warm temperatures) occurring immediately before and during the surveys. However, with the application of the precautionary approach equipped with recent information concerning the breeding cycles occurring later than previously reported in the GGBF population to the north of the subject land, the following recommendations are suggested to increase the probability of detecting the species at Dam 6:

- Targeted surveys should be conducted using the same techniques described in this report on a few more occasions prior to end of the activity period of the species (and preferably after rain) across the NRE Colliery. These surveys should include Dam 6 to accurately determine the presence of the species and the extent of their utilisation (e.g. breeding, foraging, over-winter sites) of the Study Area before the proposal might modify these environments. Breeding success of GGBF can vary substantially from one year to another and based on historical information collected from the Coomaditchy Lagoon, it is strongly influenced by above average rainfall (exceeding 350 mm) during September through to December (Goldingay and Lewis 1999). Thus, conducting surveys on a few occasions at these sites leading up to the end of activity period will increase the chances of detecting the species and place more certainty on the results derived from the surveys conducted to date.

- In conjunction with the surveys recommended above, reference information should be collected from the Edgewood property (former brick pit) where there are known historical and recent records of the species at this site (Arthur White, personal communication, 2010). Amalgamating these surveys is particularly imperative as this population is unlikely to be isolated and may also utilise the subject land.

Please call Kylie Reed at the Biosis Research Wollongong office on (02) 4229 5222 if you have any questions regarding this report.

Yours sincerely,

A handwritten signature in grey ink, appearing to read 'M Roberts', with a long horizontal stroke extending to the right.

Michael Roberts
Senior Consultant Zoologist
Biosis Research Pty Ltd

References

Biosis Research (2010a) 'Additional Green and Golden Bell Frog (*Litoria aurea*) Surveys: NRE No. 1 Colliery.'

Biosis Research (2010b) 'Targeted Green and Golden Bell Frog Frog (*Litoria aurea*) surveys: NRE No. 1 Colliery.'

DEC & DPI (2005) 'Draft Guidelines for Threatened Species Assessment - Part 3A of the Environmental Planning and Assessment Act 1979.' NSW Department of Environment and Conservation and Department of Primary Industries.

DECC (2009) 'Threatened species survey and assessment guidelines: Field survey methods for fauna - Amphibians.' Department of Environment and Climate Change NSW.

DEWHA (2009) 'Matters of National Environmental Significance: Significant Impact Guidelines 1.1.' Commonwealth of Australia, Canberra.

Goldingay R and Lewis B (1999) Development of a conservation strategy for the Green and Golden Bell Frog *Litoria aurea* in the Illawarra Region of New South Wales. *Australian Zoologist* 31, 376-387.

Annex E

January Targeted Surveys Of
Dam 6 For Green And Golden
Bell Frog At No.1 Colliery



Danyil Skora
Gujarat NRE Coking Coal Ltd.
PO Box 281
Fairy Meadow NSW 2519
7th February 2011

Our ref: 12756

**Re: January targeted surveys of Dam 6 for Green and Golden Bell Frog
(*Litoria aurea*) at NRE No. 1 Colliery, Russell Vale.**

Dear Danyil,

Further to subsequent surveys for the Green and Golden Bell Frog *Litoria aurea* between 17th and 20th January, 2011 of Dam 6 at the NRE No. 1 Colliery, please find below the following report.

This report should be read in conjunction with reports from previous surveys of Dam 6 by Biosis Research in May, September and November, 2010 (Biosis Research 2010c; Biosis Research 2010b; Biosis Research 2010a).

Background

Gujarat NRE Coking Coal Limited (hereafter referred to as NRE) is currently seeking approval (under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act)) for the upgrade of surface facilities at the NRE No. 1 Colliery. In order to facilitate this upgrade, it has been identified that Dam 6 will require de-commissioning. Environmental Resources Management Pty. Ltd. (ERM) prepared the Environmental Assessment for the upgrade and identified that Dam 6 contained potential habitat for the Green and Golden Bell Frog (GGBF).

The GGBF has previously been recorded at the NRE Colliery Pit Top Dam in 1997 and 1998 (Goldingay and Lewis 1999). However the species was not recorded in subsequent surveys carried out in 1998 and 1999:

“Six calling bell frogs were detected at a pond within a colliery near Bulli in late 1997 (A. White, pers. comm.). A subadult bell frog was detected there in March 1998 but none was detected in November 1998 or January 1999. We failed to detect bell frogs at one site 1 km north and at two survey sites located approximately 3 km east and north of the occupied site. However, three bell frogs were detected at a disused

brickworks approximately 2 km north-east of the colliery in January 1999 (K. Mills, pers. com.). These observations suggest a very small population is present in the area. White and Pyke (1996) reported three historic locations in this area (Bulli, Thirroul, Woonona) indicating that the area has been an important location for the species over a long period.”

Biosis Research was commissioned by NRE to carry out targeted surveys for the GGBF in May, September and November, 2010. It was acknowledged that the first surveys in May were not conducted at the optimum time for the detection of the GGBF, which is between August and February when this species is known to be most active (DECC 2009). Hence, further targeted surveys for the species at Dam 6 were carried out in September and November. The GGBF was not detected at Dam 6 in any of these previous surveys.

The September and November surveys were used to inform significance assessments following the *Draft Guidelines for Threatened Species Assessment* (DEC & DPI 2005) and the *EPBC Act – Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DEWHA 2009). The assessments concluded that the de-commissioning of Dam 6 would be unlikely to have a significant impact on the GGBF. This outcome was conditional on the following aspects of the proposal being undertaken:

- Targeted surveys should be conducted using the same techniques described in this report on a few more occasions prior to end of the activity period of the species (and preferably after rain) across the NRE Colliery¹. These surveys should include Dam 6 to accurately determine the presence of the species and the extent of their utilisation (e.g. breeding, foraging, over-winter sites) of the Study Area before the proposal might modify these environments. Breeding success of GGBF can vary substantially from one year to another and based on historical information collected from the Coomaditchy Lagoon, it is strongly influenced by above average rainfall (exceeding 350 mm) during September through to December (Goldingay and Lewis 1999). Thus, conducting surveys on a few occasions at these sites leading up to the end of activity period will increase the chances of detecting the species and place more certainty on the results derived from the surveys conducted to date.
- In conjunction with the surveys recommended above, reference information should be collected from the Edgewood property (former brick pit) where there are known historical and recent records of the species at this site (Arthur White, pers. comm., 2010). Amalgamating these surveys is

¹ Note: the current investigations focused on Dam 6 only, as requested in the project Brief.

particularly imperative as this population is unlikely to be isolated and may also utilise the subject land.

In order to continue to address these conditions, NRE commissioned Biosis Research to conduct targeted surveys of Dam 6 for GGBF in January 2011, which forms the basis of this report.

Methodology

Field surveys were undertaken in accordance with DECC (2009), DEWHA² (2009a,b) and DEWHA (2010) guidelines specific to the field survey of threatened frog species in proposed development impact sites.

Surveys were undertaken by zoologists familiar with the advertisement call, ecology and identification of the GGBF over of period of four days/nights between 17th and 20th January 2011. Field surveys were undertaken following the seasonal and climatic recommendations in the guidelines:

- *Seasonal:* January to conform with DECCW and DSEWPC recommendations of between September and February and to target peak breeding season in January and February
- *Weather Conditions:* Warm temperatures, no wind and within one week of heavy rainfall (>50mm in seven days)
- *Timing:* Between dusk and dawn

Temperature, relative humidity and rainfall immediately before and during the survey are presented in the Table below. Approximately 57 mm of rainfall was recorded in early January prior to the surveys, with 44.8 mm of rain recorded between the 9 and 16 January.

Table 1: Weather conditions during field investigations and 7 days prior

Date	Temperature (°C)		Relative Humidity at 3 pm	Rainfall (mm)
	Min	Max		
9	21.1	26.1	84	21.8
10	21.1	25.4	81	14.2
11	20.5	24.7	84	7.0
12	21.1	25.4	84	1.0
13	21.2	23.2	92	0.4
14	20.4	23.9	79	0.2
15	19.4	26.0	82	0
16	20.1	25.2	82	0.2

² Now Department of Sustainability, Environment, Water, Population and Communities (DSEWPC)

Date	Temperature (°C)		Relative Humidity at 3 pm	Rainfall (mm)
	Min	Max		
17	20.4	23.1	82	0 (light drizzle)
18	18.0	22.9	73	0 (light drizzle)
19	17.7	23.4	83	0 (light drizzle)
20	19.7	26.1	84	0

Notes_source: Bureau of Meteorology (2011) – temperature, humidity and rainfall data collected from Bellambi Weather Station. Survey dates are in bold.

A number of potential reference sites in the Illawarra region were recommended by Gary Leonard of Wollongong City Council. Of these, the GGBF had been detected at Port Kembla and Edgewood Estate sites in the 6 months prior to field surveys (Gary Leonard, WCC, and Arthur White pers. comm.). These sites were selected as potential reference sites and visited prior to the survey of Dam 6 each evening.

At Port Kembla, the Port Kembla Heritage Park artificial dam and the Brick and Block dams were visited. Jen Byrne of the Department of Environment, Climate Change and Water assisted with the surveys in these locations on the first night. Due to asbestos issues at the Brick and Block site, access to the dams was limited.

Prior to the commencement of nocturnal surveys a brief diurnal habitat assessment was conducted at Dam 6 and at three reference sites (Port Kembla Heritage Park, the Brick & Block site at Port Kembla and the Edgewood property). These diurnal surveys were undertaken to establish nocturnal survey locations and determine potential access routes.

At the commencement of each nightly survey the Port Kembla Heritage Park and Edgewood reference sites were surveyed to determine whether the species was actively calling or not. During this check an initial five minute passive listening period was undertaken to determine if the species was calling unsolicited. This was followed by a period of call playback in an attempt to elicit the advertisement call of the male GGBF. This was followed by a limited period of active searching, as the purpose of checking reference sites was to determine whether the species was calling.

Dam 6 was then surveyed for a minimum of one hour, after the species had been identified at a nearby reference site on that day. A one hour search is deemed sufficient as the waterbody is <50 metres at greatest length and <0.3 hectares in size. During detailed nocturnal surveys of Dam 6 an initial 5 minute period of passive listening was undertaken to detect the call of male frogs. This was followed by a period of call playback (broadcast of frog calls) in an attempt to elicit a response from any frogs that might be present. Following call playback Dam 6

was then carefully searched for frogs using hand-held spotlights and binoculars for a minimum period of one hour. Searches were undertaken of banks and within emergent and fringing vegetation (*Typha* sp.). Active searching of refuge sites (e.g. under logs, rocks or tin) were also undertaken.

Results

Reference Sites

GGBF were successfully detected both visually and aurally through unsolicited calls and in response to call playback at the Port Kembla Heritage Park reference site each survey night. Records of amphibian species at the Port Kembla Heritage Park reference site during the field survey are listed in the following table:

Table 2: Frog Species Recorded at Port Kembla Heritage Park Reference Site

Common Name	Scientific Name	17/01/2011	18/01/2011	19/01/2011	20/01/2011
Green and Golden Bell Frog	<i>Litoria aurea</i>	1 male responded to call playbacks and 3 individuals observed	2 males responded to call playbacks and 2 individuals observed	2-3 males responded to call playback* and 11 individuals observed	3 males responded to call playback* and 8 individuals observed
Striped Marsh Frog	<i>Limnodynastes peroni</i>	10+ males heard calling and 2 individuals observed	10+ males heard calling and 1 individual observed	10+ males heard calling	7 males heard calling and 3 individuals observed

* During these two surveys GGBF were calling unsolicited

The vegetation and habitat characteristics of the Port Kembla Heritage Park site consisted of planted *Lomandra longifolia* surrounding the dam with a rocky bank and aquatic algae covering the water surface. Small stands of an aquatic reed occur on the southern and western sides of the dam. Many of the GGBFs were observed sitting on beds of algae or within emergent vegetation.

Six ponds occur at the Edgewood Estate property. The vegetation and habitat characteristics of these ponds generally consisted of fringing aquatic vegetation including *Typha* sp. and *Scheonoplectus validus*. Compared to the Port Kembla Heritage Park site, little aquatic algae covered the water surface of the ponds. There was no GGBF recorded during the field surveys at the Edgewood Estate reference site. The species was last recorded here by Arthur White of Biosphere Environmental Consulting. Six GGBF were observed in pond 3 (south of the road) in September – October 2010 however no calling was heard or solicited.

Dam 6

There was no GGBF recorded during the field surveys at Dam 6. Incidental observations of other amphibian species utilising Dam 6 during the field survey are listed in the following table.

Table 2: Frog Species Recorded at Dam 6

Common Name	Scientific Name	17/01/2011	18/01/2011	19/01/2011	20/01/2011
Eastern Common Froglet	<i>Crinia signifera</i>	1 male heard calling	~5 males heard calling	10+ males heard calling	-
Emerald Spotted Tree Frog	<i>Litoria peroni</i>	30+ males heard calling	30+ males heard calling and 1 individual observed	30+ males heard calling	25+ males heard calling and 4 individuals observed
Southern Brown Tree Frog	<i>Litoria ewingi</i>	~5 males heard calling	1 male heard calling	-	-
Striped Marsh Frog	<i>Limnodynastes peroni</i>	30+ males heard calling and 2 individuals observed	30+ males heard calling	30+ males heard calling	20+ males heard calling and 1 individual observed
Tyler's Tree Frog	<i>Litoria tyleri</i>	10+ males heard calling and 2 individuals observed	10+ males heard calling	1 male heard calling	~5 males heard calling

The vegetation and habitat characteristics of Dam 6 were mostly consistent with the previous surveys carried out by Biosis Research in May, September and November, 2010. The only exception was that aquatic vegetation once again increased in density to approximately 80% cover (previously 60% in September and 75% in November). The density and height of the dominant vegetation types, *Typha* sp. and *Scheonoplectus validus*, had also increased since the previous surveys. These differences are in response to the regrowth of *Typha* sp. and *Scheonoplectus validus* following the senescence of these species over the winter period and high rainfalls in summer.

Conclusions and Recommendations

Over the 2010-2011 period, 13 nights of survey have been carried out in total at Dam 6. Despite ideal conditions occurring immediately before and during the surveys, as established by the successful detection and use of call playbacks at the Port Kembla Heritage Park reference site, no GGBF were detected at Dam 6.

It can be concluded that the species is not present at Dam 6. The closest record of the GGBF in the Locality is at the NRE Colliery Pit Top Dam in 1997 and 1998, however no records of the species at Dam 6 have been recorded or documented (Gary Leonard pers. comm.).

Although Dam 6 is an unshaded, still waterbody containing emergent vegetation (as described suitable habitat in DEWHA 2010), no floating aquatic vegetation exists which is crucial for breeding males when emitting their calls and the cover of emergent vegetation across the dam is very high (80% during current surveys). Furthermore, the Subject Site does not contain similar habitat to that at the Port Kembla reference site, known to host permanent, large populations of the species, or at the Edgewood Property.

Given that the GGBF has not been detected at Dam 6 and suitable habitat, as previously identified, is not present the proposal, which includes the decommissioning of Dam 6, is not likely to have an impact on the GGBF and no further assessments are required under the TSC or EPBC Act.

Please call Kylie Reed at the Biosis Research Wollongong office on (02) 4229 5222 if you have any questions regarding this report.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Kylie Reed', written in a cursive style.

Kylie Reed

Zoologist

Biosis Research Pty Ltd

Acknowledgments

- Jen Byrne of the Department of Environment, Climate Change and Water assisted with the surveys in these locations on the first night.
- Arthur White of Biosphere Environmental Consultants for allowing permission to survey his monitoring sites at the Edgewood Estate property and for providing information on latest records of GGBF in the Woonona locality.
- Gary Leonard of Wollongong City Council for reference site suggestions and latest reports addressing GGBF in the Illawarra.

References

Biosis Research (2010a) *'Additional Green and Golden Bell Frog (Litoria aurea) Surveys: NRE No. 1 Colliery.'* Gujarat NRE Coking Coal Limited.

Biosis Research (2010b) *'Targeted Green and Golden Bell Frog Frog (Litoria aurea) surveys: NRE No. 1 Colliery.'* Gujarat NRE Coking Coal Limited.

Biosis Research (2010c) *'Additional Green and Golden Bell Frog Frog (Litoria aurea) surveys: NRE No. 1 Colliery.'* Gujarat NRE Coking Coal Limited.

DEC & DPI (2005) *'Draft Guidelines for Threatened Species Assessment - Part 3A of the Environmental Planning and Assessment Act 1979.'* NSW Department of Environment and Conservation and Department of Primary Industries.

DECC (2009) *Threatened species survey and assessment guidelines: field survey methods for fauna: Amphibians.* Department of Environment, Climate Change and Water. Hurstville, NSW

DEWHA (2009a) *'Matters of National Environmental Significance: Significant Impact Guidelines 1.1.'* Commonwealth of Australia, Canberra.

DEWHA (2009b). *Survey Guidelines for Australia's threatened frog: Guidelines for detecting frogs listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.* Department of Sustainability, Environment, Water, Population and Communities.

DEWHA (2010) *Significant impact guidelines for the vulnerable green and golden bell frog (Litoria aurea) EPBC Act policy statement 3.19 Nationally threatened species and ecological communities guidelines.* Department of the Environment, Water, Heritage and the Arts.

Goldingay R and Lewis B (1999) *Development of a conservation strategy for the Green and Golden Bell Frog Litoria aurea in the Illawarra Region of New South Wales.* Australian Zoologist 31, 376-387.

Annex F

EPBC Protected Matters Search



EPBC Act Protected Matters Report: Coordinates

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.

You may wish to print this report for reference before moving to other pages or websites.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Report created: 03/02/11 10:16:48

[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: 10Km

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 - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	Relevant
Threatened Ecological Communities:	None
Threatened Species:	55
Migratory Species:	51

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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	12
Commonwealth Heritage Places:	None
Listed Marine Species:	64

Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

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

Place on the RNE:	25
State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	17
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Areas

[\[Resource Information \]](#)

Approval may be required for a proposed activity that is likely to have a significant impact on the environment in a Commonwealth Marine Area, when the action is outside the Commonwealth Marine Area, or the environment anywhere when the action is taken within the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

EEZ and Territorial Sea

Threatened Species

[\[Resource Information \]](#)

Name	Status	Type of Presence
BIRDS		
Anthochaera phrygia		
Regent Honeyeater [82338]	Endangered	Species or species habitat may occur within area
Diomedea exulans amsterdamensis		
Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
Diomedea exulans antipodensis		
Antipodean Albatross [82269]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans exulans		
Tristan Albatross [82337]	Endangered	Foraging, feeding or related behaviour may occur within area
Diomedea exulans gibsoni		
Gibson's Albatross [82271]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster		

Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera		
Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta		
Kermadec Petrel (western) [64450]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri		
Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta		
Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta salvini		
Salvin's Albatross [82343]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi		
White-capped Albatross [82344]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida		
Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area

FISH

[Maccullochella macquariensis](#)

Trout Cod [26171]	Endangered	Species or species habitat likely to occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area

FROGS

[Heleioporus australiacus](#)

Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Litoria littlejohni		
Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Mixophyes balbus		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area

MAMMALS

[Balaenoptera musculus](#)

Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland population)		

Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] Eubalaena australis	Endangered	Species or species habitat may occur within area
Southern Right Whale [40] Isoodon obesulus obesulus	Endangered	Species or species habitat known to occur within area
Southern Brown Bandicoot [68050] Megaptera novaeangliae	Vulnerable	Species or species habitat known to occur within area
Humpback Whale [38] Potorous tridactylus tridactylus	Vulnerable	Species or species habitat may occur within area
Long-nosed Potoroo (SE mainland) [66645] Pseudomys novaehollandiae	Vulnerable	Species or species habitat likely to occur within area
New Holland Mouse [96] Pteropus poliocephalus	Vulnerable	Roosting known to occur within area

PLANTS

Caladenia tessellata	Vulnerable	Species or species habitat likely to occur within area
Thick-lipped Spider-orchid, Daddy Long-legs [2119] Cryptostylis hunteriana	Vulnerable	Species or species habitat may occur within area
Leafless Tongue-orchid [19533] Cynanchum elegans	Endangered	Species or species habitat likely to occur within area
White-flowered Wax Plant [12533] Daphnandra johnsonii	Endangered	Species or species habitat likely to occur within area
a tree [67186] Melaleuca biconvexa	Vulnerable	Species or species habitat may occur within area
Biconvex Paperbark [5583] Melaleuca deanei	Vulnerable	Species or species habitat may occur within area
Deane's Melaleuca [5818] Pterostylis gibbosa	Endangered	Species or species habitat likely to occur within area
Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562] Pterostylis saxicola	Endangered	Species or species habitat may occur within area
Sydney Plains Greenhood [64537] Pultenaea aristata	Vulnerable	Species or species habitat likely to occur within area
[18062] Thelymitra sp. Kangaloon (D.L.Jones 18108)	Critically Endangered	Species or species habitat likely to occur within area
Kangaloon Sun-orchid [81971]		

REPTILES

Caretta caretta	Endangered	Species or species habitat likely to occur within area
Loggerhead Turtle [1763]		

Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area

SHARKS

Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat may occur within area
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Migratory Species

[Resource Information]

Name	Status	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]		Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]		Foraging, feeding or related behaviour may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area

Macronectes halli	Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera	Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Puffinus leucomelas	Streaked Shearwater [66541]		Species or species habitat may occur within area
Sterna albifrons	Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri	Buller's Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto)	Shy Albatross, Tasmanian Shy Albatross [64697]		Species or species habitat may occur within area
Thalassarche impavida	Campbell Albatross [64459]		Species or species habitat may occur within area
Thalassarche melanophris	Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini	Salvin's Albatross [64463]		Species or species habitat may occur within area
Thalassarche steadi	White-capped Albatross [64462]		Species or species habitat may occur within area
Migratory Marine Species			
Balaenoptera edeni	Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus	Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata	Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias	Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta	Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas	Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata	Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis	Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Lagenorhynchus obscurus	Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae	Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus	Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area

[Orcinus orca](#)

Killer Whale, Orca [46]

Species or species habitat may occur within area

[Rhincodon typus](#)

Whale Shark [66680]

Vulnerable

Species or species habitat may occur within area

Migratory Terrestrial Species

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]

Species or species habitat likely to occur within area

[Hirundapus caudacutus](#)

White-throated Needletail [682]

Species or species habitat may occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

[Monarcha melanopsis](#)

Black-faced Monarch [609]

Breeding may occur within area

[Myiagra cyanoleuca](#)

Satin Flycatcher [612]

Breeding likely to occur within area

[Neophema chrysogaster](#)

Orange-bellied Parrot [747]

Critically
Endangered

Species or species habitat may occur within area

[Rhipidura rufifrons](#)

Rufous Fantail [592]

Breeding may occur within area

[Xanthomyza phrygia](#)

Regent Honeyeater [430]

Species or species habitat may occur within area

Migratory Wetlands Species

[Ardea alba](#)

Great Egret, White Egret
[59541]

Species or species habitat may occur within area

[Ardea ibis](#)

Cattle Egret [59542]

Species or species habitat may occur within area

[Arenaria interpres](#)

Ruddy Turnstone [872]

Species or species habitat known to occur within area

[Calidris alba](#)

Sanderling [875]

Species or species habitat known to occur within area

[Calidris canutus](#)

Red Knot, Knot [855]

Species or species habitat known to occur within area

[Charadrius bicinctus](#)

Double-banded Plover [895]

Species or species habitat known to occur within area

[Gallinago hardwickii](#)

Latham's Snipe, Japanese Snipe
[863]

Species or species habitat may occur within area

[Limosa lapponica](#)

Bar-tailed Godwit [844]

Species or species habitat known to occur within area

[Rostratula benghalensis s. lat.](#)

Painted Snipe [889]

Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

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

Defence - AIRTC WOLLONGONG

Defence - WOLLONGONG MULTI-USER DEPOT

Commonwealth Land - Australian Postal Commission

Commonwealth Land - Director of War Service Homes

Commonwealth Land - Commonwealth Trading Bank of Australia

Commonwealth Land - Telstra Corporation Limited

Defence - HYDROGRAPHIC OFFICE

Commonwealth Land - Australian Postal Corporation

Defence - Graovac House

Defence - TS ALBATROSS-WOLLONGONG

Commonwealth Land - Defence Housing Authority

Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

Name	Status	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris alba		
Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]		Species or species habitat known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Catharacta skua		
Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius ruficapillus		
Red-capped Plover [881]		Species or species habitat known to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]		Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]		Foraging, feeding or related behaviour may occur within area

[Diomedea exulans \(sensu lato\)](#)

Wandering Albatross [1073] Vulnerable

Species or species habitat may occur within area

[Diomedea gibsoni](#)

Gibson's Albatross [64466]

Species or species habitat may occur within area

[Gallinago hardwickii](#)

Latham's Snipe, Japanese Snipe [863]

Species or species habitat may occur within area

[Haliaeetus leucogaster](#)

White-bellied Sea-Eagle [943]

Species or species habitat likely to occur within area

[Hirundapus caudacutus](#)

White-throated Needletail [682]

Species or species habitat may occur within area

[Lathamus discolor](#)

Swift Parrot [744]

Endangered

Species or species habitat likely to occur within area

[Limosa lapponica](#)

Bar-tailed Godwit [844]

Species or species habitat known to occur within area

[Macronectes giganteus](#)

Southern Giant-Petrel [1060]

Endangered

Species or species habitat may occur within area

[Macronectes halli](#)

Northern Giant-Petrel [1061]

Vulnerable

Species or species habitat may occur within area

[Merops ornatus](#)

Rainbow Bee-eater [670]

Species or species habitat may occur within area

[Monarcha melanopsis](#)

Black-faced Monarch [609]

Breeding may occur within area

[Myiagra cyanoleuca](#)

Satin Flycatcher [612]

Breeding likely to occur within area

[Neophema chrysogaster](#)

Orange-bellied Parrot [747]

Critically
Endangered

Species or species habitat may occur within area

[Rhipidura rufifrons](#)

Rufous Fantail [592]

Breeding may occur within area

[Rostratula benghalensis s. lat.](#)

Painted Snipe [889]

Species or species habitat may occur within area

[Sterna albifrons](#)

Little Tern [813]

Species or species habitat may occur within area

[Thalassarche bulleri](#)

Buller's Albatross [64460]

Vulnerable

Species or species habitat may occur within area

[Thalassarche cauta \(sensu stricto\)](#)

Shy Albatross, Tasmanian Shy Albatross [64697]

Species or species habitat may occur within area

[Thalassarche impavida](#)

Campbell Albatross [64459]

Species or species habitat may occur within area

[Thalassarche melanophris](#)

Black-browed Albatross [66472] Vulnerable

Species or species habitat may occur within area

[Thalassarche salvini](#)

Salvin's Albatross [64463]

Species or species habitat may occur within area

[Thalassarche steadi](#)

White-capped Albatross [64462]

Species or species habitat may occur within area

Fish

[Acentronura tentaculata](#)

Shortpouch Pygmy Pipehorse [66187] Festucalex cinctus	Species or species habitat may occur within area
Girdled Pipefish [66214] Filicampus tigris	Species or species habitat may occur within area
Tiger Pipefish [66217] Heraldia nocturna	Species or species habitat may occur within area
Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227] Hippichthys penicillus	Species or species habitat may occur within area
Beady Pipefish, Steep-nosed Pipefish [66231] Hippocampus abdominalis	Species or species habitat may occur within area
Bigbelly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233] Hippocampus whitei	Species or species habitat may occur within area
White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240] Histiogamphelus briggsii	Species or species habitat may occur within area
Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242] Lissocampus runa	Species or species habitat may occur within area
Javelin Pipefish [66251] Maroubra perserrata	Species or species habitat may occur within area
Sawtooth Pipefish [66252] Notiocampus ruber	Species or species habitat may occur within area
Red Pipefish [66265] Phyllopteryx taeniolatus	Species or species habitat may occur within area
Common Seadragon, Weedy Seadragon [66268] Solegnathus spinosissimus	Species or species habitat may occur within area
Spiny Pipehorse, Australian Spiny Pipehorse [66275] Solenostomus cyanopterus	Species or species habitat may occur within area
Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] Solenostomus paegnius	Species or species habitat may occur within area
Rough-snout Ghost Pipefish [68425] Solenostomus paradoxus	Species or species habitat may occur within area
Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184] Stigmatopora argus	Species or species habitat may occur within area
Spotted Pipefish, Gulf Pipefish [66276] Stigmatopora nigra	Species or species habitat may occur within area
Widebody Pipefish, Wide-bodied Pipefish, Black	Species or species habitat may occur within area

Pipefish [66277]

[Syngnathoides biaculeatus](#)

Double-end Pipehorse,
Double-ended Pipehorse,
Alligator Pipefish [66279]

Species or species habitat may occur within area

[Trachyrhamphus bicoarctatus](#)

Bentstick Pipefish, Bend Stick
Pipefish, Short-tailed Pipefish
[66280]

Species or species habitat may occur within area

[Urocampus carinirostris](#)

Hairy Pipefish [66282]

Species or species habitat may occur within area

[Vanacampus margaritifer](#)

Mother-of-pearl Pipefish
[66283]

Species or species habitat may occur within area

Mammals

[Arctocephalus forsteri](#)

New Zealand Fur-seal [20]

Species or species habitat may occur within area

[Arctocephalus pusillus](#)

Australian Fur-seal,
Australo-African Fur-seal [21]

Species or species habitat may occur within area

Reptiles

[Caretta caretta](#)

Loggerhead Turtle [1763] Endangered

Species or species habitat likely to occur within area

[Chelonia mydas](#)

Green Turtle [1765] Vulnerable

Species or species habitat known to occur within area

[Dermochelys coriacea](#)

Leatherback Turtle, Leathery
Turtle, Luth [1768] Endangered

Species or species habitat likely to occur within area

[Eretmochelys imbricata](#)

Hawksbill Turtle [1766] Vulnerable

Species or species habitat known to occur within area

[Natator depressus](#)

Flatback Turtle [59257] Vulnerable

Species or species habitat likely to occur within area

Whales and Other Cetaceans

[**Resource Information**]

Name	Status	Type of Presence
------	--------	------------------

Mammals

[Balaenoptera acutorostrata](#)

Minke Whale [33]

Species or species habitat may occur within area

[Balaenoptera edeni](#)

Bryde's Whale [35]

Species or species habitat may occur within area

[Balaenoptera musculus](#)

Blue Whale [36] Endangered

Species or species habitat may occur within area

[Caperea marginata](#)

Pygmy Right Whale [39]

Species or species habitat may occur within area

[Delphinus delphis](#)

Common Dolphin, Short-beaked
Common Dolphin [60]

Species or species habitat may occur within area

[Eubalaena australis](#)

Southern Right Whale [40] Endangered

Species or species habitat known to occur within area

Grampus griseus		Risso's Dolphin, Grampus [64]	Species or species habitat may occur within area
Lagenorhynchus obscurus		Dusky Dolphin [43]	Species or species habitat may occur within area
Megaptera novaeangliae	Vulnerable	Humpback Whale [38]	Species or species habitat known to occur within area
Orcinus orca		Killer Whale, Orca [46]	Species or species habitat may occur within area
Tursiops aduncus		Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]	Species or species habitat likely to occur within area
Tursiops truncatus s. str.		Bottlenose Dolphin [68417]	Species or species habitat may occur within area

Extra Information

Places on the RNE

[Resource Information]

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
Loddens Creek Catchment NSW	Indicative Place
Upper Nepean Water Catchment NSW	Indicative Place
Austinmer Beach Geological Site NSW	Registered
Indigenous	
Bulli Area NSW	Registered
Historic	
Austinmer Railway Station Group NSW	Indicative Place
Austinmer War Memorial NSW	Indicative Place
Barracks Headquarters and Quartermasters Building NSW	Indicative Place
Cataract Dam & Reservoir NSW	Indicative Place
Corrimal Colliery Ruins and Shaft NSW	Indicative Place
Glastonbury Gardens NSW	Indicative Place
Gleniffer Brae Manor House and Garden NSW	Indicative Place
Greenhill Garden NSW	Indicative Place
Hillside Garden NSW	Indicative Place
Illawarra Escarpment NSW	Indicative Place
Mount Keira Summit Park NSW	Indicative Place
Thirroul Soldiers Memorial NSW	Indicative Place
Trooper Andrews Memorial Drinking Fountain NSW	Indicative Place
Wollongong Memorial Arch NSW	Indicative Place
Belmore Basin Lighthouse NSW	Registered
Bulli Family Hotel NSW	Registered
Courthouse (former) NSW	Registered
Illawarra Historical Museum NSW	Registered
Little Milton NSW	Registered
Wollongong Courthouse NSW	Registered
Wollongong Harbour (part) NSW	Registered

State and Territory Reserves

[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
Mammals		
Capra hircus		
Goat [2]		Species or species habitat may occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat may occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides		
Alligator Weed [11620]		Species or species habitat may occur within area
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat may occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Nassella trichotoma		
Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat may occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		

Blackberry, European
Blackberry [68406] Species or species habitat likely to occur within area

[Salix spp. except S.babylonica, S.x calodendron & S.x reichardtiji](#)

Willows except Weeping
Willow, Pussy Willow and
Sterile Pussy Willow [68497] Species or species habitat may occur within area

[Salvinia molesta](#)

Salvinia, Giant Salvinia,
Aquarium Watermoss, Kariba
Weed [13665] Species or species habitat may occur within area

[Ulex europaeus](#)

Gorse, Furze [7693] Species or species habitat may occur within area

Caveat

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

This report is designed to assist in identifying the 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 Heritage and Register of National Estate properties, Wetlands of International 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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

150.89522 -34.3626

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:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA 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, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- Other groups and individuals

Environment Australia 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.

[Department of Sustainability, Environment, Water, Population and Communities](#)

GPO Box 787

Canberra ACT 2601 Australia

+61 2 6274 1111 [ABN](#)

| [Australian Government](#) |

ERM has over 100 offices
across the following
countries worldwide

Australia	Netherlands
Argentina	Peru
Belgium	Poland
Brazil	Portugal
China	Puerto Rico
France	Singapore
Germany	Spain
Hong Kong	Sri Lanka
Hungary	Sweden
India	Taiwan
Indonesia	Thailand
Ireland	UK
Italy	USA
Japan	Venezuela
Korea	Vietnam
Malaysia	
Mexico	

Environmental Resources Management

Building C, 33 Saunders Street
Pyrmont NSW 2009
Locked Bag 24,
Broadway NSW 2007

T: 61 2 8584 8888
F: 61 2 8584 8800
www.erm.com

