

CROOKWELL 2 WIND FARM
TURBINE MICROSITING BIODIVERSITY
MANAGEMENT PLAN

Crookwell Development Pty. Ltd.



Brett Lane & Associates Pty. Ltd.
Ecological Research & Management

Suite 5 61 - 63 Camberwell Road, Hawthorn, VIC 3123

P.O. Box 337, Camberwell, VIC 3124

Ph. (03) 9815 2111

Fax. (03) 9815 2685

March 2016

Report No. 8172 (6.2)

CONTENTS

1. INTRODUCTION..... 1

2. BACKGROUND 2

 2.1. Project description 2

 2.2. TMBMP objectives 2

 2.3. Existing Ecological Conditions..... 2

3. TURBINE MICROSITING BIODIVERSITY CHECKLIST 5

4. CROOKWELL 2 WIND FARM BIODIVERSITY CONSIDERATIONS 6

 4.1. Waterbodies and watercourses 6

 4.2. Scattered Trees 7

 4.3. Groups of trees (including woodland and forest vegetation)..... 7

 4.4. Rocky Outcrops 8

5. REFERENCES..... 10

TABLES

Table 1: Turbine Micrositing Biodiversity Management Checklist..... 5

FIGURES

Figure 1: Crookwell 2 Wind Farm Mod-2 Layout..... 4

1. INTRODUCTION

The Crookwell 2 Wind Farm Mod-2 development proposal comprises up to 33 wind turbines on a 2,088 hectare area centred 14 km south-east of Crookwell in the Southern Tablelands of New South Wales. The Mod-2 proposal differs from the Mod1 approved development in the following aspects:

- Reduced number of turbines;
- Increase in height of turbines;
- Increase in blade length with an increase in rotor sweep area (RSA); and
- Provision for micrositing of turbines within a 100 meter radius of the approved turbine location as part of Mod-1 application.

Crookwell Development Pty Ltd have engaged Brett Lane & Associates (BL&A) to prepare a Turbine Micrositing Biodiversity Management Plan (TMBMP) to make certain that any potential future micrositing of turbines does not result in impacts to biodiversity beyond those outlined in the Crookwell 2 Wind Farm: Supplementary Ecological Impact Assessment of Proposed Modifications (Mod-2) (BL&A 2016) for which Crookwell Development Pty Ltd is seeking development consent. This Turbine Micrositing Biodiversity Management Plan (TMBMP) details objectives and strategies to this end. It is divided into the sections described below.

Section 2 discusses the project background and existing ecological site conditions.

Section 3 provides a check-list to be utilised in the case of turbine micrositing to manage risks to biodiversity values.

Section 4 outlines the ecological basis behind items in the checklist, and details further mitigation measures to be implemented should the conditions in the check-list not be met.

This Plan was prepared by a team from BL&A, comprising Teisha Lay (Zoologist), Elinor Ebsworth (Botanist), Alan Brennan (Senior Ecologist & Project Manager), Bernard O'Callaghan (Senior Ecologist & Project Manager) and Brett Lane (Principal Consultant).

2. BACKGROUND

This section outlines the project to which this TMBMP relates as well as the context in which the TMBMP is to operate.

2.1. Project description

The Crookwell 2 Wind Farm Mod-2 development proposal comprises up to 33 wind turbines on a 2,088 hectare area centred 14 km south-east of Crookwell in the Southern Tablelands of New South Wales.

A range of turbine designs are currently being considered by Crookwell Development Pty Ltd. These comprise a tower with a maximum height of 95 meters and a rotor diameter of up to 130 meters. This would result in a maximum height to blade tip of 160 meters and a minimum RSA height of 30 meters.

The proposed layout of turbines and associated infrastructure for the Crookwell 2 Wind Farm Mod-2 proposal is shown in Figure 1. To maintain flexibility within design, Crookwell Development Pty Ltd is seeking approval to micro-site turbines within a 100 meter radius of the proposed turbine locations as approved in Mod-1 application shown in Figure 1.

2.2. TMBMP objectives

The objectives of this TMBMP are to:

- Identify habitats of ecological sensitivity on the Crookwell 2 Wind Farm site;
- Provide a checklist to avoid potential additional impacts to biodiversity – beyond those approved in the Mod-2 development consent (once issued) – resulting from micrositing of turbines; and
- Provide mitigation measures for the project should potential impacts to biodiversity resulting from micrositing of turbines, beyond those approved in the Mod-2 development consent (once issued), be identified.

Mitigation activities are aimed at avoiding or reducing potential impacts. Mitigation measures are to be incorporated into the design of the development so that impacts are unlikely to occur. Avoiding impacts is given precedence, followed by measures to reduce impacts. Usually a combination of both will ultimately benefit fauna and flora species.

2.3. Existing Ecological Conditions

2.3.1. Fauna

Fauna habitats within the Crookwell 2 Wind Farm site are documented in URS 2004a. Dominant habitat types for fauna include the following:

- Introduced grassland;
- Native grassland;
- Woodland;
- Gully reedland/sedgeland;
- Paddock trees and windrows; and
- Aquatic habitat including farm dams.

Mapping of these habitats indicates introduced grassland dominates the proposed Crookwell 2 Wind Farm site. In addition, aquatic habitats were degraded with poor fringing vegetation. Whilst the survey sites supported some granite outcrops, the vegetation was highly modified (improved pasture and weeds) and the river corridor highly eroded. Large patches of woodland habitat occur mostly outside the wind farm boundary. A few smaller patches are scattered throughout the site, mostly to the north and west. Low bird diversity and abundance reflects the paucity of treed habitat within and surrounding the wind farm site.

It was concluded that no major waterbird habitat occurs on the wind farm site or in the locality. Pejar Dam, Lake Pejar and Lake Edward are water storages that do not provide suitable habitat for a wide diversity of waterbirds and shorebirds that typically require gentle sloping shorelines, substantial areas of fringing vegetation and mudflats for feeding (URS 2004a).

The *Crookwell 2 Wind Farm: Supplementary Ecological Impact Assessment of Mod-2* (BL&A 2016) determined the proposed Mod-2 layout will not impact on threatened fauna species and their habitat beyond that allowed for under the Mod1 approved development. This includes a provision in the Mod-2 proposal for micrositing turbines within a 100 meter radius of the designated turbine location approved in Mod-1 application. Biodiversity considerations for turbine micrositing are described in Section 4.

2.3.2. Flora

Vegetation within the Crookwell 2 Wind Farm site was previously mapped and documented by URS (2004a) and Biosis Research (2009). Exotic grassland (improved pasture) dominated the site, with small patches of native vegetation on and adjacent to the site. The *Crookwell 2 Wind Farm: Supplementary Ecological Impact Assessment of Mod-2* (BL&A 2016) has determined that the proposed Mod-2 layout will not impact on native vegetation, threatened flora or listed communities beyond that allowed for under the Mod-1 approved development.

We note the Mod-2 proposal provides for micrositing turbines within a 100 metre radius of each designated turbine location approved in Mod-1 application.

Native grassland may provide habitat for the TSC Act-listed Little Whip Snake and Pink-tailed Legless-lizard, and the threatened flora species Hoary Sunray, Basalt Peppercreess and Austral Toadflax (Biosis Research 2009). If the groundcover comprises more than 50% of species native to NSW, then the grassland will also constitute a native vegetation community. Areas of native grassland may also qualify as the EPBC Act-listed community Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory.

It is note that native grassland (*Themeda* dominated) was recorded outside of the wind farm boundary (URS 2004a). This vegetation was later categorised as woodland (Biosis 2009). It is therefore unlikely that any native grassland and specialist grassland species would experience impacts from micrositing.

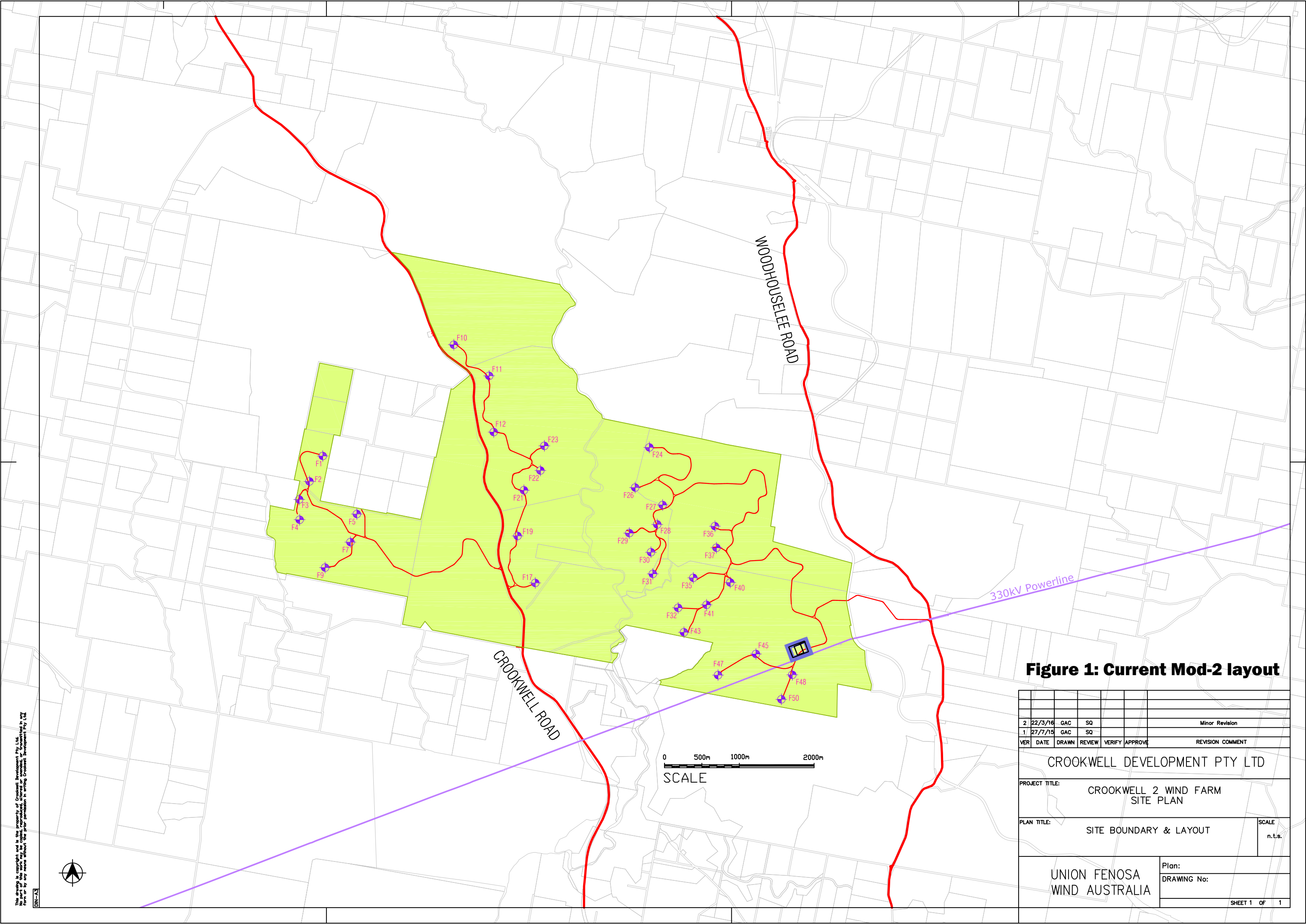


Figure 1: Current Mod-2 layout

2	22/3/16	GAC	SQ			Minor Revision
1	27/7/15	GAC	SQ			
VER	DATE	DRAWN	REVIEW	VERIFY	APPROVE	REVISION COMMENT
CROOKWELL DEVELOPMENT PTY LTD						
PROJECT TITLE:		CROOKWELL 2 WIND FARM SITE PLAN				
PLAN TITLE:		SITE BOUNDARY & LAYOUT				SCALE: n.t.s.
UNION FENOSA WIND AUSTRALIA		Plan:		DRAWING No:		
SHEET 1 OF 1						

This drawing is controlled by the company of Crookwell Development Pty Ltd. No part of this drawing may be copied, reproduced, stored or transmitted in any form or by any means without the prior permission in writing Crookwell Development Pty Ltd.



3. TURBINE MICROSITING BIODIVERSITY CHECKLIST

This check-list should be used for *each turbine* where micrositing is to occur. Where the answer to *all* questions is “No”, no further consideration of biodiversity is required and micrositing can proceed without further investigation or assessment. If the answer to any question is “Yes”, further consideration of biodiversity with regards to turbine location within the Crookwell 2 Wind Farm Site is required. The nature of this consideration can be determined from the relevant section in Chapter 4 of this document.

Table 1: Turbine Micrositing Biodiversity Management Checklist

Is the proposed microsited turbine location...	YES	NO
Closer to a water body and watercourse than the proposed Mod-2 siting.	See section 4.1	No further consideration of biodiversity required – micrositing can proceed without further investigation or assessment
Closer to a scattered tree with a known raptor nest than the proposed Mod-2 siting.	See section 4.2	
Closer to a group of trees (including woodland and forest vegetation) than the proposed Mod-2 siting.	See section 4.3	
Closer to an area of rocky outcrop than the proposed Mod-2 siting.	See section 4.4	

4. CROOKWELL 2 WIND FARM BIODIVERSITY CONSIDERATIONS

4.1. Waterbodies and watercourses

4.1.1. Habitat Provision

Farm dams and creeks may potentially provide habitat for common frogs, waterbirds and bats (Eastern Bent-wing bat and Eastern False Pipistrelle). As such, placement of turbines at closer proximity than approved Mod-2 may potentially increase the collision risk to birds and bats which utilise aquatic habitat for foraging and breeding purposes.

The majority of turbine sites are situated away from major bodies of water, these being Wollondilly River, Pejar Dam and the small natural lakes to the north of the wind farm site. If required, the mitigation measures presented below should be implemented.

4.1.2. Mitigation measures

To reduce the risk associated with aquatic and terrestrial habitats, the following mitigation measures should be considered:

- Negative impacts on aquatic habitats will be avoided by micrositing turbines and other wind farm infrastructure (e.g. tracks, hard stand areas and underground or overground power cabling) no closer than the approved distance or as a result of micro-siting at least 30 metres away from aquatic habitat;
- The proposed micrositing must avoid causing significant hydrological changes and consequent impacts to drainage lines;
- Where proposed roads intersect suitable frog habitats such as vegetated creeks or drainage lines, crossings must be constructed to minimise impacts to populations during and post- construction;
- Retain terrestrial habitats and dispersal corridors:
 - Incorporate appropriate buffer zones (30 metre minimum from edge of water) along waterways and waterbodies;
 - Ensure terrestrial connectivity is retained from wildlife corridors such as drainage lines, creeks and rivers, to water bodies that are within 200 metres from corridors by avoiding or minimising the removal of native vegetation; and
 - Maintain existing hydrological regimes.
- Manage terrestrial weeds manually and without chemicals within 30 metres of waterways; and
- Best practice erosion control measures will be implemented prior to the commencement of construction activities and continue throughout the operation of the wind farm.

The URS report (URS 2004a) indicated that one (unspecified) turbine is proposed to be situated within 60 metres of a farm dam on the 'Ahgunyah' property. The

placement of the turbine should be no closer to the dam and mitigation measure implemented.

4.2. Scattered Trees

4.2.1. Habitat provision

Scattered trees may provide habitat for forest bats and other species such as the small mammals and raptors, which may sometimes build nests in scattered trees. If a raptor nest is present, turbines are to be moved as part of the micro-siting no closer to the nest. In other cases, proposed mitigation measures are provided below.

4.2.2. Mitigation measures

To reduce the risk associated with scattered tree loss, the following mitigation measures should be considered:

- The removal of scattered trees due to micro-siting should be avoided wherever possible and otherwise minimised;
- Surveys of scattered trees proposed for removal to determine the presence of fauna in hollows; and
- Any fauna found in scattered trees during pre-construction surveys must be removed by a qualified wildlife handler and translocated to similar nearby habitat before trees are removed.

4.3. Groups of trees (including woodland and forest vegetation)

4.3.1. Habitat Provision

Groups of trees (including woodland and forest vegetation) may provide habitat for a number of fauna species, namely Brown Treecreeper, Diamond Firetail, Hooded Robin, Gang Gang Cockatoo, Speckled Warbler, Koala, raptors and threatened bat species (Eastern Bent-wing Bat and Eastern False Pipistrelle). These species are considered likely to occur in woodland habitat surrounding the wind farm site (Biosis Research 2009).

If groups of trees are indigenous, it may constitute part of a vegetation community. Woodland vegetation communities may also provide habitat for the threatened flora species Yass Daisy, Basalt Peppercreess, Michelago Parrot-pea, Camden Woollybutt, Mongarlowe Mallee, Buttercup Doubletail, Cotoneaster Pomaderris and Austral Toadflax (Biosis Research 2009).

As such, placement of turbines closer through micro-siting than currently permitted to groups of trees may result in direct (clearance) or indirect (e.g. sedimentation) impacts on native vegetation and removal of threatened flora species and habitat for threatened fauna species. This should be avoided, and if not able to be avoided should be mitigated as outlined below.

4.3.2. Mitigation measures

To maximise the effectiveness of mitigation measures to avoid impacts on the threatened woodland communities and flora and fauna species, the following will be employed:

- Turbines situated should be sited no closer to woodland remnants where bird and bat activity is most frequent and in particular turbines F1 to F4 and F24, which are located adjacent to woodland remnants, should be sited away rather than towards the woodland to avoid and minimise impacts on vegetation, flora and fauna populations;
- Retain and maintain all wildlife corridors by avoiding the removal of groups of trees wherever possible;
- Include buffer zones around woodland habitat of at least 30 metres of grassed land; and
- Weed control, by an experienced contractor, is to be carried out along disturbed areas to control any weed outbreaks close to woodlands after construction is completed.

4.4. Rocky Outcrops

4.4.1. Habitat Provision

Rocky outcrops may provide habitat for the TSC Act-listed Little Whip Snake and Pink-tailed Legless-lizard. Turbine construction within areas of rocky outcrops may require the removal of surface rocks. This may represent a temporary, small and localised loss of sheltering habitat for a range of common and widespread reptiles recorded and predicted to occur across the wind farm site as well as for the TSC Act-listed Little Whip Snake and Pink-tailed Legless-lizard. It should be noted that turbine sites which contain rocky habitat support no native grassland/grassy woodland habitat favoured by the Little Whip Snake and Pink-tailed Legless-lizard and do not link with any areas of native grassland or woodland (URS 2004a).

The potential habitat loss and increase in the likelihood of injury to any sheltering reptiles is considered to be negligible given the limited extent of impact and the presence of suitable rocky habitat outside the turbine sites on these particular ridges (URS 2004a). The original assessment (URS 2004a) indicated that impacts on these threatened species – Little Whip Snake and Pink-tailed Legless-lizard – were unlikely as these species were not detected during targeted surveys are so are considered unlikely to occur.

However, it is recommended that turbines and associated infrastructure are placed no closer to any rocky outcrops. However, if this is not possible, the following mitigation measures are proposed.

4.4.2. Mitigation measures

To maximise the effectiveness of mitigation measures to avoid potential impacts on the species living within rocky outcrops the following are recommended to be employed:

- Wherever possible, rocky outcrop will be avoided when micrositing turbines;
- If removal of rocks is unavoidable, the extent of such habitat affected will be minimised;
- If the removal of rocks cannot be avoided, pre-construction surveys to determine the presence of fauna underneath surface rocks must be undertaken. Any fauna found during pre-construction surveys must be

removed by a qualified wildlife handler and translocated to similar nearby habitat that won't be impacted;

- Any rocks to be removed should be relocated to similar adjacent habitat to provide habitat for ground-dwelling fauna; and
- During construction and wind farm operation, best practice erosion and sediment control measures must be implemented to avoid impacts on rocky outcrop areas.

5. REFERENCES

- Biosis Research (2009), *Crookwell II Wind Farm – Modifications to DA-176-8-2004-I Ecological Assessment*, prepared for Robert Luxmoore Pty Ltd on behalf of Union Fenosa Wind Australia Pty Ltd by Biosis Research, January 2009.
- Brett Lane & Associates (BL&A) 2008a, *Crookwell Stage II Wind Farm – Flora and Fauna Assessment Review*, Report No. 8172 (1.0), prepared for Robert Luxmoore Pty Ltd on behalf of Union Fenosa Wind Australia Pty Ltd by BL&A, November 2008.
- Brett Lane & Associates (BL&A) 2008b, *Crookwell Stage II Wind Farm – Ecological Impact Assessment of Proposed Modifications*, Report 8172 (3.1), prepared for Robert Luxmoore Pty Ltd on behalf of Union Fenosa Wind Australia Pty Ltd by BL&A, November 2008.
- Brett Lane & Associates (BL&A) 2009, *Crookwell Stage II Wind Farm – Review of Original Environmental Impact Assessment*, Report No. 8172 (2.0), prepared for Robert Luxmoore Pty Ltd on behalf of Union Fenosa Wind Australia Pty Ltd by BL&A, January 2009.
- Brett Lane & Associates (BL&A) 2016, *Crookwell 2 Wind Farm: Supplementary Ecological Impact Assessment of Proposed Modifications (Mod-2)*, prepared for Crookwell Development Pty. Ltd by BL&A, March 2016.
- Department of the Environment 2015, *EPBC Act Protected Matters Search Tool*, Department of the Environment, Canberra, viewed 7th August 2015, <<http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999/protected>>
- Department of Infrastructure, Planning and Natural Resources (DIPNR) 2005, *Crookwell II Wind Farm – Conditions of Consent*, Department of Infrastructure, Planning and Natural Resources, Sydney.
- URS 2004a, *A Survey and Impact Assessment of the Terrestrial Flora and Fauna of the Proposed Crookwell II Wind Farm*, prepared for Wind Farm Joint Venture by URS, July 2004.
- URS 2004b, *Crookwell II Wind Farm: Environmental Impact Statement: Volume 1 Main Report, Volume 2 Appendices and Volume 2A Appendices*”, July 2004.