APPENDIX C: ENVIRONMENTAL ASSESSMENT

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6470

APPENDIX D: SUBMISSIONS

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6470

APPENDIX E: RESPONSE TO SUBMISSIONS

See the Department's website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6470

APPENDIX F: FINAL DESIGN TURBINE LOCATIONS

Table 1: *Final design turbine locations and difference (source: Table 2-2 Modification EA)*

Turbine ID	Surveyed Final Design Coordinates and elevation			Distance relocated (m) <50 50-100 >100	Direction moved	Change in Turbine Level (m)
	Easting	Northing	Level Base of Tower			
KIA_01	722206	6178258	987.42	35.7	East	7.4
KIA_02	722106	6178003	968.24	43.4	North	7.5
BAN_01	722867	6177000	961.07	47.4	SE	5.5
BAN_02	722816	6176718	960.89	12.6	South	-0.1
BAN_03	722567	6176552	959.37	36.8	South	-0.6
BAN_04	722477	6176299	957.8	12.8	South	-1.2
BAN_05	723284	6176726	964.46	12.5	South	-1.3
BAN_06	723235	6176463	971.72	4.5	West	2.6
BAN_07	723092	6176141	973.04	33.3	NW	-7.7
BAN_08	723327	6175886	1000.99	187.0	SSW	14.8
BAN_09	722740	6174867	952.9	167.0	West	-3.8
BAN_10	722846	6174519	959.13	80.4	South	-0.9
BAN_11	723242	6174950	964.19	48.5	North	1.0
BAN_12	723177	6174649	968.18	64.8	West	5.1
BAN_13	723736	6174579	960.3	168.6	ESE	-3.6
BAN_14	723832	6174779	974.36	85.0	South	-5.6
BAN_15	724314	6174314	965.87	177.9	North	2.9
BAN_16	724441	6173780	971.89	14.0	South	1.9
BAN_17	724453	6173505	975.64	13.9	West	0.6
BAN_18	723870	6173444	957.43	32.0	West	0.7
BAN_19	724307	6173286	969.32	2.2	SE	-0.7
BAN_20	724521	6172964	970.76	0.0	N.A.	0.8
BAN_21	724485	6172357	968.7	111.9	SSE	7.6
BAN_22	724466	6172100	981.57	22.0	South	1.6
BAN_23	724269	6171949	975.81	16.1	NW	1.4
BAN_24	724049	6171628	955.85	123.6	South	2.3
BAN_25	724647	6171804	986.26	50.9	NW	1.3
BAN_26	724630	6171532	985.61	46.6	NW	1.6
BAN_27	724502	6171321	980.48	20.6	East	4.3
BAN_28	724213	6171232	973	9.9	NW	3.0
BAN_29	723793	6171252	959.5	7.1	West	4.5
BAN_30	724099	6171000	955.16	1.0	N.A.	1.2
POM_01	725833	6166934	898.69	115.2	NE	-1.3
POM_02	726044	6166594	888.82	45.0	SW	5.2
POM_03	726063	6166277	884.18	102.2	West	4.2
POM_04	726461	6166355	873.2	96.2	SW	12.5
POM_05	726800	6166565	865.08	8.1	West	5.1
POM_06	727033	6165858	862.62	56.7	SW	2.6
POM_07	727112	6165618	844.99	23.4	West	-0.2
POM_08	725438	6165310	888.16	0.0	NA	-11.8
POM_09	724870	6165173	883.05	28.3	SSW	-2.9
POM_10	725390	6165082	892.5	92.5	East	-6.0
POM_11	725525	6164826	889.87	64.4	NW	-10.1
POM_12	724220	6164723	890.59	10.2	North	-8.6
POM_13	724725	6164560	888.39	6.0	North	-4.2
POM_14	725064	6164835	892.14	36.4	SW	1.3
POM_15	725079	6164566	901.81	8.5	SW	2.7
POM_16	725216	6164233	893.4	18.1	South	8.4

Turbine ID	Surveyed Final Design Coordinates and elevation			Distance relocated (m) <50 50-100 >100	Direction moved	Change in Turbine Level (m)
	Easting	Northing	Level Base of Tower			
POM_17	725509	6163949	865.02	7.2	SW	7.6
POM_18	725752	6163649	849.99	11.0	North	10.0
POM_19	724788	6163595	899.03	56.6	North	0.2
POM_20	725434	6163257	833.73	7.6	West	13.7
POM_21	725752	6162969	828	7.2	NE	8.0
POM_22	726057	6162593	821.56	81.5	SE	6.0
POM_23	726339	6162361	812.01	20.2	East	12.2
GUR_01	727827	6161200	787.19	2.2	South	2.2
GUR_02	727730	6160921	805.09	8.9	North	-3.8
GUR_03	727826	6160598	820.43	10.0	North	-3.0
GUR_04	727464	6160571	799.12	13.5	NW	-0.8
GUR_05	727307	6160350	816.25	3.2	West	1.3
GUR_06	727298	6160051	779.65	10.8	NE	2.7
GUR_07	727912	6160363	836.3	101.5	North	12.0
GUR_08	727832	6159846	773.02	0.0	N.A.	-0.7
GUR_09	727269	6159369	811.32	36.9	South	1.7
GUR_10	727389	6158918	819.87	60.5	SSE	8.5
GUR_11	727520	6158639	833.15	6.4	NW	3.1
GUR_12	727479	6158308	839.08	59.7	South	7.5
GUR_13	727642	6158039	824.07	19.0	SW	4.1
GUR_14	727753	6157727	832.16	0.0	N.A.	2.2
GUR_15	727834	6157450	833.9	43.7	North	5.1
GUR_16	728211	6159145	785.91	12.0	SW	1.6
GUR_17	727997	6158925	803.51	29.4	South	3.5
GUR_18	728036	6158675	810.96	55.3	East	4.4
	Note: GW100 is a GW100-2.5 and has hub height of 80 metres. GW82 is a GW82-1.5 and has a hub height of 85 metres.					

APPENDIX G: SUPPLEMENTARY INFORMATION PROVIDED BY PROPONENT

Gullen Range Wind Farm

Modification Application (MP 07_0118 MOD 1)

Supplementary information for Department of Planning and Environment

April 2015

Prepared for: New Gullen Range Wind Farm Pty Ltd
By: Goldwind Australia Pty Ltd

Gullen Range Wind Farm – Modification Application

Supplementary Report to Department of Planning and Environment

9 April 2015

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Appendices

1. Purpose of this document

The Gullen Range Wind Farm (**GRWF**) project is owned by New Gullen Range Wind Farm Pty Ltd (**NGRWF**) and is now fully constructed and operational.

This document has been prepared by NGRWF to update the environmental assessment documentation prepared in relation to modification application 07_0118 MOD1 (**Modification Application**) for the Gullen Range Wind Farm. NGRWF remains of the view that the final location of all infrastructure forming part of the project is consistent with, and authorised by, project approval 07_0118 granted for the Gullen Range Wind Farm (**Project Approval**). However, without prejudice to this view, the Modification Application seeks to address the Department of Planning and Environment's (**DPE**) concerns in relation to the final location of certain turbines by formally modifying the Project Approval to reflect the final turbine layout.

NGRWF has previously submitted reports to the DPE and Planning Assessment Commission (**PAC**) in relation to the Modification Application including:

- GRWF Mod 1 – Environmental Assessment dated 31 March 2014;
- GRWF Mod1 – Submissions Report dated 16 June 2014;
- GRWF Mod 1 – Report to PAC dated 26 August 2014; and
- other recent correspondence to the DPE, as indicated in Section 3,

(**Modification Assessment Documentation**).

The PAC refused the Modification Application in October 2014. The PAC's refusal of the Modification Application was set aside by orders made by the Land and Environment Court in March 2015. Accordingly, the Modification Application will now be re-determined.

The PAC subsequently requested that the DPE update the Secretary's Environmental Assessment Report prepared in July 2014 (**2014 SEAR**) with a new Secretary's Environmental Assessment Report (**New SEAR**).

This report has been prepared to update the Modification Assessment Documentation and assist the DPE in preparing the New SEAR.

This report includes:

- an update on the current status of the GRWF;
- further information which has become available since the Modification Assessment Documentation was prepared; and
- an updated NGRWF response to the draft conditions recommended in the 2014 SEAR.

2. Project Implementation Status

The Gullen Range Wind Farm is now fully constructed and operational.

Construction commenced in September 2012 with site preparatory works, installation of access tracks, and clearing of turbine sites and hardstands. The 33kV/330kV substation and TransGrid 330kV switchyard were constructed in 2013, and connected to the Grid and energised in December 2013. Installation of the 73 wind turbines were completed and commissioned by December 2014.

The construction site office and temporary laydown areas are currently being decommissioned and sites rehabilitated.

Construction and occupation certificates have been obtained by an independent certifier for the Gullen Range Wind Farm and Environment Protection Licence no. 20365 (**EPL**) was issued for the project on 26 September 2014.

A pre-operations compliance report was also submitted to the DPE in December 2014.

The Gullen Range Wind Farm is NSW's largest operational wind farm and represents an investment in NSW of over $300M. Its 73 wind turbines provide a generation capacity of 165.5 MW, enough to supply 60,000 NSW homes with renewable energy. The renewable energy being delivered by the project is delivering significant emissions savings to NSW equivalent to over 3 million tonnes of greenhouse gases by 2020.

The Gullen Range Wind Farm represents significant local investment including:

- $6M in local road upgrades;
- $15M to construction contractors working in the local community;
- $2.3M per year for land access payments, maintenance and community fund; and
- an ongoing operations and maintenance workforce of 13.

These direct benefits will have an even larger (multiplier effect) indirect benefits for the local economy.

3. The 2014 SEAR Recommended Conditions

NGRWF provided comments on recommended conditions proposed in the 2014 SEAR in its report to PAC dated August 2014. Additional information has also become available since the 2014 SEAR was prepared and includes the following:

- NGRWF Report to the PAC dated August 2014 that includes detailed responses to the assessment in the 2014 SEAR and the associated recommended conditions;
- specialist assessments that supported the NGRWF Report to PAC dated August 2014;
- detail of acquisitions and landowner agreements for neighbouring properties;
- the EPL issued by Environment Protection Authority (**EPA**) in October 2014;
- survey for Powerful Owl and Little Eagle dated October 2014;
- updated Noise Assessment dated December 2014;
- Pre-Operations Compliance Report dated December 2014;
- Powerful Owl Survey dated January 2015;
- Monthly Survey Reports for the Bird and Bat Adaptive Management Plan (**BBAMP**) in January and February 2015;
- updated status of the GRWF landscape screening program as at April 2015; and
- the current status of the GRWF.

The assessments provided by NGRWF in relation to the Modification Application have demonstrated that the impacts of the final turbine locations are negligible.

No modifications are sought by NGRWF to the conditions of the Project Approval apart from a modification to conditions 1.1 and 1.2 to include the Modification Assessment Documentation in the list of the project documents.

NGRWF considers that no further modifications to the conditions of the Project Approval should be imposed. However, if the DPE is still minded to recommend modifications to the conditions of the Project Approval notwithstanding the additional information contained in this report, then NGRWF has commented on the recommended conditions provided in the 2014 SEAR. Table 3.1 summarises NGRWF's comments on the recommended conditions provided in the 2014 SEAR. Further detail follows.

Table 3-1- Summary of NGRWF response to recommended conditions from the 2014 SEAR

Number	Aspect	Summary of Requirement	NGRWF View
1.1	Terms of Approval	Requires project to be carried out generally in accordance with certain documents and conditions	Accepted
1.2	Terms of Approval	Addresses situation where inconsistency between Terms of Approval	Accepted
1.6 a)	Limits for BAN 9 & BAN 15	Requires BAN 9 and BAN 15 to be constructed in accordance with conditions 1.1 b) to 1.1 d) or as otherwise determined within condition 2.25A	Condition now unnecessary as B29 is now owned by NGRWF and B12 is now an associated residence (Section 4)
1.6 b)	Removal of BAN 09 and BAN 15	Requires BAN 9 and BAN 15 to be relocated within a year of the determination of the Modification Application	Condition now unnecessary as B29 is now owned by NGRWF and B12 is now an associated residence
1.6 c)	POM 3 and POM 4	Requires POM 3 and 4 to be completely switched off between 1/11 and 31/3 to protect Little Eagle	Condition not justified by available data. Monitoring in October 2014 and January to March 2015 has not detected Little Eagle. NGRWF proposes that this issue continue to be managed via the BBAMP. (Section 5.3)
1.9	Decommissioning	Requires site to be decommissioned within 18 months of the cessation of operation	Condition is unnecessary as similar to existing condition 1.10 and there is no need to replace the existing condition (See Section 6)
1.10	Decommissioning and Rehabilitation Plan (**DRP**)	Requires preparation of Decommissioning and Rehabilitation Plan within 6 months of determination of Modification Application and updates every 5 years.	Condition is inappropriate as preparation of DRP is more appropriate closer to when decommissioning will actually occur and future site options are clearer

Number	Aspect	Summary of Requirement	NGRWF View
1.11	Turbine decommissioning	Requires turbines that cease operating for more than 12 consecutive months to be dismantled within 18 months	Condition is unnecessary as similar to existing condition 1.10 and there is no need to replace the existing condition
1.11A	Decommissioning transport - roads	Additional requirement to assess route and prepare Road Dilapidation Report before and after decommissioning	Accepted
1.11B	Lease agreements	Requires written evidence of lease agreements with site landowners to be provided to the Secretary prior to construction	This condition is inappropriate as leases are already in place and construction is now complete
1.11C	Decommissioning Environment Management Plan (**EMP**)	Prepare and implement EMP for decommissioning prior to decommissioning	Accepted
2.3A	Substation Landscape Management Plan (**SLMP**)	Requires a SLMP to be prepared within 3 months of determination of the Modification Application	This condition is unnecessary as the Modification Application does not propose any changes to the substation, and in any event, the issue is already addressed by the existing landscaping program (Section 7.2)
2.3B	Audit of SLMP	Requires an independent audit of implementation of SLMP	This condition is unnecessary as the Modification Application does not propose any changes to the substation
2.3C	K2 landscaping	Requires plantings to ameliorate visual impact of KIA 1 and KIA 2 on residence K2	Residence K2 is covered by existing landscaping screening conditions, but has not taken up NGRWF offers for landscaping. (Section 7.3)
2.19	Noise tonality	Excessive tonality levels referable to ISO standard and imposition of penalty for excessive noise	This condition is unnecessary as the Project Approval already includes a condition regarding tonality (Section 8.2)
2.20A	Noise Low Frequency	Requires monitoring in respect of Low Frequency Noise	This condition is unnecessary, but is accepted subject to any requirement for such monitoring be identified by an acoustic specialist. (Section 8.3)
2.21A	Noise Compliance	Requires noise compliance monitoring to be made publicly available	Accepted

Number	Aspect	Summary of Requirement	NGRWF View
2.24A	Review of noise within 3km	Allows any resident <3km to seek independent noise review.	This condition is unnecessary and extremely onerous (there are more than 100 residences within 3km) and does not align with current standards and exceeds requirements of the draft NSW Planning Guidelines: Windfarms. The current condition considers the noise effects of the wind farm on all nearby residences and requires external monitoring and assessment methodology to follow accepted industry standards and therefore is considered acceptable. (Section 8.5)
2.25A	Acquisition of B29	Requires residence B29 to be acquired if required by the owner	This condition is unnecessary as B29 is now owned by NGRWF (Section 4)
2.25B	Acquisition of PW34	Requires residence PW34 to be acquired by NGRWF	This condition is unnecessary as PW34 is now an associated residence (Section 4)
2.35	Revised Compensation Habitat Package (**CHP**) and biodiversity assessment	Requires preparation of revised CHP and updated biodiversity assessment	Any change to condition 2.35 is unnecessary as the issue is comprehensively addressed under the existing condition 2.35 and NGRWF has already submitted a revised CHP and proposed Conservation Property Vegetation Plan (**CPVP**) (Section 5.5)
2.35B	Powerful Owl Monitoring	Require monitoring of impact of GRWF on Powerful Owl	The condition is unnecessary and unsupported by an assessment of the impacts of the Modification Application and unnecessary given the existing Project Approval conditions (Section 5.4)
3.4	Annual Environmental Management Report (**AEMR**)	Requires preparation of an AEMR	This condition is unnecessary and not related to the Modification Application and substantially replicates the requirements of existing condition 6.1. (Section 9)

Number	Aspect	Summary of Requirement	NGRWF View
5.1A	Community Consultative Committee (**CCC**)	Establish and participate in CCC.	This condition is unnecessary and unrelated to the impacts of the Modification Application and is inappropriate and the existing processes in place are preferable. (Section 10)
5.2A	Monitoring	Requires all monitoring to be put on website	Accepted
5.5	Complaints	Requires maintenance of register of complaints on website	NGRWF agrees to maintain a register but suggests it not be made publicly available
7.5 c)	Landscape Management Plan (**LMP**)	Requires update to LMP to include weed management strategy	This condition is unnecessary and unrelated to the Modification Application and weed control is already addressed under the existing Project Approval.

4. Specific Landholder Issues (recommended conditions 1.6A, 2.25A and 2.25B)

Since the 2014 SEAR was prepared:

- property B29 has been acquired by NGRWF;
- property PW34 is now an associated residence; and
- property, B12 is now an associated residence.

While NGRWF does not accept that the project impacts on these properties are outside those permitted, the above actions have removed the need for imposition of any conditions, as part of a modified Project Approval, to address any inferred impacts on these properties. Accordingly, conditions 1.6A, 2.25A and 2.25B, which were recommended by the DPE in the 2014 SEAR, are no longer appropriate or required.

5. Biodiversity Issues

5.1. Overview

The recommendations of the 2014 SEAR included provisions in relation to biodiversity. Three recommended conditions, 1.6(c), replacement condition 2.35 and recommended condition 2.35B all impose additional requirements in respect of biodiversity issues. NGRWF considers that these proposed additional provisions are not justified for the reasons set out below.

The Project Approval already contains a number of specific environmental conditions which mitigate any risk to biodiversity including risk to the Powerful Owl (Condition 2.33 and 3.1) and the Little

Eagle (Condition 3.1) (even on the assumption that the Little Eagle is present, which is not supported by the recent and earlier survey results) and in relation to offsetting loss of native vegetation and habit (Condition 2.35). In particular:

- condition 2.33 relates to Powerful Owl and prohibits the proponent from operating turbines POM_03, POM_4, POM_06 and POM_7 between one hour before sunset and one hour after sunrise during the period 30 November to 31 March unless it is able to demonstrate that the operation of these turbines will not cause any adverse impact on Powerful Owl juvenile dispersion;
- Condition 2.35 sets out the process for establishing a Compensatory Habitat Package (CHP) to offset in perpetuity the value of habitat lost as a result of the project
- conditions 2.36 and 2.37 (relate to Powerful Owl and Wedge-tailed Eagle respectively) require the proponent to make a financial contribution of $1,500.00 (CPI adjusted from September 2010 quarter) to the NSW Wildlife Information and Rescue Service (WIRES) for each death of a Powerful Owl or Wedge-tailed Eagle that has reasonably been attributed to the carrying out of the Project; and
- condition 3.1 (in respect of bird and bats) requires the proponent to:
    - prepare and submit to the DPE for approval, a Bird and Bat Adaptive Management Program (BBAMP) that addresses 'at risk' bird and bat groups;
    - to implement the approved BBAMP; and
    - "to implement reasonable and feasible mitigation measures as identified in [the BBAMP] where the need for further action is identified through the [BBAMP], or as otherwise agreed with the DPE".

5.2. Avifauna issues and their management

A BBAMP has been approved by the DPE under condition 3.1 of the Project Approval. It represents a robust adaptive management regime, which will, if any adverse impacts are detected on the Little Eagle and/or Powerful Owl (via the required monitoring), require the proponent to implement reasonable and feasible mitigation measures. In particular, the BBAMP:

- requires monitoring of local populations, including their utilisation of habitat within wind farm areas and any mortalities as a result of collision with turbine blades;
- requires monitoring of behaviour of local populations, including their interaction with the wind farm and avoidance behaviour around turbines;
- requires monitoring of natural and human changes in the environment;
- requires the impact of the wind farm upon local populations to be analysed and assessed;
- provides a mechanism to identify trigger points or thresholds for a management response;
- requires an adaptive management approach to identifying and implementing appropriate management actions to reduce any impacts; and
- requires monitoring and evaluation of the effectiveness of these measures.

It is considered that the existing condition 2.33, 3.1 and existence of an approved BBAMP and subsidiary POMS with the BBAMP implemented by a DPE approved specialist provides for effective and responsive management of avifauna issues. Further comments are provided in the following sections with respect to relevant recommended conditions.

5.3. Recommended condition 1.6(c) relating to Little Eagle

The 2014 SEAR recommended that a new condition 1.6A(c) be imposed which required turbines POM_3 and POM_4 to be completely switched off during the fledgling period of the Little Eagle, from 1st November through to the 31st of March each year.

NGRWF believes that this condition is inappropriate and should not be imposed for the reasons set out below.

As previously indicated, the existing Project Approval conditions already contain a precautionary and robust adaptive management regime via the BBAMP for managing any impacts on the Little Eagle.

In addition, expert advice for the Little Eagle has been obtained in relation to the Project and is contained in the 'Little Eagle Review dated August 2014 (**Little Eagle Review**). The Little Eagle Review was provided in Appendix D1 of NGRWF's report to the PAC dated August 2014 and a targeted survey was undertaken in October 2014 to assess whether the Little Eagle was present at the nest site attributed to the Little Eagle. The October 2014 survey report was provided to the DPE in February 2015.

Of 28 survey events between 2007 and 2015 and involving the four turbine groups only a single sighting of the Little Eagle was recorded in Autumn 2007 (Table 5.1). This single sighting was in the location of the Gurrundah Group of turbines (7km south of the POM 03 and POM 04 turbines), and no Little Eagle has been observed in the vicinity of the Pomeroy Group of turbines.

Table 5-1 – GRWF - Bird survey results and occurrences of the Little Eagle

GROUP	Autumn 2007	Autumn 2011	Summer 2012	Winter 2012	Spring 2012	January 2015	February 2015
Kialla	No	No	No	No	No	No	No
Bannister	No	No	No	No	No	No	No
Pomeroy	No	No	No	No	No	No	No
Gurrundah	✓	No	No	No	No	No	No

Observations from a survey in May 2011, during preparation of the BBAMP, did identify possible nests and roost trees in the gullies of the woodland to the south of POM 03 and POM 04, but none were occupied at the time. The specialist attributed the unoccupied nest to the Little Eagle. It is not clear how long prior to the nest being observed was it last occupied. Nesting at that time of year was not expected.

The October 2014 survey that targeted the nest attributed to Little Eagle but did not identify any Little Eagles and concluded that there is no current Little Eagle breeding activity in the Pomeroy district.

Monthly surveys have also been undertaken under the BBAMP since full operations commenced. These initial monthly surveys commenced in January 2015 and three surveys have now occurred without the Little Eagle being observed at any location for the wind farm.

Further, even if the Little Eagle were to become present in the vicinity of the Pomeroy Group of turbines, Ian Smales (Appendix 1) concluded that:

I do not consider that there is strong evidence for any collision risk for Little Eagles posed by the four turbines in question. If Little Eagles are present or were to use the nest attributed to them in future, I do not consider that any risk of collisions with the four turbines has materially altered by their relocation from their indicative locations to their final locations.

Accordingly, there is no basis for claiming any increased risk to the Little Eagle as a result of the final turbine locations for POM_3 and POM_4.

Accordingly, the recommended condition is unsupported by an assessment of the impacts of the Modification Application or subsequent surveys. In any event, it is unnecessary given that the existing Project Approval conditions already contain a robust adaptive management regime for managing impacts on the Little Eagle.

5.4. Recommended Condition 2.35B relating to Powerful Owl

Recommended Condition 2.35B relates to an additional requirement for a monitoring program to assess the impact of the project on the Powerful Owl "*particularly for turbines POM 03, POM 04, POM 06 and POM 07*".

NGRWF strongly submits that recommended condition 2.35B is inappropriate and should not be imposed for the following reasons:

As outlined above, the existing Project Approval conditions already contain a precautionary and robust adaptive management regime for managing any impacts on the Powerful Owl, including by requiring shut down of four turbines during evenings over four months.

Further, as outlined above, Ian Smales' (Appendix 1) has concluded that:

I consider that any risk of turbine collisions for Powerful Owls would be primarily for dispersing young birds that may fly out of the forest as they move away from their natal territory. This risk would relate to a matter of a few days per annum and there is no evident basis for determining whether, in fact, such birds might encounter any turbines. The minor changes from the indicative to final locations of the four turbines in question do not appear to me to materially alter any collision risk they may pose.

Accordingly, the recommended condition is unsupported by an assessment of the impacts of the Modification Application, and in any event, is unnecessary given that the existing Project Approval conditions already contain a robust adaptive management regime for managing impacts on the Powerful Owl.

The BBAMP development included baseline monitoring that was completed in 2011/2012. Further monitoring in respect of Stage 2 of the BBAMP commenced with the start of wind farm operations. The monthly surveys under the BBAMP commenced in January 2015, and 3 periods of monthly surveys have been completed.

In relation to the Powerful Owl, if any carcass is identified, the BBAMP specifically requires NGRWF to conduct additional site wide surveys to ascertain presence and behaviour of the species, engage an expert to revise the risk assessment, ensure that any sheep or rabbit carcasses are removed promptly, and to make the payment to WIRES in accordance with condition 2.36 of the Project Approval.

In addition, expert advice for the Powerful Owl has been obtained in relation to the Project and is contained in the Powerful Owl Management Strategy dated January 2012 (**Powerful Owl Management Strategy**).

The Powerful Owl Management Strategy establishes a framework for the investigation of Powerful Owl juvenile dispersal. In particular, the Powerful Owl Management Strategy is intended to address:

- whether Powerful Owls are present, and if so, whether they are breeding within the Pomeroy precinct;
- when any breeding pair lay their eggs;
- when dispersal is likely to occur;
- whether dispersal is likely to occur in the direction of turbines; and
- how well individuals are able to avoid turbines.

The Powerful Owl Management Strategy adopts an adaptive management approach that involves the integration of information gained from monitoring and evaluation. The Powerful Owl Management Strategy is intended to operate within the context of the BBAMP. The Powerful Owl Management Strategy recommends operational monitoring through the BBAMP, with the view to review and vary mitigation measures, as required.

Non-routine monitoring additional to monthly surveys under the BBAMP occurred in October 2014 and January 2015 with the following results:

- Further monitoring for the Powerful Owl and Little Eagle occurred in October 2014. In summary, the survey found:
    1. no Little Eagles were observed;
    2. there is no current Little Eagle breeding activity in the Pomeroy district as evidenced by disused nests;
    3. a pair of adult Powerful Owls were observed; and
    4. it is inconclusive as to whether any juvenile Powerful Owls were present.
- Further monitoring was undertaken in January 2015 to try and locate juvenile Powerful Owl but none were detected and a request was made to the DPE to lift the operating restrictions for POM_03, 04, 06 and 07 for the month of March 2015. Further consultation is proposed with the OEH for this issue.

NGRWF engaged an independent expert to provide an opinion on any "increased risk to biodiversity" resulting from the final location of POM_03, POM_04, POM_06 and POM_07. Ian Smales of Biosis stated in his report dated 31 October 2014 (Appendix 1) that:

> *I do not consider that the altered locations of the four turbines, when compared with their previous indicative locations, materially alter any risk of collisions posed by the four turbines to Powerful Owls.*
>
> *…*
>
> *I consider that any risk of turbine collisions for Powerful Owls would be primarily for dispersing young birds that may fly out of the forest as they move away from their natal territory. This risk would relate to a matter of a few days per annum and there is no evident basis for determining whether, in fact, such birds might encounter any turbines. The minor changes from the indicative to final locations of the four turbines in question do not appear to me to materially alter any collision risk they may pose.*

In addition to the monitoring and regime management directed to birds and bats, NGRWF has planned the implementation of an offset incorporating a large woodland area adjacent the Pomeroy precinct that will not only protect in perpetuity, native vegetation communities impacted by the project but also provides for protection of the foraging habitat for Powerful Owl and woodland where the unoccupied nest attributed to Little Eagle was observed.

The offset proposal has:

- involved preparation of a CHP that was approved by DPE in 2012. The CHP was updated in August 2014 and submitted to the PAC. It was further strengthened and submitted to the DPE in March 2015. The updated CHP includes validation of the projects' impacts on native vegetation (undertaken in July 2014) and covers a significantly larger area and more native vegetation diversity than was the case for the approved CHP.
- Sought assistance of the DPE, Office of Environment and Heritage (**OEH**) and Local Land Services (**LLS**) for the implementation of a Property Vegetation Plan (**PVP**) based on the March 2015 submission by NGRWF.

The above actions are regarded as a comprehensive, beyond compliance response to protecting biodiversity in the vicinity of the GRWF project.

5.5. Native Vegetation Impacts and Offset Area (Recommended Condition 2.35)

As indicated above, NGRWF has already made significant effort to implement a suitable CHP via a PVP. The 2014 SEAR includes a recommended Condition 2.35 to replace the existing Condition 2.35 of the Project Approval which requires the preparation of a CHP "*to offset in perpetuity the value of habitat lost as a result of the project*". A CHP was approved by the DPE in 2012 under the existing condition 2.35.

The recommended new Condition 2.35 includes a number of additional requirements, some of which are able to be addressed, and some that are not practical. To the extent possible, NGRWF has addressed requirements of the recommended Condition 2.35 in its revised CHP and proposed CPVP submitted to DPE in March 2015.

NGRWF is therefore of the opinion that the recommended condition is unnecessary, as NGRWF has adequately and practically addressed the objectives of the recommended condition in the context of the existing Project Approval condition.

To confirm the actual impact of the project on native vegetation, NGRWF arranged for a validation survey to be completed by two botanists. Overall, the validated impact on native vegetation has a larger extent than estimated for the 2008 Biodiversity Assessment. The increase in area of impacted vegetation is partly due to a changed methodology for assessment and different classification of vegetation with inclusion of additional areas as EECs.

The revised CHP (March 2015) addresses the actual impacts on native vegetation (in accordance with current classification guidance) and was used to confirm the amount of offset required for the project. It also includes new management actions developed in consultation with the OEH.

Further mapping of the proposed offset area was undertaken in early 2015, and the revised CHP was submitted to the DPE and OEH in March 2015. A proposal for a CPVP to secure these offsets was submitted to the DPE together with the revised CHP. The Offset area has now been appreciably extended beyond that described in the CHP which was approved in 2012. Further, it is understood

that the OEH is supportive of the proposal for an expanded CPVP. Further consultation with the OEH is proposed to occur, under the existing approval conditions, before the CPVP is finalised and implemented. The finalisation and implementation of the CPVP is expected to deliver a suitable offset for the project.

NGRWF submits that any change to condition 2.35 is unnecessary as this issue is being comprehensively addressed under the existing condition 2.35, and has been overtaken by the further assessments, revised CHP and draft CPVP outlined above.

6. Decommissioning

6.1. Overview

The recommended conditions of the 2014 SEAR relating to decommissioning are additional to existing Project Approval conditions and while put forward by the DPE as standardising conditions, some are not relevant to the GRWF or the Modification Application.

6.2. Lease provisions for Decommissioning (Recommended Condition 1.11B)

Recommended condition 1.11B in the 2014 SEAR requires that "*Prior to commencement of construction the Proponent shall provide written evidence to the satisfaction of the Secretary that the lease agreements with site landowners have adequate provisions to require that the decommissioning occurs in accordance with this approval*".

Construction of the GRWF is now complete and the leases with host landowners are already agreed and in place. Evidence of the provisions relating to decommissioning in these leases were provided to the DPE prior to construction commencing and the lease provisions were accepted by the DPE as appropriate.

Given this, it is wholly inappropriate that a new condition be imposed which imposes any pre-construction requirement or seeks to potentially re-open already agreed leases, which have already been reviewed and accepted by the DPE.

6.3. Decommissioning and Rehabilitation Plan (Recommended Condition 1.10)

Recommended condition 1.10 in the 2014 SEAR requires the preparation of a DRP within six months of determination of the Modification Application. The preparation of a DRP 6 months after the determination of the modification, at a time when the operation of the wind farm is in its first year, serves no benefit given that the project will not be decommissioned until 20 years or more into the future, and the future use of the site is currently unknown. NGRWF submits that development of the DRP is only appropriate closer to the time when decommissioning would actually occur and when future site options are clearer.

6.4. Removal of turbines and operational records (Recommended Condition 1.11)

Recommended condition 1.11 in the 2014 SEAR is similar to the existing condition 1.10 of the Project Approval and, accordingly, NGRWF submits that there is no need to replace the existing condition.

6.5. Decommissioning (Recommended Condition 1.9)

Recommended condition 1.19 in the 2014 SEAR is similar to the existing condition 1.10 of the Project Approval and, accordingly, NGRWF submits that there is no need to replace the existing condition.

6.6. Road Dilapidation Report (Recommended Condition 1.11A)

Recommended condition 1.11A in the 2014 SEAR is acceptable to NGRWF. NGRWF appreciates that it has a responsibility to make good any accelerated deterioration in life of local roads arising from its decommissioning activities.

6.7. Decommissioning EMP (Recommended Condition 1.11C)

Recommended condition 1.11C in the 2014 SEAR is acceptable to NGRWF. An Environmental Management Plan (**EMP**) could be developed in conjunction with a DRP prior to decommissioning. NGRWF appreciates that it has an obligation to incorporate appropriate environmental management controls for all its activities. The most appropriate time for developing management plans for decommissioning is immediately prior to such works occurring, when the nature of activities is clear and management requirements can be best foreseen.

7. Landscaping

7.1. Overview

NGRWF is committed to meeting and exceeding the landscape screening obligations contained in the current conditions of the Project Approval. NGRWF is well advanced in implementing the landscape screening requirements of the Project Approval in accordance with the approved Landscape Management Plan.

A total of 94 enquiries have been received from the local community in regards to the NGRWF Landscape Screening Offer. Responses to these are summarised below:

- 24 did not qualify for landscaping treatments under the Project Approval conditions (outside of 3km zone or had no Approved DA for building); and
- 70 were eligible for landscape screening inspection under the Project Approval conditions and have been addressed as follows;
    - 69 properties have been inspected;
    - one property is still to be inspected;
    - NGRWF has already agreed Landscaping Plans with 57 of the 69 properties which were inspected. Landscaping works on these properties are currently under way in accordance with the approved Landscape Architect's recommendations for the practical planting season;
    - A further 6 of the 69 properties inspected have already been provided with draft landscape plans for the landowners consideration and, if suitable, agreement; and
    - landscaping plans are currently being prepared for the remaining 6 of the 69 properties inspected.

The progress achieved has required considerable co-ordination, planning and consultation, and this will continue for some time through the conduct of works for establishment and maintenance of landscape screening treatments.

7.2. Substation Landscape Management Plan (Recommended Condition 2.3A and 2.3B)

The 2014 SEAR recommended new conditions 2.3A and 2.3B requiring an SLMP.

The Modification Application does not propose any amendment to the substation and so will not result in any increased visual impacts.

The location of the TransGrid switchyard and substation was determined by proximity to the 330kV Sydney West to Yass transmission line and towards the top of the Great Dividing Range along which the GRWF is located. Despite its elevated location, the switchyard and substation are not visible over a wide area and do have a reasonable degree of topographic and vegetative screening. However, three properties close to the substation site have views from parts of their property. The four residences relating to the three properties with views to the switchyard and substation from parts of their property are listed below.

- Residence PW 4;
- Residence PW 5 and 36; and
- Residence PW 7.

Screening of the switchyard and substation at the three properties can be achieved through a combination of screening at the substation location and also using screening on the neighbouring landowners' properties. There are limitations to the areas where screening can be effectively and safely installed adjacent to the switchyard and substation due to:

- electrical and fire safety clearances required around the perimeter of high voltage facilities;
- electrical safety clearances required below 330kV and 11kV overhead transmission lines and for the connection to the switchyard and substation;
- the relative topographic level of land, to the north and west of the switchyard and substation and, the height of structures in the 330kV switchyard above the hill where they are located; and
- the topographic level of residences to the north of the switchyard and substation.

Due to the statutory electrical safety clearances and terrain limitations on providing effective screening at the switchyard or substation, the best screening for the three properties affected by views to the substation was landscape screening in proximity to the residences. This has been incorporated into the landscape plans prepared by the approved landscape architect and agreed with each of the owners of the residences outlined above. NGRWF has undertaken this process using the approved landscape architect and agreements have been reached for landscape screening in respect of each of the three neighbouring properties outlined above. These have been previously discussed with the DPE.

In addition to the agreed individual landscape plans for these three landowners, the screening of the switchyard and substation is also taken into account in the Landscape Management Plan approved by the DPE under existing conditions 7.4 and 7.5 of the Project Approval. This Landscape Management Plan already makes provision for on-site planting around the substation. NGRWF is working with the approved landscape architect to look at ways that the screening provided in the LMP can be supplemented now that the TransGrid site rehabilitation works are nearing completion. As soon as TransGrid remove a temporary dam on the western side of the switchyard, the supplementary screen planting will be implemented by NGRWF.

NGRWF commits to planting mature plantings around the substation but, in order to mitigate the concerns of the approved landscape architect that mature stock will not be as effective as tube stock, NGRWF will also plant less mature tube stock. The number of mature stock to be used will also be limited by actual mature stock availability. Planting will potentially be complete before the re-determination of the Modification Application.

Finally:

- Condition 2.3A c) is not warranted as maintenance and independent audits are already provided for in the current Project Approval conditions.
- The requirements of the recommended Condition 2.3A d) are not able to be practically achieved. Condition 2.3A d) requires that; '*The screening must be effective in visually screening the substation from the time the planting occurs…*". This objective is not practical given the realistic timeframe for the establishment of screen vegetation. It is acknowledged that the full effect of screen planting will not be realised until vegetation is effectively established and the plantings have matured in height and breadth.

Accordingly, NGRWF does not believe that the recommended conditions 2.3A and 2.3B are either warranted or justified.

7.3. Landscaping for Residence K2 (Recommended Condition 2.3C)

The 2014 SEAR recommended a new condition 2.3C to apply for Residence K2. It is noted that the final location of the turbine closest to the residence, KIA 01 is in fact 35.7 metres further away from Residence K2 than the indicative location originally assessed. Accordingly, this condition is not considered to relate to the Modification Application.

Residence K2 has the benefit of the existing landscape screening conditions imposed under the Project Approval. The landowners of Residence K2 have been contacted on a number of occasions, but have declined an inspection by the approved Landscape Architect or screen plantings. Should they request screen plantings, then NGRWF believes that a suitable program can be developed under the existing landscaping conditions and the LMP. Accordingly, NGRWF believes that an additional condition is not required.

7.4. Landscape Management Plan - Weeds (Recommended Condition 7.5(c))

The 2014 SEAR recommended that *"the Landscape Management Plan as detailed within condition 7.5(b) is to be updated within 3 months of the date of determination of modification 1 to include measures to be implemented as part of a weed management strategy to remove risks of the spread of noxious weeds between properties."*

The 2014 SEAR states the reasoning for this additional requirement at the end of Section 5.4 of the 2014 SEAR in terms which make it clear that this is not an issue related to the Modification Application.

The Landscape Management Plan approved by the DPE under existing conditions 7.4 and 7.5 of the Project Approval already makes provision for measures to address the spread of noxious weeds.

Given that this condition is unrelated to the Modification Application and that weed control is already addressed in the plans approved under the existing Project Approval conditions, NGRWF considers that this condition should not be imposed.

8. New Noise Conditions

8.1. Overview

NGRWF provided specialist assessments as part of the Modification Assessment Documentation which demonstrated the ability of the final turbine layout to comply with the noise conditions imposed on the Project Approval.

The Environment Protection Authority's (EPA) review of the modification application on 9 April 2014 noted that approval conditions have appropriate noise limits and that the change in noise impact as a result of the modified turbine locations is not considered audible or significant. Accordingly, the EPA concluded that:

> *The EPA is satisfied that the current project approval conditions contain appropriate noise limits. The acoustic assessments predict that under all operating scenarios (and including the above qualification) these noise limits will be met during the operation of the Gullen Range Wind Farm, including the modified turbine locations. The difference in location of wind turbines between the final design layout and the layout in the project approval, in terms of noise impacts on surrounding (non-involved receivers) is not considered audible or significant.*

The noise assessment was subject to further review by the DPE (Jeff Parnell, DPE's noise specialist) and Wilkinson Murray (independent noise specialists).

Jeff Parnell concluded that "*compliance with approved criteria is achievable at all non-associated residential properties and based on information supplied, there is no reason to believe that the project is not capable of meeting the noise goals established by the approval."*

Wilkinson Murray supported the conclusion of the DPE review and the reasons that support this conclusion.

The EPL was issued by the Environment Protection Authority (EPA) in September 2014. A revised noise assessment addressing interim Condition 7 of the EPL was submitted to EPA in December 2014, and the interim condition has been removed from the EPL. It is also noted that noise compliance monitoring for 17 residence locations is currently in progress with the results expected to be available by the end of April 2015.

NGRWF does not believe that any additional conditions in respect of noise impacts are warranted for the following reasons:

- the EPA, DPE and Wilkinson Murray reviews are consistent in confirming that noise compliance can be achieved under the existing Project Approval conditions;
- the final turbine layout the subject of the Modification Application has not changed predicted noise impacts at relevant receivers;
- EPL 20365 has been issued for GRWF and already contains further clear noise limits which apply to the project;
- The existing noise conditions consider the noise effects of the wind farm on all nearby residences and require external monitoring and assessment methodology to follow accepted industry standards and therefore are considered acceptable in current form, and
- noise compliance monitoring and reporting is already in progress and will be reported soon.

Nevertheless, comments are provided on the specific aspects of the recommended noise conditions.

8.2. Noise aspects – Tonality (Recommended Condition 2.19)

Based on the conclusion from the EPA, there does not appear to be a need to vary noise conditions.

The Project Approval already includes a condition in respect of tonality. The DPE has recommended changing the reference Standard from IEC 61400-11:2012 to ISO 1996.2:2007. AECOM has provided specialist advice on the recommended condition for tonality and concluded that:

- both Standards are utilised throughout the industry and are similar, but that the ISO 1996.2: 2007 Standard recommends a sliding penalty adjustment at the residence of 2 to 6dB(A) if tonality is found based on its magnitude, rather than the 5dB(A) arbitrary penalty proposed in the new condition and
- AECOM also notes that reference to 'excessive tonality' is inappropriate as this term is not defined in the ISO Standard.

8.3. Noise aspects – Low Frequency Noise (Recommended Condition 2.20A)

This is an additional condition which is not connected to the Modification Application and does not appear warranted based on significant recent reviews of Wind Farms and Low Frequency noise.

AECOM's advice is that there shouldn't be mandatory objective testing requirements for low frequency noise unless its presence is subjectively identified by a noise expert, as is the case with all special audible or annoying characteristics. Inclusion of mandatory objective testing requirements in relation to low frequency noise would increase measurement complexity and require specialised equipment in order to create a distinction between those contributions to low frequency noise from the rural activities and ambient environment.

However, NGRWF has no objection to the inclusion of a low frequency testing condition, so long as it is updated to ensure that it is only required where subjective testing by an independent acoustic expert indicates this is warranted.

8.4. Noise Compliance Results on Website (Recommended Condition 2.21)

NGRWF agrees to a condition requiring the verified results of noise compliance monitoring being made available on the website.

8.5. Compliance Monitoring (Recommended Condition 2.24A)

NGRWF is concerned that DPE has recommended a new condition that allows any landowner with a residence within 3 kilometres to seek an independent review of noise impacts in circumstances where there is no existing background noise measurements at such distances. This is because, at such distances, predicted noise levels are well below the background noise levels and, without previous background noise measurements at these locations distinguishing wind farm noise from ambient noise, will be very difficult and at times not possible. The current condition considers the noise effects of the wind farm on all nearby residences, including those up to 3km and requires external monitoring and assessment methodology to follow accepted industry standards to address noise concerns at all such residences.

Further, NGRWF notes that the proposed 3km distance does not align with current standards or with the draft NSW Planning Guidelines: Wind Farms. There are more than 100 residences within 3km of the wind farm.

The existing Noise Management Plan, approved by the DPE under existing conditions 7.4 and 7.5 of the Project Approval, already contains controls to verify noise impacts utilising pre-development background noise measurements from 17 locations in close proximity to the wind farm. NGRWF submits that this remains the most accurate way of establishing compliance at all residences around GRWF and should not be modified via the proposed new condition 2.24A.

9. Condition re Annual EMR (Recommended Condition 3.4)

The 2014 SEAR recommended a new condition 3.4 requiring that:

> "*The Proponent must prepare and submit to the Secretary, an Annual Environmental Management Report (AEMR) throughout the life of the project, or as otherwise required by the Secretary. The AEMR must review the performance of the project against the Operation Environmental Management Plan, the conditions of the approval and other licences and approvals relating to the project. The AEMR must include, but not necessarily be limited to*…[sub clauses (a) to (h) set out the matters to be addressed by the AEMR]."

This further condition is not related to the Modification Application and substantially replicates the requirements of the existing condition 6.1. Given this, NGRWF is concerned that this condition would, if imposed, duplicate effort and not provide additional value. Accordingly, NGRWF requests that the new condition be omitted from a modified approval.

10. Community Consultation

10.1. Summary of Recent Community Engagement Initiatives

Over the eight months since the issue of the 2014 SEAR, NGRWF has continued to actively undertake community engagement activities. This reflects NGWRF's aim to improve its consultation performance and strengthen existing channels of communication.

Initiatives undertaken over the last 8 months have included:

- Commencement of the previously committed Community Enhancement Program, comprising a Community Fund and Clean Energy Program following the start of operation of the wind farm as required under existing conditions.
- The initial application window for the Community Fund was advertised by the Upper Lachlan Shire Council and has attracted a total of 15 applications from groups within 10km of the wind farm. At the time of writing, the Community Fund Committee has met to discuss the applications and make recommendations for support. It is expected these recommendations will be confirmed by NGRWF and the respective councils over the next few weeks, and funding subsequently distributed.
- The initial application window for the Clean Energy Program has opened, with publicity through local newspapers, the GRWF website, and targeted emails. To date, a total of 14 applications have been received by residents with 5km of the wind farm. A third party has been appointed to undertake Energy Efficiency Audits, the first stage of the Program, and these are expected to commence over the next few months.
- NGRWF has been active in assisting the Bannister Hall Community Association to purchase the Bannister Hall. Funds were supplied to the Association to cover the full costs of the purchase the hall for the benefit of the Bannister Community, including bush fire meetings, exercise programs, playgroup and short term accommodation. The picture below was taken during a BBQ to celebrate the handing over of the Bannister Hall in Dec 2014.

- Community Update Newsletters have been distributed to residents within 10km of the wind farm in Sept 2014 and December 2014.
- The first Community Open Day is planned for 18th April 2015, as required under the Statement of Commitments. The family friendly event will feature a complimentary BBQ, activities for children, the chance to see how a wind farm operates, and learn about the benefits of wind power in general.
- The ongoing Landscaping Program (see Section 7 for details) continues with a high level of engagement and communication with those residents who have registered for the Program.
- NGRWF has continued to provide mitigating measures to rectify any TV reception issues for residents within 5km of the wind farm. To date, around 13 residents around the wind farm have contacted NGRWF to discuss TV reception issues, and mitigation measures have been implemented.
- A number of residents in the township of Crookwell have contacted NGRWF about TV reception issues. Despite town limits being considerably more than 5km from the windfarm, NGRWF has previously committed $80,000 to a new TV transmitter in Crookwell and have been actively supporting Upper Lachlan Shire Council in delivering this benefit. NGRWF has acted to provide beyond compliance requirements and offered TV mitigation measures to residents of Crookwell who have contacted the Project Team and who do not wish to wait for the TV transmitter to be operational. To date a total of 51 residents in Crookwell have contacted NGRWF and 34 residences have had mitigation measures implemented. It is expected that this will result in a further $75,000 of costs to the windfarm.
- Ongoing engagement with residents hosting noise monitoring equipment as part of noise compliance testing, including notifying of access, discussion of monitoring requirements, and provision of information when requested.

10.2. Community Consultative Committee (Recommended Condition 5.1A)

NGRWF appreciates that DPE wishes to standardise approval conditions across NSW wind farm projects and that a condition for a CCC is a standard inclusion for all new project approvals.

However, NGRWF does not believe that the proposed CCC process is necessary or essential to achieving consultation objectives, and can involve significant bureaucracy for its members. In assessing the suitability of the recommended condition, NGRWF has given consideration to the following factors:

- Construction and commissioning of GRWF is complete and full operation commenced in December 2014.
- Channels of communication have already been established and should remain in place rather than restructuring existing arrangements and programs and causing a transition period of uncertainty.
- NGRWF believes that the refinement of existing channels of communication will be more effective and practical than founding new processes under the CCC model
- A framework for community engagement is already in place, with a Community Information Plan (**CIP**) developed in accordance with existing Condition 5.3 of the Project Approval and agreed with DPE prior to commencement of construction.
- NGRWF has maintained an active role in consulting with the local community and other stakeholders throughout the project implementation, including face to face meetings, newsletters, websites and media releases, a communication portal, and complaints system.
- In June 2013, at request of DPE, an independent audit was conducted by KMH of the consultation for GRWF. The review of consultation was provided to DPE and various community stakeholders. No written feedback was provided by the DPE, however, conversations with the Compliance Department confirmed that the project was fully compliant. The KMH report concluded that GRWFPL had achieved compliance with the conditions pertaining to the communication of project activities.
- NGRWF has improved its consultation performance over the last year to achieve improved relationships. The appointment of a dedicated Community Engagement Manager has assisted this objective.

It is NGRWF's view that establishing and operating a CCC for the life of the wind farm is onerous and not necessary to achieve improved community/developer relationships. It is anticipated that better consultation initiatives outcomes are possible through a dynamic, balanced approach that respects the diverse objectives of key sectors of the community and the proponent.

10.3. Monitoring Results (2014 SEAR Recommended Condition 5.2A)

NGRWF agrees with the recommended condition to have monitoring results on GRWF's website

10.4. Complaints Register (2014 SEAR Recommended Condition 5.5)

The 2014 SEAR recommended a replacement condition 5.5 in respect of the Complaints Register. The key difference between the existing condition and the recommended condition is that rather than requiring that "*the Complaints Register shall be made available for inspection by the Director-General*", the recommended condition requires that "*The Complaints Register shall be made publicly available on the dedicated website with the personal details removed, unless otherwise advised by the complainant*".

NGRWF agrees with the position that personal details of complainants not be made publicly available on websites. Furthermore, NGRWF believe that details of the complaint that may allow another party to surmise as to the details of the complainant are not helpful to maintaining harmonious relationships in some communities. Previous experience of divisions within the community for various projects has led to a preference to maintain privacy for individuals.

Accordingly, NGRWF will maintain a detailed complaints register but suggests this not be made publicly available, but rather reviewed by the DPE or the Environmental Representative (**ER**) at any stage.

11. Traffic and Transport issues

The Modification Application did not require any changes to the way traffic and transport activities are managed. These matters continue to be managed under the existing conditions of the Project Approval and through consultation with Local Councils.

The transport of all turbine components (towers, nacelles and blades) to the project area has been completed and all turbines have now been installed.

NGRWF has worked closely with officers of both the Upper Lachlan Shire and Goulburn Mulwaree Councils to agree the requirements to maintain the roads in a good condition. As per the Project Approval requirements, NGRWF commissioned a pre-construction dilapidation assessment and report by independent experts that has included:

- both photographs and a road Network Survey Vehicle which is able to map the road profile in detail using laser instrumentation; and
- a detailed mobile laser scanner survey with a 6 lens panoramic camera that provides high resolution detail of the road condition.

Following the completion of the final oversized deliveries to site, NGRWF commissioned a post construction dilapidation report by the same independent organisation. This included running the road Network Survey Vehicle back over the heavy vehicle transport route to determine any change in profile or condition. NGRWF then commissioned the same independent road expert to provide a further report on recommended works.

Following the assessments, NGRWF undertook discussions with the Councils concerned in regards to the appropriate work necessary to return the roads to the condition they would have been expected to be in, if the project had not taken place. NGRWF has now reached agreement with both Upper Lachlan Shire Council and Goulburn Mulwaree Council as to a suitable contribution to restore local roads. The work is now underway in Upper Lachlan Shire and is complete in the Goulburn Mulwaree Shire.

Overall, NGRWF has contributed in excess of $6M towards upgrades and restoration of local roads. NGRWF assessments have indicated that the work arising from its contributions has been over and above that necessary to address the impacts of the project implementation. NGRWF's view has been verified by specialist engineering assessments. Some stretches of road have been improved as a result. This includes enhancements to the local road network which were not required by the project and were not due to dilapidation from project implementation, such as the replacement of floodways with culverts.

NGRWF considers that the Councils and local road users have already benefited from the works carried out to date and will benefit further from the additional restorative and supplementary works.

12. References

Author	Description of Reference and date
Brett Lane, BLA	Monthly report of monitoring for GRWF BBAMP, January 2015
Brett Lane, BLA	Monthly report of monitoring for GRWF BBAMP, January 2015
Department of Planning and Environment (DPE)	Secretary Environmental Assessment Report, July 2014
DPE	Secretary's Environmental Assessment Report, July 2014
Ecofocus Environmental Consulting (EEC)	Report of Survey, October 2014
EEC	Report of Survey, January 2015
Environment Protection Authority (EPA)	Environment Protection Licence 20365, October 2014
Fresh Landscape Design	Individual Landscape Plan – Barber
Fresh Landscape Design	Individual Landscape Plan - Ikin
Fresh Landscape Design	Individual Landscape Plan - Johnson
Ian Smales, Biosis	GRWF - Report of Ian John Smales, October 2014
Land and Environment Court	Order, Case Number 14/40907 NGRWF v Minister for Planning, 6 March 2015
Marshall Day Acoustics	Updated Noise Assessment, December 2014
NGRWF	GRWF Modification Application – Environmental Assessment, March 2014
NGRWF	GRWF Modification Application – Submissions Report, June 2014
NGRWF	GRWF Modification Application – Report to Planning Assessment Commission, August 2014
NGRWF	Pre-Operations Compliance Report, December 2014
NGRWF	Request to DPE to obtain lifting of operational restrictions on POM_03, 04, 06 and 07 in respect of risk to Powerful Owl, Feb 2015
NGRWF	OEMP – Landscape Management Plan, Rev D, January 2014
nghenvironmental	Bird and Bat Adaptive Management Program, May 2012
nghenvironmental	Compensatory Habitat Package (revised), March 2015
nghenvironmental	Powerful Owl Management Strategy, January 2012
nghenvironmental	Property Vegetation Plan (Draft) March 2015
nghenvironmental	Validation of impacts on Native Vegetation, March 2015

Appendix 1 – Report of Ian John Smales, October 2014

Gullen Range Wind Farm (07_0118)

Proponent: New Gullen Range Wind Farm Pty Ltd

Report of Ian John Smales

Executive summary

The key question addressed by this report is whether the risk of turbine collisions for Little Eagle and Powerful Owl may have been increased by the re-positioning of four wind turbines in the Pomeroy precinct of Gullen Range Wind Farm.

I do not consider that the relocation of the four turbines from their indicative locations to their final locations has materially altered risk of collisions for Little Eagles or Powerful Owls with the four turbines in question.

I have been retained on behalf of New Gullen Range Wind Farm Pty Ltd to:

a) Assess any collision risk between POM_03, POM_04, POM_06 and POM_07 and the powerful owl and little eagle, having regard to the indicative locations and final locations of the turbines; and

b) prepare a brief factual report in relation to (a).

Process and methodology

I visited Gullen Range Wind Farm on the afternoon of 30th October 2014. During my visit I examined the four turbines in their final locations and the previous indicative locations of each. I also observed the context and the final locations and previous indicative locations of each relative to forest and scattered trees. This report has been prepared on the basis of my examination of the site and information contained in documents listed below and my own professional experience in ornithology and with bird interactions with wind farms in south-eastern Australia.

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Documents and other material reviewed to prepare this report

In undertaking my investigations I have taken note of information contained in the following documents and reports:

1. Pomeroy area – Wind turbines and aerial. Document Number GR-PM-DWG_0093 Revision D dated 27/03/2014, depicting indicative and final locations of wind turbines in the Pomeroy section of Gullen Range Wind Farm.

2. Bird and Bat Adaptive Management Plan & Monitoring Program (GR-PM-PLN-0012) Gullen Range Wind Farm. May 2012. Report by ngh environmental for Goldwind Australia Pty Ltd.

3. Powerful Owl Management Strategy (GR-PM-PLN-0013) Gullen Range Wind Farm. January 2012. Report by ngh environmental for Goldwind Australia Pty Ltd.

4. Gullen Range Modification 1 – Draft Consent Conditions. Little Eagle Review. August 2014. Report by ngh environmental for Goldwind Australia Pty Ltd.

5. Compensatory Habitat Package (GR-PM-PLN-0014). August 2014. Gullen Range Wind Farm. January 2012. Report by ngh environmental for Goldwind Australia Pty Ltd.

6. Gullen Range Wind Farm (07_0118) Draft Order No. 18 under section 121B of the *Environment Planning and Assessment Act* 1979 issued by Department of Planning and Environment 10 October 2014.

7. Gullen Range Wind Farm Modification Application (MP 07_0118 MOD 1) Submissions Report. June 2014. Prepared for Gullen Range Wind Farm Pty Ltd by Goldwind Australia Pty Ltd.

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Persons assisting with this work

This report has been prepared by me with no assistance from any other person.

Findings

Turbine locations relative to habitat features for the two species

References to document numbers below are as per the list of references above.

Document 4 provides records of Little Eagles from Gullen Range Wind Farm site obtained during bird surveys there in autumn 2007, autumn 2011 and summer, winter and spring 2012. A single record of the species was made in the Gurrundah precinct of the wind farm in 2007. No Little Eagles were observed in the Pomeroy precinct. Two nests attributed to Little Eagles were detected in forested sections of the Pomeroy precinct in 2011, but bird surveys by ngh for the project have not detected the species (document 4, Gullen Range Modification 1 – Draft Consent Conditions. Little Eagle Review). One of the nests is in a block of forest south and west of the four turbines in question and of relevance to the question of collision risk they may pose. It is approximately 500 metres south-east of the final location of turbine POM_03. During my visit to the site I located and briefly observed a nest that was consistent in its location with the nest described by ngh in document 4. The nest's structure and position within the tree were consistent with my knowledge of Little Eagle nests, but I note that some other species build similar nests.

Document 3 provides details of an adult pair of Powerful Owls that was detected and observed to have an active nest in a gully, and a number of perch and roost sites within the same block of forest.

The locations of a nest attributed to Little Eagles; a documented Powerful Owl nest and documented perches and roosts of Powerful Owls are shown on maps in document 2 (Bird and Bat Adaptive Management Plan & Monitoring Program (GR-PM-PLN-0012) Gullen Range Wind Farm). I refer to these generically as 'potential Little Eagle and documented Powerful Owl locations'. Radial buffer distances of 200 and 500 metres from the nest attributed to Little Eagles and the active Powerful Owl nest are shown in the map Ref: 1557 – BBMP – 3. In relation to the four turbines in question, the primary area of habitat for the Powerful Owl is a large patch of forest to their south and west. Habitat for Little Eagles includes forest, scattered trees and open grassland areas. In this context, the feature of principal interest for that species is the nest south of POM_03 that is considered likely to have been built by Little Eagles, albeit that no Little Eagles have been confirmed to have used it.

Information provided in document 7 and my examination of the site shows that the final locations of the four turbines in question differ from the indicative locations for them as approved in 2010, as follows:

- Final location of POM_03 is 102.2 metres west of its indicative location.
- Final location of POM_04 is 96.2 metres south-west of its indicative location.
- Final location of POM_06 is 56.7 metres south-west of its indicative location.
- Final location of POM_07 is 23.4 metres west of its indicative location.

The final and indicative locations of the four turbines relative to patches of forest and scattered trees are shown in document 1 (Pomeroy area – Wind turbines and aerial Document Number GR-PM-DWG_0093). My examination of the site shows that the final locations of all four turbines are in open areas outside of forested areas.

My site examination of the site and reference to these maps indicates the following:

- Final location of POM_03 is to the west, essentially further around the perimeter of the patch of forest, from its indicative location. Its final location is slightly further from potential Little Eagle and documented Powerful Owl locations. The final location is now approximately 500 metres (radial distance) from the attributed Little Eagle nest, whereas its indicative location was closer to the nest.

- Final location of POM_04 has been moved south-west and is closer to the patch of forest and to the attributed Little Eagle nest. Nonetheless, its final location is substantially further from the edge of the forest patch than are the indicative or final locations of turbines POM_03 and POM_07. It does not appear to be materially different (in radial distances) than its indicative location was from Powerful Owl locations. It is also somewhat further from groups of scattered trees than was its indicative location.

- Final location of POM_06 is closer to the block of forest by the direct distance it has been moved. That has placed it closer to potential Little Eagle and documented

Powerful Owl locations. However, its final location is further than the indicative or final locations of the other three turbines from both the attributed Little Eagle nest and the Powerful Owl nest. It remains further than 500 metres from the former and appears to be more than 800 metres from the latter.

- The final location of POM_07 is further from the edge of the forest block than its indicative location. It is now further from the Powerful Owl nest and marginally closer to the attributed Little Eagle nest. It remains rather more than 500 metres from either nest.

Habitat and behaviours of the two species

Little Eagles occur widely across Australia and range over open and wooded environments. Little Eagles may live for more than twenty years and a home range is likely to be used by a pair throughout their adult lives. They frequently nest in live trees within woodlands and forests, often on hillsides. In common with many other eagle species, a pair of Little Eagles may have up to three nests within their territory and in a given year they are likely to use only one of them. Disused nests may remain for many years. Their primary prey is now rabbits, which they hunt in open areas. Little Eagles will frequently perch in scattered trees within otherwise open areas.

At Gullen Range Wind Farm site, Little Eagles would thus be likely to utilise both wooded and open areas and nests would be expected to occur within patches of forest. If the species occupies a territory it would generally be readily observable and especially so within a few hundred metres of an active nest during the breeding season. My site visit demonstrated that vantage points afford excellent views over the relevant landscape from which Little Eagles could be observed if they were present. From the information available to me it would appear unlikely that Little Eagles currently occupy the area close to the four turbines in question. There is no evident basis for predicting how Little Eagles might apportion their use of available habitats if they were to use the attributed nest in future. Relative to their indicative locations, the final locations of all four turbines do not appear to me to materially alter the collision risk they might pose to the species.

Powerful Owls inhabit densely treed environments and the great majority of their prey is arboreal mammals, primarily larger species of possums and gliders. Studies of their diet shows they almost never prey upon terrestrial species. Powerful Owls nest in hollows within large forest trees and they use routine daytime perch and roost sites in densely foliaged forest trees. As a consequence, Powerful Owls are generally confined to forests and rarely venture into open environments. Powerful Owls may live for decades and a given territory is likely to be utilised by a pair for their adult lives. I consider it would be rare for adult Powerful Owls to be at risk of collision with turbines sited outside blocks of forest, such the four turbines in question.

I agree with the suggestion outlined in document 3, that dispersal of juvenile Powerful Owls may represent the period of greatest collision risk for that species. However, I am not aware of published studies of juvenile dispersal behaviour for this species. Nonetheless, some general information about bird behaviour and survivorship are pertinent. Dispersal

of juvenile birds is usually a brief event in which young birds move away from their natal territory over a period of a few days. Where a pair of Powerful Owls breed each year this would be an annual event. In territorial birds, dispersal is usually gender specific, with juvenile females often moving greater distances than juvenile males from the natal territory. In long-lived territorial species that breed annually like Powerful Owls, mortality of juveniles, especially during the period of dispersal is naturally high. The territory occupied by parent birds offers sufficient resources for the pair and their dependent young of the year. For this reason, as juveniles of one year become independent they are forced to disperse in an attempt to locate a mate and a potential territory of their own. Since suitable habitat is often fully occupied by existing pairs who will exclude conspecifics from their territories, many dispersing juveniles are unsuccessful and naturally do not survive.

The locations of the two turbines closest to the known Powerful Owl nest (POM_06 and POM_07) have been altered by the shorter of the four relocated distances. I do not consider that the altered locations of the four turbines, when compared with their previous indicative locations, materially alter any risk of collisions posed by the four turbines to Powerful Owls.

Turbine collision risk

No quantitative turbine collision risk assessment based on bird flight data has been undertaken for the two species in question at Gullen Range Wind Farm. Information available to me suggests that data that might quantify whether one turbine location represents a different risk from that of another location is not available.

Conclusions

The key question I address is whether the risk of turbine collision for Little Eagle and Powerful Owl may have been increased by the re-positioning of the four turbines.

As no quantified collision risk is available for either species at Gullen Range Wind Farm the question of whether collision risk may have increased as a result of the re-positioning of the four turbines requires an informed qualitative assessment.

I do not consider that there is strong evidence for any collision risk for Little Eagles posed by the four turbines in question. If Little Eagles are present or were to use the nest attributed to them in future, I do not consider that any risk of collisions with the four turbines has materially altered by their relocation from their indicative locations to their final locations.

I consider that any risk of turbine collisions for Powerful Owls would be primarily for dispersing young birds that may fly out of the forest as they move away from their natal territory. This risk would relate to a matter of a few days per annum and there is no evident basis for determining whether, in fact, such birds might encounter any turbines. The minor changes from the indicative to final locations of the four turbines in question do not appear to me to materially alter any collision risk they may pose.

31st October 2014

Annexure A – Qualifications and Experience Ian John Smales

Ian John Smales
Principal Zoologist
Melbourne Resource Group
Biosis Pty Ltd
Victoria

Qualifications:

MSc. University of Melbourne

Professional Experience:

Ian Smales, Principal Zoologist with Biosis Pty Ltd has over thirty years of professional experience in wildlife research and natural resource management with the public and non-government sectors. He has been with Biosis since 2003. Ian has broad field expertise investigating the ecology, distribution and habitat requirements of Australian vertebrate fauna and has undertaken comprehensive research projects for birds and reptiles. Ian has authored or co-authored multiple scientific papers and consultant reports in those fields.

Ian's career has included periods with the Wildlife Management Section of Victoria's former Fisheries and Wildlife Division (1978 - 87) and as Conservation Biologist with the Zoological Parks and Gardens Board of Victoria (1990 – 2003). He has been involved with research and management for threatened fauna throughout his career and has been a long-standing member of the national recovery teams for the Helmeted Honeyeater and the Orange-bellied Parrot.

Ian has designed and managed numerous flora and fauna assessments for multiple development projects including a number of major Government infrastructure projects.

Ornithology
Ian's research on birds has encompassed population biology and his MSc dissertation is entitled *"Population ecology of the Helmeted Honeyeater* Lichenostomus melanops cassidix*: long-term investigations of a threatened bird"*. It is based on his 20-year study of this critically endangered bird. He has investigated bird abundance, habitat use and behaviours at numerous sites for woodland birds, shorebirds, raptors, owls and almost all other Australasian taxonomic groups. Ian has designed and led long-term investigations of bird and bat utilisation of many wind energy facilities in Tasmania, South Australia, Victoria, Queensland and Fiji.

Wind turbine collision risk
Under Ian's management Biosis has led the development in Australia of numerical modelling of potential risks of bird and bat collisions with wind turbines. Biosis owns the only proprietary Avian Collision Risk Model developed in Australia for this purpose and it has been used for approximately 30 proposed wind energy projects in Australia and by authorities including the Commonwealth of Australia. Ian is the senior author of the 2013 description of this mathematical collision risk model published in the U.S. journal *Wildlife Society Bulletin*. He presented a paper on cumulative risk assessment at the first world conference on wind energy and wildlife in Trondheim, Norway in 2011 and was a member of the organising committee for the first Australian conference on the subject held in Melbourne in 2012. In 2014 Ian was invited to prepare a chapter entitled *Vulnerable species – modelling of collision risk and populations as mitigation tools* for a two-volume international book on all aspects of wind energy and wildlife to be published in the UK.

Professional Affiliations and Memberships:

IUCN Species Survival Commission, Re-Introduction Specialist Group

Birdlife Australia

Australian Society of Herpetologists

Helmeted Honeyeater National Recovery Team (1989 -)

Orange-bellied Parrot National Recovery Team (1994 – 2003)

Scientific Panel, South-west Victoria Brolga Research Project (2009 -)

'A' Class Australian Bird & Bat Banding Scheme Licence, endorsed for use of mist nets

Publications:

Ian has authored, or co-authored multiple publications. The following selection relates to wind energy and birds:

Smales, I., Quin, B., Menkhorst, P. & Franklin, D. 2009. Demography of the Helmeted Honeyeater (*Lichenostomus melanops cassidix*) *Emu* 109: 352–359.

Smales, I., Holdsworth, M., Menkhorst, P., Starks, J. & Brown, P. 2000: Re-introduction of orange-bellied parrots, Australia. *Re-introduction News: Newsletter of the Re-introduction Specialist Group of the IUCN's Species Survival Commission*. 19: 32-34.

Pavlova, A., Selwood, P., Harrisson, K.A., Murray, N., Quin, B., Menkhorst, P., **Smales, I.** and Sunnucks, P. 2014. Integrating phylogeography and morphometrics to assess conservation merits and inform conservation strategies for an endangered subspecies of a common bird species. Biological Conservation 174: 136–146.

Smales, I. in prep. *Vulnerable species – modelling of collision risk and populations as mitigation tools.*in M. Perrow (ed) Wildlife and Wind Farms: conflicts and solutions. Pelagic Publishing. UK.

Smales, I. in prep. *Fauna collisions with wind turbines: effects and impacts, individuals and populations. What are we trying to assess?* Wind and Wildlife. Springer, Holland.

Smales, I., Muir, S., Meredith, C. & Baird, R. 2013. *A Description of the Biosis Model to Assess Risk of Bird Collisions with Wind Turbines.* Wildlife Society Bulletin 37(1):59–65.

Smales, I. 2006. Impacts of avian collisions with wind power turbines: an overview of the modelling of cumulative risks posed by multiple wind farms. Biosis Research report to Australian Government Department of Environment and Heritage.

Biosis Pty. Ltd. 2013. Bat and Avifauna Management Plan for Yaloak South Wind Farm: Background & Rationale. Report for Pacific Hydro Ltd. Authors: I. Smales & D. Gilmore.

Biosis Pty. Ltd. 2013. Bat and Avifauna Management Plan for Yaloak South Wind Farm: Implementation Plan. Report for Pacific Hydro Ltd. Authors: I. Smales & D. Gilmore.

Biosis Pty. Ltd. 2013. Bat and avifauna management plan for Stockyard Hill Wind Farm: Implementation plan. Report for Origin Energy Power Ltd. Authors: D. Gilmore & **I. Smales**.

Biosis Pty. Ltd. 2013. Bat and avifauna management plan for Stockyard Hill Wind Farm: Background information and mitigation measures. Report for Origin Energy Power Ltd. Authors: D. Gilmore & **I. Smales**.

Biosis Research Pty. Ltd. 2012. Orange-bellied Parrot Collision Risk: Preliminary Scenario Modelling for TasWind Project. Report to Hydro Electric Corporation. Authors: **I. Smales** & S. Muir.

Biosis Research Pty. Ltd. 2010. Avifauna Collision Risk Update 2009 Surveys Studland Bay Wind Farm North West Tasmania. Report for Roaring 40s Renewable Energy Pty. Ltd. Authors: N. Garvey & **I. Smales**.

Biosis Research Pty. Ltd. 2010. Wedge-tailed Eagle Turbine Collision Risk Modelling Yaloak South Wind Farm. Report for Pacific Hydro Ltd. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2009. Modelled risk of Brolga collisions with turbines at the proposed Stockyard Hill Wind Farm. Report to Stockyard Hill Wind Farm Pty. Ltd. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2008. Modelled risk of Brolga collisions with turbines at the proposed Mortlake Wind Farm. Report to Acciona Energy Oceania Pty. Ltd. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2005. Bird and Bat Collision Risk Assessment for proposed Butoni Wind Farm, Sigatoka, Fiji. Report for Fiji Electricity Authority. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2005. Modelled cumulative impacts on the Orange-bellied Parrot of wind farms across the species' range in south-eastern Australia. Report to Department of the Environment and Heritage. Authors: **I. Smales**, S. Muir & C. Meredith.

APPENDIX H: LITTLE EAGLE REVIEW

GULLEN RANGE MODIFICATION 1 – DRAFT CONSENT CONDITIONS

Little Eagle Review

AUGUST 2014

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Document Verification

Project Title: Little Eagle Review

Project Number: [Subject]

Project File Name: Document1

Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Draft V1	13/08/14	Deb Frazer	Brooke Marshall	Nick Graham-Higgs
Draft V1.1	14/08/14	Deb Frazer		
Final V1	14/08/14	Deb Frazer		

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CONTENTS

1 LITTLE EAGLE REVIEW

The Little Eagle is identified as a key species within the Bird and Bat Adaptive Management Plan for the Gullen Range Wind Farm. Its inclusion has been based on limited sightings during site fauna surveys, 2007 to 2012 and identification of an unoccupied nest attributed to the Little Eagle. This review considers the records of sightings of the Little Eagle at the site, what is known of the risks to the Little Eagle at Gullen Range Wind Farm and the suitability of recommended conditions from a risk management perspective and context of an operating wind farm.

This review has been prepared to better inform the decision making process in relation to an OEH recommendation for a new project approval condition 1.6A (c) which is:

To reduce the impact on the Little Eagle, turbines POM_3 and POM_4 are to be completely switched off during the fledgling period of the Little Eagle, from 1st November through to the 31st of March, every year.

This response considers the local records, ecological risk factors and management options that may be appropriate for the Little Eagle in regard to the above recommended approval condition.

1.1 OCCURRENCE LOCALLY AND WITHIN GULLEN RANGE WIND FARM PROJECT BOUNDARIES

This species is known from the region and was detected onsite. Standardised bird surveys have been undertaken as part of the Biodiversity Assessment (2007), and base line (pre-construction) surveys for the Bird and Bat Adaptive Management Plan (BBAMP) (2011 and 2012). The surveys are taken from set locations and include a designated time period for observations. These surveys detected the Little Eagle onsite on one occasion, at the Gurrundah precinct in 2007.

Table 1.1 – GRWF - Bird survey results and occurrences of the Little Eagle

GROUP	Autumn 2007	Autumn 2011	Summer 2012	Winter 2012	Spring 2012
Kialla	No	No	No	No	No
Bannister	No	No	No	No	No
Pomeroy	No	No	No	No	No
Gurrundah	✓	No	No	No	No

Additional on-ground site investigations at Gullen Range Wind Farm have informed the development of environmental management plans and strategies, including the;

- Powerful Owl Management Strategy (POMS) (January 2012),
- Bird and Bat Adaptive Management Plan (BBAMP) (May 2012)
- Flora and Fauna Management Sub-plan (FFMP) (July 2012) (a Sub-plan of the Construction Environmental Management Plan (CEMP); September 2012),

As well as set aims, including to update and validate existing flora and fauna habitat values, the additional investigations resulted in additional observations that assisted in developing appropriate management strategies. In May 2011, as part of the onsite work to inform the development of the Powerful Owl

Management Plan, two Little Eagle nests were opportunistically identified at the Pomeroy precinct. These nests were identified by the owl and raptor specialist consultant John Young as Little Eagle nests[1]. The nests were inactive at the time as the observations were made outside of the eagle's breeding season.

Targeted baseline surveys were undertaken at Gullen Range during February, August, and October 2012. Bird surveys were undertaken at POM 3 and POM 7 with views over the area of a known nesting area. Little Eagles were not recorded on-site during baseline surveys. Therefore, there has only been one observation of an individual Little Eagle recorded in Autumn 2007 within the Gullen Range Wind Farm project area across all the surveys undertaken.

1.2 TURBINES NEAR LITTLE EAGLE NEST: POM 3 AND 4

At Pomeroy, a large section of the precinct is bordered by contiguous forest. The two turbines closest to the most northern Little Eagle nest are **POM 3 and 4**, both of which are the subject of the modification report. POM 3 has moved to the west by 102 metres and POM 4 has moved by 96 metres to the south west. Neither of the installed turbines has been moved directly towards the Little Eagle nest site and each of the turbines has a smaller rotor than is allowed under the project approval. The rotor swept area of the installed turbines is approximately 90.7% of the maximum dimension rotor permissible under the Project Approval.

These turbines are subject to a proposed condition that has been recommended by OEH, requiring shut down of the turbines from 1st November through to the 31st of March every year. The condition has been recommended to address an OEH concern that the risk to the Little Eagle has increased. The recommended condition for shutdown has been inadequately formed in that it does not distinguish daytime versus night time impact.

POM 3 was moved 102m west of the approved layout. The turbine remains on the interface of open woodland and forest and appears to have moved further from individual trees on the periphery of this forested vegetation. As such the impact of the relocation on birds and bats is considered benign, in terms of potential risk to impacts to these fauna groups.

In terms of risk to the Little Eagle, the turbine has moved 75.25m further away from the nest reducing the potential fledgling collision risk (distances to nest: approved layout 441.25m, built layout 516.5m).

POM 4 was moved 96m west south west of the approved layout, but not directly towards the large, contiguous forested area. The turbine appears to have moved into a slightly more cleared area of open woodland. However, in general the turbine remains on the interface of open woodland and forest.

In terms of risk to the Little Eagle, the turbine has moved 40.95m closer to the nest reducing the buffer marginally compared to the original approved location. The nest however, is still buffered by 425m and the turbine is unlikely to present any more risk than the original location based on its current location that is now in a more cleared area (distances to nest: approved layout 465.75m, as built layout 424.8m).

Overall, the net effect of the movement of the two turbines is unlikely to present any more risk than the original turbine locations for the Little Eagle, contrary to the view expressed by OEH.

[1] John Young is approved independent specialist to monitor dispersal of powerful owl juveniles (approved by DPE 1/4/11).

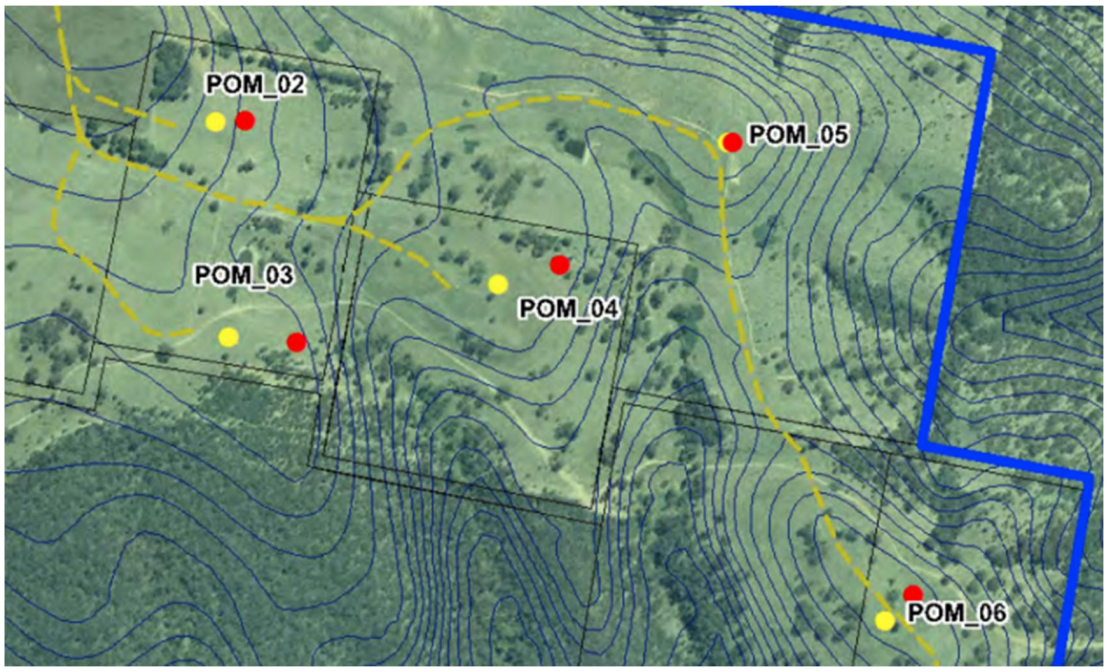

Figure 1: Yellow - 'as built' turbine location; Red - approved turbine location

Please note: contiguous forest vegetation at Pomeroy occurs south of POM 3 and 4.

1.3 RISK ASSESSMENT

1.3.1 Nest fidelity – confirmation of breeding

Studies of nesting Little Eagles suggest a tendency for long-term fidelity of individual birds to nest-sites and breeding territories (Debus 1984; Debus *et al*. 2007; Debus *et al.* 2009). Within their breeding territory Little Eagles can have up to three nests approximately 500 m apart, but will preferentially use the same nest each year; if a preferred nest is destroyed they will often opt to build a new nest in a nearby tree in the immediate area (John Young pers. comm. 2014).

Implications of draft condition

As only the nest sites, but no actual Little Eagles, were recorded in May 2011, it is first necessary to determine if the nests are being actively used each breeding season. If the Little Eagle is breeding at the Gullen Range Wind Farm site at the identified nest approximately 450 metres south of POM 3, this nest is likely to be used each breeding season and active breeding at this site would be readily identifiable. However, it is also possible that this nest site is not being used, is an old, or abandoned nest and there is no risk to Little Eagle fledging.

Monitoring of the nest site near POM 3 is required in spring 2014 to confirm if the Little Eagle is using this nest for breeding. If, after survey, the species is not found using the nest, the recommended approval condition is not applicable and may require review, or perhaps deletion. If the Little Eagle is observed to be using the nest, then further monitoring to identify periods which may present risk to fledglings should be undertaken and adaptive management controls implemented in accordance with the approved BBAMP.

1.3.2 Breeding biology – risks to fledglings

The Little Eagle is a diurnal raptor, hunting during the day preying on rabbits, birds, lizards, and possums (Morcombe 2004). The species nests in living trees, mostly eucalypts, in woodland and rarely in isolated trees (Debus 1984). Debus *et al.* (2009) has observed a preference for the Little Eagle to nest in large trees on slopes with a southerly component. John Young (pers. comm. 2014) has observed the species nesting around hilltops and on the sides of slopes in wooded areas.

Their main breeding season is September to October, but can begin in August (John Young pers. comm. 2014). Two eggs are generally laid in late spring and the estimated incubation period is 37-39 days (Debus *et al* 2007). Young fledge the nests in summer. Fledging occurs on average from early December, but can be up until early January. Debus (1984) indicates a nestling period of about 8 ½ to 9 ½ weeks (i.e. young fledge the nest at around nine weeks on average).

On fledging day, juvenile Little Eagles will fledge (fly) short distances (i.e. up to 50 m) and over time they will gradually increase their range from the nest. Observations by Debus *et al.* (2007) suggest when juveniles attain adult proportions and can fly well, they often practise soaring in the nest area (low over the tree-canopy at first) and progress to soaring at greater heights to food-beg from high-soaring parents. Debus *et al.* (2009) observed juveniles to make low flights around treetops ranging from 100m from the nest in weeks 2 or 3 post –fledging; in week 4 juveniles started soaring >300m from the nest; in week five they had adult-like aerial abilities ranging up to 500m from the nest where they started practicing hunting manoeuvers; in week 6 juveniles ranged up to 1 km from the nests begging aerially hunting parents for food and practicing foraging behaviour; in week 9 the juveniles dependence for food from their parents lessened and they started hunting for themselves at which point they were seen intermittently or rarely in their natal territories.

Nesting Little Eagles have been shown to be tolerant of the proximity of houses. Debus *et al.* (2007) observed pairs of Little Eagles nested at distances of 250 – 400m from occupied rural residences, with some nests in view of residences and others concealed in woodland canopy. The eagles were not disturbed by unconcealed observation of them from 50-140m away. Although, females were generally wary of approach at approximately 120 – 140m (Debus *et al.* 2007). POM 3 is located 441.25 metres and POM 4 is located 465.75 from the closest nest. Based on the above observations by Debus *et al.* (2007), Little Eagles were able to tolerate disturbances at distances less than 400m when nesting. Under the current modification the turbine location changes for POM 3 and POM 4 are greater than 400m from the closest known nest site and are unlikely to disturb Little Eagle nesting.

Implications of draft condition

The draft condition 1.6A (c) requires that POM 3 and POM 4 be shut down for a duration of 5 months, from 1st November through to the 31st of March every year to protect fledglings colliding with turbines. As a first point of contention, this should be restricted to day time periods only. The literature review identifies that: 1) the fledging period is generally between early December through to February when there would be a heightened risk of juvenile collision with turbines; and 2) that fledglings have a dependence on parental feeding and are at higher risk of collision for approximately two months after fledging (Marchant & Higgins 1993; Debus *et al* 2007).

The key risk to the Little Eagle is therefore identified as potential collision of fledglings, particularly in the two months post-fledging. Further investigation into the breeding and fledging season of the Little Eagle at Gullen Range Wind Farm is required to accurately inform the period when Little Eagle fledglings are at risk of collision. It should be noted however, that as the Little Eagle is diurnal there is no risk of fledgling collision from turbine operation at night.

It is also expected that any requirement to shut down operations would be based on risk of impact during the fledgling period and that this could be partly determined by monitoring of nest occupancy and commencement of the fledgling stage.

1.3.3 Flight behaviour and turbine collision risk

Wedge-tailed Eagles have been known to exhibit a lower collision avoidance rate than other species of birds which are attributed to their size, manoeuvrability and hunting style. While Little Eagles have not been recorded in the Australian carcass search literature, it is a medium sized raptor with similar soaring and prospecting foraging behaviour as the Wedge-tailed Eagle (Aumann 2001); for Little Eagles, most foraging is done in flight from soaring and circling on updraughts or thermals, with dive attacks at prey (Morcombe 2004; Debus *et al.* 2007). As a result, the Little Eagle has been assumed to be at the same risk of collision with turbines as the Wedge-tailed Eagle. Recent studies however, are beginning to document active avoidance by the Wedge-tailed Eagle.

Hull and Muir (2013) in their study of the Tasmanian Wedge-tailed Eagle and White-bellied Sea-eagle at three wind farms in northern Tasmania found that both species actively avoided turbines, with both species demonstrating distinctive avoidance behaviour. Wedge-tailed Eagles demonstrated an 81 to 90% avoidance rate at the two operational wind farms. Hull and Muir (2013) also observed an increasing avoidance of turbines form the commissioning stage to the operational stage indicating that the avoidance rates at the operational sites related to species-specific responses to the turbines or other specific features of the sites. That is, the eagles "apparently observe the turbines and alter their flight paths to minimise contact with them" pg. 55. Further the work includes evidence that eagles fly closer to shutdown turbines than active turbines, which could lead to modifications in the behaviour of eagles that may actually increase the collision risk (Hull *et al.* 2012).

Monitoring of the Little Eagle for GRWF could include some review of flight patterns at the site and risk in relation to impact by turbines. This could occur over the first year or two under the BBAMP and adaptive management process.

1.4 MANAGEMENT OPTIONS

1.4.1 Key risks requiring management

There can be multiple management options that may be appropriate to manage raptor collision with wind turbines, and while turbine shut-down is one of these options, it may not be appropriate in the case of the Little Eagle at Gullen Range Wind Farm. Increased monitoring, survey and investigation may be more appropriate. There is provision for these actions under the BBAMP and that would be the relevant means to manage avifauna risks.

This review has highlighted that the key risk to Little Eagles is the potential for fledglings to collide with a wind turbine, primarily within the first two months post-fledging. However, it must first be confirmed that the identified nest sites are currently being used by the Little Eagle. Additionally the nature of risk management and in the case of shut down, the timing and duration should be subject to specialist observations rather than broad exclusions.

1.4.2 Existing risk management framework within BBAMP

Risks to raptors in general are already included within the endorsed 2012 '*Bird and Bat Adaptive Management Plan and Monitoring Program*' for Gullen Range Wind Farm. The BBAMP has triggers for action for any key at-risk species and incorporates adaptive management, which encompasses the Little Eagle.

These triggers include:

- *Multiple mortalities of one species.*

The corresponding potential management action if a mortality is observed is:

- *Expert to notify the Operator that sector management may be required if further mortality is suspected (short-term action).*
- *Increase carcass search frequency and detection surveys for the species to ascertain if their presence in the vicinity of the wind farm has increased (short-term action).*
- *Expert to assess reasons for increase and review risk assessment for the species (short-term action).*

Further triggers are listed for the Wedge-tailed Eagle which include:

- *Detected breeding close to turbines where there is a high risk of adult or juvenile mortality***.**

Listed potential management actions do not include shutdown, rather:

- *Alter monitoring program (e.g. increase survey frequency) (short-term). If appropriate, the installation of deterrents may be a long-term management action (long-term).*

1.4.3 Additional management measures to be added to BBAMP

The above trigger for the Wedge-tailed Eagle would also be appropriate for the Little Eagle and we recommend update of the BBAMP to include similar triggers for this species. Further, we recommend documentation of a Little Eagle Subplan as part of the BBAMP to outline specific issues to this species discussed in this review which would include:

1. Risks to fledglings
2. Monitoring requirements
3. Outcomes and reporting

1. Risks to fledglings

The Subplan would document the breeding biology, fledging period and potential risks, as discussed above.

2. Monitoring requirements

The Subplan would document survey methods to monitor the breeding and fledgling period of the Little Eagle and would be informed by an approved expert. As a priority, it is understood that Goldwind have committed to surveying the Little Eagle in 2014/2015 at Gullen Range Wind Farm to first confirm if the species is nesting and breeding within the area. If the species is found to be nesting, follow-up surveys would be undertaken to document fledgling behaviour. As a minimum, two surveys would be undertaken by an expert; one during the species known breeding season (September -October 2014) and another during the fledgling season (February 2015).

3. Outcomes and reporting

The findings of Little Eagle monitoring would be used to inform the management requirements for this species. Targeted monitoring for the Little Eagle allows a measured and scientific approach to determine:

1. If Little Eagles are using the nest sites for breeding and if management is actually required;
2. The 'actual' level of risk of fledglings colliding with turbines POM 3 and POM 4; and
3. Tailored management measures to specifically address the 'known' risk using an adaptive management approach.

The triggers and management actions to safeguard this species would be based on monitoring survey results (point 2) and would be informed by an expert in Little Eagle ecology. John Young has extensive experience in Little Eagle observation and survey; he has been consulted in regard to monitoring for this species and would be engaged to participate in the field surveys. He has previously been approved by DPE (1/4/11) as the independent specialist in respect of Powerful Owl dispersal for the GRWF project.

2 CONCLUSION

While it is acknowledged there are gaps in knowledge on Little Eagle collision risk with turbines, assumptions about risks on site should be carefully evaluated and management actions must be informed by evidence or sound logic. Rather than prescriptive shut-down periods, we suggest processes such as monitoring to first assess the Little Eagle risk level, then evidence-based principles for adaptive management should be documented in the BBAMP and informed by the approved specialist. The expert is best placed to assess the ecological significance of monitoring outcomes and assess the effectiveness of Little Eagle management actions over the life of the BBAMP; therefore ensuring the management of the Little Eagle remains relevant to the actual risk.

Based on the format of the Project Approval Conditions, it appears that the logical place to address the issue of the Little Eagle is within Section 2 – Specific Environmental Conditions. This is consistent with the way that Powerful Owl issue has been addressed by the current Project Approval. Accordingly, in the absence of knowledge of the actual risk to the Little Eagle, it is proposed that:

- the recommended condition 1.6A (c) is deleted from the Section 1.6 – 'Limits of Approval'
- an appropriate condition to address future management of the possible risk to the Little Eagle is added under Section 2 – Specific Environmental Conditions' Any such condition should avoid prescriptive requirements for shutdown and recognise the ability of the approved specialist to determine the appropriate management action based on monitoring outcomes.

3 REFERENCES

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APPENDIX I: POWERFUL OWL AND LITTLE EAGLE SURVEY

Gullen Range Wind Farm

Powerful Owl and Little Eagle Survey 2014

October 2014

Document History

Project Title:	Gullen Range Wind Farm Powerful Owl and Little Eagle Survey 2014.		
Revision	**Date**	**Prepared by**	**Reviewed by**
Draft	28/10/2014	Jacqui Coughlan and Rena Gaborov	Jim Reside
Draft Final	29/10/2014	Jacqui Coughlan	Jim Reside
Final	25/02/2015	Jacqui Coughlan	

Contents

Executive Summary

Surveys were conducted in the Pomeroy precinct of the Gullen Range Wind Farm in order to identify the presence of any breeding pair of Powerful Owls and, if present, to assess whether or not the pair had successfully bred this season and whether a juvenile bird was still in the area.

The location of two previously detected Little Eagle nests was also checked to assess for breeding activity of this species.

The surveys were carried out over three days and three nights in late October, 2014 by Dr. Jacqueline Coughlan of EcoFocus Environmental Consulting and Rena Gaborov of Wildlife Unlimited P/L.

A pair of Powerful Owls was detected at a historical roost site first identified by John Young in May 2011. No young owl was detected. Given the timing of the breeding season, a young owl may have already begun to move away from the parents and be roosting a significant distance from the adult birds. Previously identified Little Eagle nests were located and checked. There was no sign of activity in or near the nests and no Little Eagles were sited. However the breeding season is from August to December so it is possible that the birds are yet to arrive.

Our findings were:

- Little Eagles were not sighted in the Pomeroy district, and have not previously been detected in the Pomeroy district of GRWF, although a previous survey attributed two disused nests to Little Eagle.
- Adult Powerful Owls continue to inhabit the original roost sites in the gullies discovered in 2011.
- It is inconclusive as to whether a juvenile Powerful Owl was present at the site

1. Introduction

1.1 Background and purpose of this report

The Gullen Range Wind Farm (GRWF) was approved subject to the conditions specified in Annexure A of the Land and Environment Court Order (LEC), 4 August 2010. Conditions relevant to the Powerful Owl are outlined below.

L&ECO Condition 2.33:

> *The Proponent shall not operate wind turbines POM_03, POM_04, POM_06 and POM_07 between one hour before sunset and one hour after sunrise during the period 30 November to 31 March, unless the Proponent demonstrates to the satisfaction of the Director-General that operation during these periods will not adversely impact on Powerful Owl juvenile dispersion .*

Should the proponent wish to demonstrate no adverse impact to Powerful Owl juvenile dispersal, the Proponent shall undertake the following:

> *a) Monitoring of the [dispersal] of Powerful Owl juveniles in and around the site, to be conducted by an independent specialist approved by the Director-General*
>
> *b) Preparation of a report to be submitted to the Director-General presenting the outcomes of monitoring and impacts to the Powerful Owl juvenile [dispersal] in and around the site; and*
>
> *c) Conclusively demonstrating to the satisfaction of the Director-General that the [dispersal] of Powerful Owl juveniles in and around the site will not be adversely impacted by the project.*

A Powerful Owl Management Strategy (POMS) was prepared by nghenvironmental (2012) in response to the LEC order.

Surveys were undertaken in May 2011 by recognised Australian owl expert John Young of John Young Wildlife, on behalf of nghenvironmental. Survey results are provided in Appendix A of the POMS. The surveys identified:

- Evidence of historical Powerful Owl roost sites
- An active Powerful Owl nest tree (the owls were preparing to breed)
- A pair of roosting Powerful Owls

From the 2011 survey it was concluded that only one pair of Powerful Owls was breeding in the forest and that the owls' core breeding habitat was limited to one gully, although the male would hunt throughout the forest. The occupied gully is outside of the Project boundary, extending to the south of POM_07.

In addition to locating a breeding pair of Powerful Owls, the 2011 surveys identified two nests attributed to Little Eagle and two Wedge-tailed Eagle nests within the Pomeroy precinct. A third Wedge-tailed Eagle nest was identified outside the project boundary approximately 600m to the west of POM _21.

In October 2014, Jacqui Coughlan (EcoFocus Environmental Consulting) and Rena Gaborov (Wildlife Unlimited P/L) were engaged by Goldwind to undertake surveys of the previously identified sites to ascertain the status of the Powerful Owls, in particular whether they had bred this year and had young.

2. Methodology

2.1 Survey location

Broadly, surveys were conducted in the locations identified by John Young in May 2011 as Powerful Owl roost and nest trees, Wedge-tailed Eagle nests and Little Eagle nests and as mapped in nghenvironmental (2012). The majority of survey locations are within the Pomeroy precinct of the GRWF. Surveys were conducted over a three day period from the 20th to the 22nd October 2014.

Significant finds such as nests, roosts, and threatened species were photographed and waypoints taken using a hand held GPS. Survey timing and effort is shown in Figures 1 and 2.

Table 2-1. Search effort for all species

Date	Focal Species	Survey Type	Location	Person hours
20.10.14	Powerful Owl	Diurnal search for roost sites and roosting owls	Gully due south of POM_07 Refer Figure 1 Survey Effort	7
20.10.14	Powerful Owl	Dusk watch and listen	Roost tree in gully 0726923/6164809	7
20.10.14	Wedge-tailed Eagle	Diurnal search	Gully and slopes accessed from POM_07.	1
21.10.14	Little Eagle	Diurnal search for nest	Gully due south of POM_18 Refer figure for search area	2
21.10.14	Little Eagle Wedge-tailed Eagle	Diurnal vantage point search. 20 turbines in view	POM_18 - Ridge above valley where little eagle nest is located.	1
21.10.14	Little Eagle	Diurnal search for nest	Gully due south of POM_03 Refer figure for search area	2
21.10.14	Powerful Owl	Dusk watch and listen	40 m north of PO roosts (JC) & 20m upslope of roost tree in gully (RG) Refer to Figure for 'dusk listen' locations	6
22.10.14	Powerful Owl	Diurnal roost inspection	Gully and slopes accessed from POM_07.	4
22.10.14	Wedge-tailed Eagle	Nest inspection	Upstream from PO roosts. Location of WTE nest recorded May 2011.	1 – Concurrent with above.
22.10.14	Little Eagle, Wedge-tailed Eagle	Diurnal vantage point search. 8 turbines visible.	From vantage point at POM_19	2
22.10.14	Powerful Owl	Dusk watch and listen	Gully and slopes accessed from POM_07.	4

2.2 Powerful Owl

Survey effort consisted of daytime searches for active roosts and 'dusk listens' at the roost trees. Survey effort is outlined in **Table 2-1** above.

2.2.1 Roost Searches

Roosts can be identified by build-up of white wash (excreta), pellets (regurgitated fur and bone), feathers and other evidence of feeding activity such as feather scatters. Searches for roost sites were undertaken during the day in the main gully where they had been identified in 2011 surveys. When a roost was located, all evidence was documented, bagged, labelled and a GPS waypoint taken. Diurnal searches for roosting Powerful Owls were also undertaken. This involved two observers scanning dense upper foliage of gully vegetation with binoculars. Location of roost searches are shown on Figure 1 with expanded detail in Figure 2.

The minimum information recorded at the time of collection was date, name of collector and a GPS waypoint or tree number).

2.2.2 Dusk Listens

Survey effort for the Powerful Owl was focussed at dusk (daylight saving time) (6.30pm to 8.30pm). At these times owls are active as they leave the roost to forage. Owls vocalise with distinctive calls as they leave and arrive at their nest and roost sites. Some of these calls are loud and clearly audible from a distance while others are very soft and only audible close to the animal. The call of the male, female and juvenile Powerful Owls are all distinctive but require vigilance at dusk to detect. Roosting Powerful Owls are extremely difficult to detect as they hide within dense foliage in gully vegetation.

Owl call playback was not used because this method is only helpful if owls have not previously been located in the area being searched. The gully occupied by the Powerful Owl pair had been previously confirmed by John Young and the data from 2011 was used to guide the 2014 searches.

Surveys at dusk involved vigilance and listening at the roost site in the gully south of POM_07. Both observers would sit in silence and listen for calls. Occasionally a sweep of the canopy vegetation was made with a light to check for owls that might have arrived undetected. Data recorded during each monitoring session was:

- Presence of Powerful Owl
- Time of call/s
- Type of call
- Direction of call
- Behaviour during call (e.g. calling in flight, calling before flight)
- Weather conditions

Daylight roost searches and dusk listens are listed in **Table 2-1** and mapped in **Figure 1.**

2.2.3 Little Eagle

Neither the LEC decision nor the POMS outline monitoring requirements for the Little Eagle. However, since two nests attributed to the species were identified by John Young during May 2011 surveys (nghenvironmental 2012), the species was included in the survey effort for 2014.

During 2014 surveys, the previously identified nests were located and assessed for presence of Little Eagle. This involved observing the nest through binoculars for activity and checking the base of the trees for any signs such as excreta or prey remains.

Vantage point surveys were also undertaken to survey for raptors. This involved observers sitting on a high vantage point with a clear view of a large section of the wind farm and scanning the sky for raptors. This was done both with the naked eye and with binoculars. All raptors seen were recorded. Two vantage surveys were undertaken as listed in **Table 2-1** and shown on Figure 1.

2.2.4 Wedge-tailed Eagle

Wedge-tailed Eagle nests recorded in the Pomeroy precinct by nghenvironmental (2012) were located and checked for condition and any sign of occupation. Vantage point scans (**Table 2-1** and Figure 1) employed for Little Eagle can also detect Wedge-tailed Eagles.

3. Results

3.1 Powerful Owl

All survey results for the Powerful Owl are shown in Figure 2 and summarised in **Table 3-1**.

3.1.1 Roosts

Numerous active roost sites were located in the area identified by nghenvironmental (2012). Roost sites recorded in 2014 are shown on Figure 2. These roosts were still in use, evidenced by the large amounts of whitewash and pellets on the ground beneath the roost trees. A new roost site (not previously found in 2011) was located on the western bank of the gully about 50m from the roost tree where the owls were observed. A fresh feather scatter from a Crimson Rosella was found in addition to whitewash and pellets (refer Appendix A).

On the evening of 20th October two adult Powerful Owls were detected roosting in one of the historical roost trees identified in 2011 by John Young. They were first seen at 5pm and observed for several hours. A single call was heard from the male before one owl was seen to fly out in an easterly direction. The second owl was also absent after dark but it was not observed leaving.

The following evening (21st October) the observers sat in two locations to listen for owls (50m north of the roost tree the owls were seen in the day before and 200 metres further north where the other active roost trees are located) (Figure 2). A female Powerful Owl (higher pitched call than male) called 25 times between 19:34-19:44 approximately 50 metres southeast of location one. A spotlight conducted at 20:10 did not locate the bird. In the second location Sulphur-crested Cockatoos called loudly and continuously from the commencement of dusk watch until 8pm which would have impeded the detection of owl calls from the location of JC 200m north of roost site (refer **Table 3-1**).

During daytime roost searches on the 22nd October an adult Powerful Owl (see Appendix A) was observed roosting among foliage in the gully in the same tree as seen on the evening of the 20th. A second adult was not observed and nor were any young.

On the evening of 22nd October, again the two observers sat separately - one at the same location where the female was heard the night before and the other approximately 200 metres further south between the active roost and historical roosts further up the gully. From 19:44-19:48 the female called 17 times. The male was not heard to call and neither bird was observed.

Table 3-1. Results of Powerful owl surveys.

Date	Survey Type	Observations
20.10.14	Diurnal roost inspection	Adult Powerful Owl located roosting approx. 18 m up in foliage. Roost tree is in floor of gully of tributary of main river. Sex not determined. A second owl detected secreted amongst dense foliage behind the first.
20.10.14	Dusk watch and listen	Owls identified at roost at 5pm were observed for several hours over dusk. A single call was heard at 7.25pm and the bird flew at 7.30 pm.
21.10.14	Dusk watch and listen	Female Powerful Owl called 25 times (heard by RG 40m north of roost tree). No owls heard by JC 200m north of current roost site.
22.10.14	Diurnal roost inspection	Adult observed in same roost tree in gully. Hollow in roost tree shows signs of wear.
22.10.14	Dusk watch and listen	Female called from east across gully. Called 17 times, calls 7 secs apart, until 7.48 pm (6.48 AEST) when calling ceased. Bird was not sighted.

3.1.2 Nests

The base of hollow-bearing tree (HBT) identified in 2011 as the nest tree was searched. No evidence of use by owls was recorded. A second HBT approximately 50m upstream on the bank of the river was also searched. Large numbers of Sulphur-crested Cockatoos were present, in this area during surveys and feathers of this species at the HBT may indicate the hollows have been used for breeding this year by the cockatoos.

The roost tree described above in the gully of the tributary in which the adult owls were detected contains a large hollow suitable for nesting by Powerful Owls. The entrance of hollow showed distinctive wear that could have been caused by owls entering and leaving the hollow (Refer Appendix A for photos)

3.2 Little Eagle

Both nests attributed to the Little Eagle identified by John Young in May 2011 were located and assessed. Neither nest was occupied. The first nest (south of turbine 18) had some old whitewash at its base. The nest is approximately 26m high in a forked branch. The second nest (south of POM_03) was similar, approximately 28 metres high also in a forked branch. Small passerine birds were seen to fly in and out of the nest strongly suggesting it is not being used by a raptor. No adult Little Eagles were observed in the vicinity of the nests during three person hours of assessing the area, during vantage point surveys or opportunistically while traversing the site on foot and vehicle over three days.

3.3 Wedge tailed Eagle

The two Wedge- tailed Eagle nests identified in the Pomeroy precinct by John Young were located and assessed. The first nest was occupied by a pair of Peregrine Falcons. The female was on the nest and the male displayed typical aggressive circle screeching behaviour as JC approached the location of the nest. The second Wedge-tailed Eagle nest in the same gully as the roosting Powerful Owls was not active. It looked unkept and straggly.

4. Discussion

A young Powerful Owl was not seen or heard during the three day survey period in late October 2014 despite diurnal searches and dusk listening. However, given the timing of the survey, the cryptic behaviour of the owls and the variable breeding biology of the species, the results of this survey cannot be considered evidence that the owls have not successfully bred this year. It is possible that they have bred, the owlet/s have fledged and begun the process of slowly moving away from the parents.

It is also quite possible the pair bred and the young has died. However, without monitoring breeding earlier in the season it is difficult to ascertain success.

However, it is clear that construction of the turbines has not deterred a pair of Powerful Owls from continuing to inhabit its historical gully roost sites.

While no juvenile owl was detected, there is some suggestion from evidence collected during this survey, such as the pair roosting together and obvious wear marks around the hollow, that the resident pair of owls may have bred this year. At this stage of development, young are more likely to roost near the female however may on occasion roost up to 500 metres away (Bilney 2013).

In order to be conclusive about the presence of a young owl at least one more survey would need to be undertaken as soon as possible in suitable roosting habitat in gullies in the forest block around where the adults occur and walking the area at night to listen for the chick calling.

5. Conclusion and Recommendations

Whilst no juvenile owl was detected, there is some suggestion from evidence collected during this survey that the resident pair of owls may have bred this year. Not enough is known about the behaviour of dispersing young to predict what path they would take when dispersing. In order to be more conclusive about whether the owls have bred and successfully fledged young, monitoring should occur on several occasions through the breeding season (at least middle and end) in suitable roosting habitat in gullies in the forest block where the adults occur.

Our survey did not observe any Little Eagles or Wedge-tailed Eagles in the Pomeroy precinct so far in the current breeding season. There is no current evidence for breeding of Little Eagles in the Pomeroy precinct, however the breeding season can be up to December, and therefore nests may need to be checked more than once.

References

Bilney, R. J. 2013. 'Home-range, diet and breeding of a Powerful Owl *Ninox strenua* in East Gippsland, Victoria', *Australian Field Ornithology*. 30:40–46.

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Appendix A. Photographs

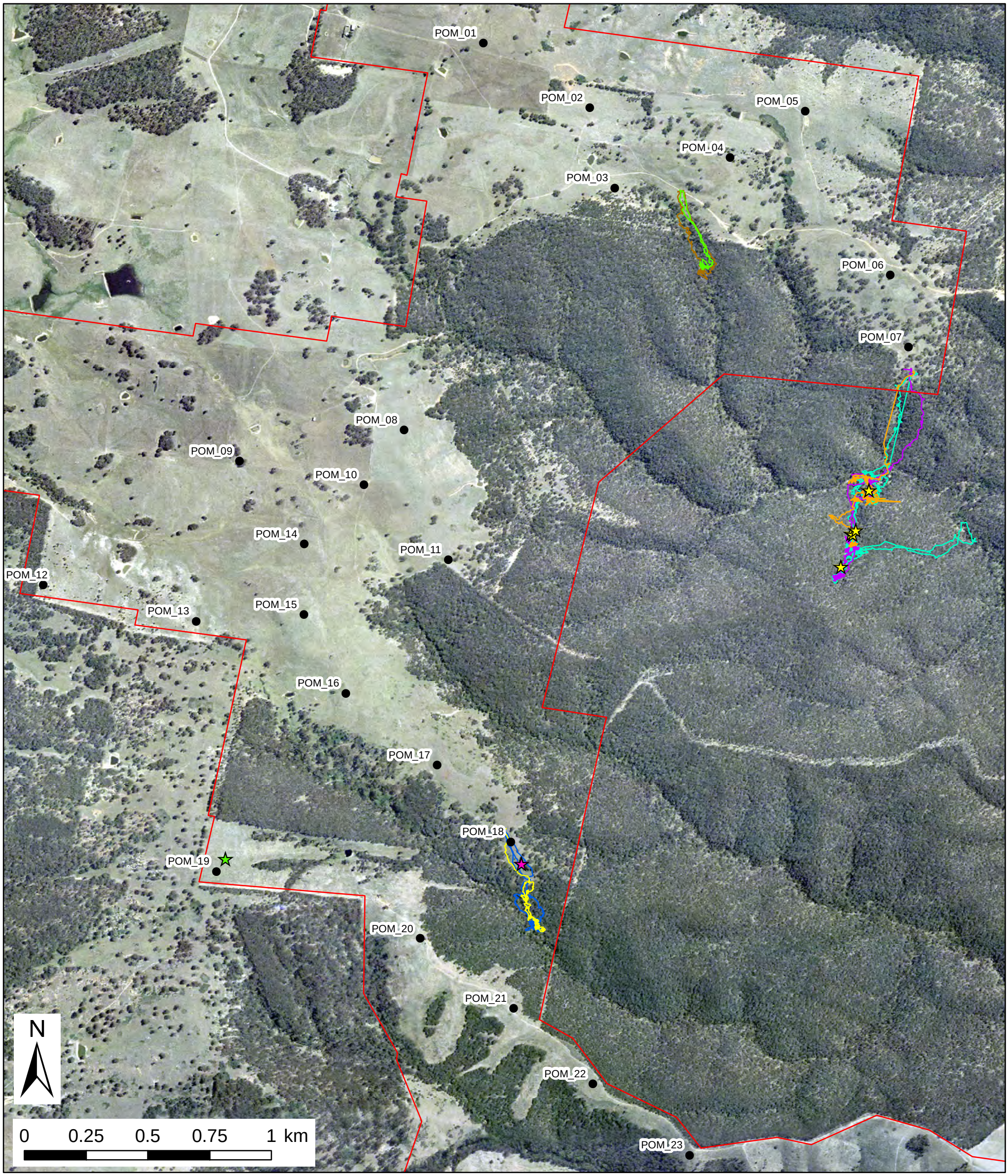
Powerful Owl seen roosting 20 October 2014	
Powerful Owl seen roosting 22nd October 2014	

Hollow showing wear marks in roost tree where owls were observed roosting.	
Regurgitated owl pellet under roost tree.	
Crimson rosella feather scatter below roost tree.	

View from vantage point at POM_18	
Little Eagle Nest 1 south of POM_18	
Little Eagle Nest 2 south of POM_03	

Appendix C. Figures

Figure 1: Survey Effort 2014



Legend

- Turbine Location
- Site Boundary
- Dusk Listen
- Vantage 1
- Vantage 2
- Little Eagle Nest Search 1(a)
- Little Eagle Nest Search 1(b)
- Little Eagle Nest Search 2(a)
- Little Eagle Nest Search 2(b)
- Powerful Owl Search 1
- Powerful Owl Search 2
- Powerful Owl Search 3

Projection: GDA94
Map Date: 27/10/2014
Image Source: Goldwind

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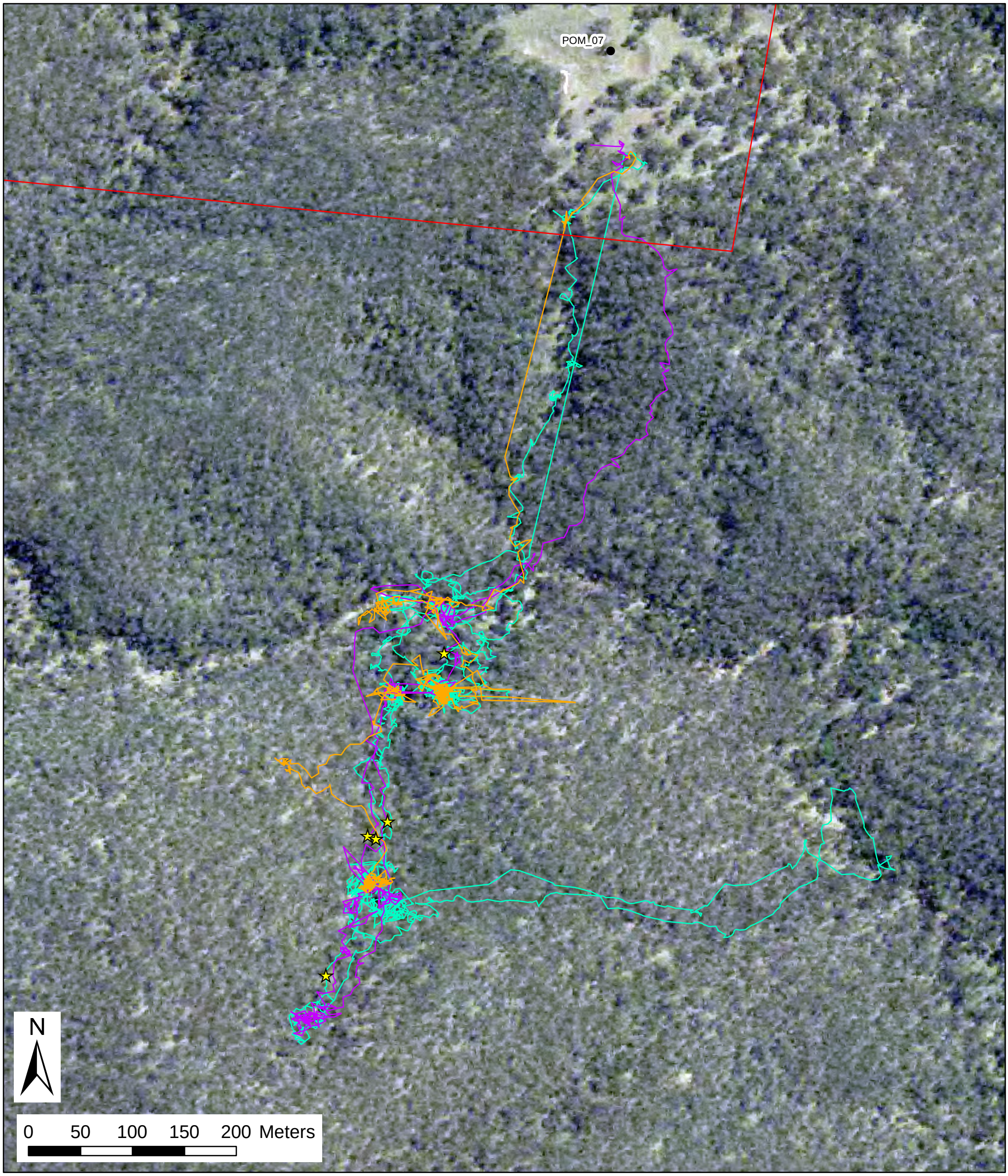
Figure 2: Powerful Owl Survey Effort 2014



Legend

- Turbine Location
- Site Boundary
- Dusk Listen
- Powerful Owl Search 1
- Powerful Owl Search 2
- Powerful Owl Search 3

Projection: GDA94
Map Date: 28/10/2014
Image Source: Goldwind

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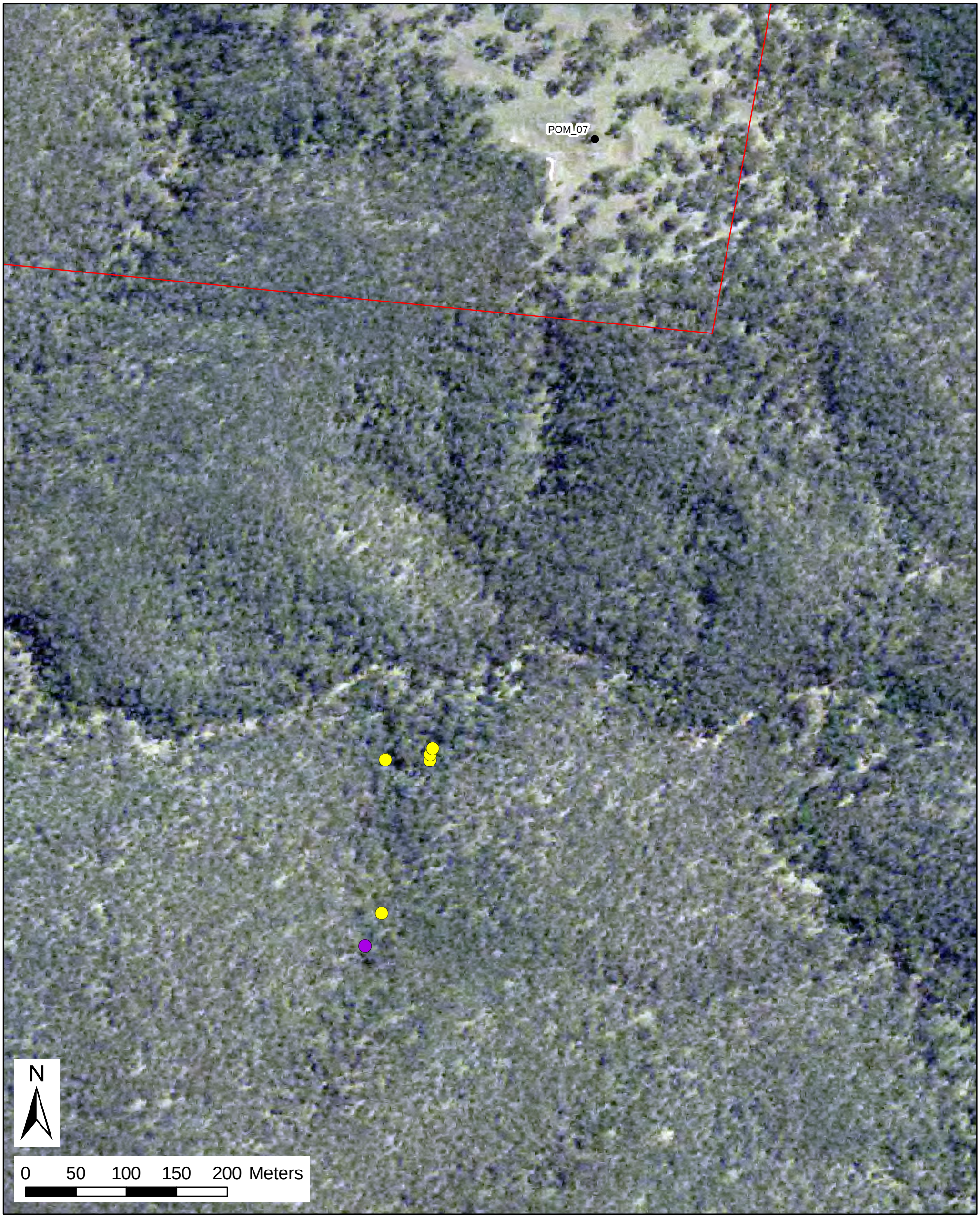
Figure 3: Powerful Owl Observations 2014



Legend

- Site Boundary
- Turbine Location
- Powerful Owl Sightings
- Roost Tree

Projection: GDA94
Map Date: 27/10/2014
Image Source: Goldwind

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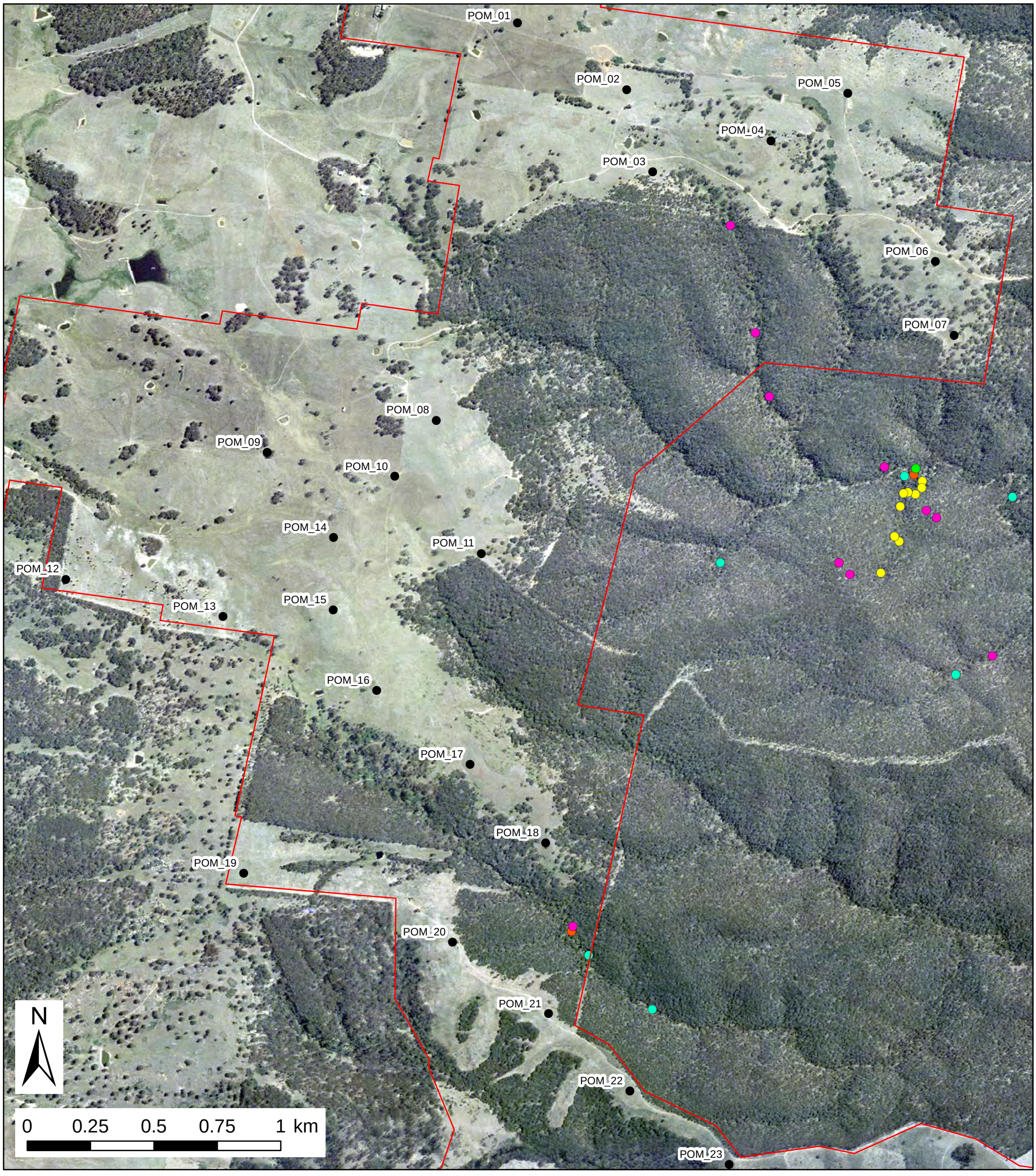
Figure 4: Powerful Owl Observations 2011



Legend

- Site Boundary
- Turbine Location
- Nest
- Feed Perch
- Roost Tree
- Roost Habitat
- Hollow-bearing Tree

Projection: GDA94
Map Date: 28/10/2014
Image Source: Goldwind

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Figure 5: Little Eagle and Wedge-tailed Eagle nests 2014

Legend

- Site Boundary
- Turbine Location
- Little Eagle Nest
- Wedge-tailed Eagle Nest

Projection: GDA94
Map Date: 28/10/2014
Image Source: Goldwind

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APPENDIX J: EXPERT WITNESS REPORT OF IAN SMALES

Gullen Range Wind Farm (07_0118) Draft Order No. 18 under section 121B of the *Environment Planning and Assessment Act 1979*

Proponent: New Gullen Range Wind Farm Pty Ltd

Expert Report of Ian John Smales

Executive summary

The key question addressed by this report is whether the risk of turbine collisions for Little Eagle and Powerful Owl may have been increased by the re-positioning of four wind turbines in the Pomeroy precinct of Gullen Range Wind Farm.

I do not consider that the relocation of the four turbines from their indicative locations to their final locations has materially altered risk of collisions for Little Eagles or Powerful Owls with the four turbines in question.

Name and address

Ian John Smales

Biosis Pty. Ltd.

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Port Melbourne

Vic. 3207

Areas of expertise

a) I hold the degree of Master of Science from the University of Melbourne. My Masters dissertation was on the demography of a critically endangered bird, the Helmeted Honeyeater.

b) For the past 36 years I have been professionally engaged in management, research and assessment of south-eastern Australia's vertebrate fauna.

c) My qualifications and experience are detailed in Annexure A.

d) My area of expertise is vertebrate zoology.

e) My areas of expertise to make this report are ornithology, including avian population demography; and avian collision risk assessment for wind farms. With regard to the latter, I have the lead role in the development and application of the Biosis Deterministic Collision Risk Model used for quantified assessment of potential risks of wind turbine

collisions for birds. I have applied the model to evaluate potential risk for numerous bird species for wind farms proposed and in operation in Victoria, South Australia, Tasmania, Queensland and Fiji. Of specific relevance I am the senior author of the following:

- Smales, I., Muir, S., Meredith, C. & Baird, R. 2013. *A Description of the Biosis Model to Assess Risk of Bird Collisions with Wind Turbines*. Wildlife Society Bulletin 37(1): 59–65.
- Smales, I, Venosta, M. & Muir, S. 2009. Appendix D: *Birds and Bats* in *National Wind Farm Development Guidelines Public Consultation Draft*. Environment Protection & Heritage Council, Commonwealth of Australia.
- Smales, I. *et al.* 2006. *Wind farm collision risk for birds: Cumulative risks for threatened and migratory species*. Biosis Research report prepared for the Australian Government Department of the Environment and Heritage.

I acknowledge that I have read the Code of Conduct for Expert Witnesses NSW and agree to abide by it.

Scope

The Draft Order states that *"POM_03, POM_04, POM_06 and POM_07 have been relocated closer to known habitat for the powerful owl and little eagle resulting in an increased risk to biodiversity".*

I have been retained on behalf of New Gullen Range Wind Farm Pty Ltd to:

a) Assess any collision risk between POM_03, POM_04, POM_06 and POM_07 and the powerful owl and little eagle, having regard to the indicative locations and final locations of the turbines; and

b) prepare a brief factual report in relation to (a).

Process and methodology

I visited Gullen Range Wind Farm on the afternoon of 30th October 2014. During my visit I examined the four turbines in their final locations and the previous indicative locations of each. I also observed the context and the final locations and previous indicative locations of each relative to forest and scattered trees. This report has been prepared on the basis of my examination of the site and information contained in documents listed below and my own professional experience in ornithology and with bird interactions with wind farms in south-eastern Australia.

Documents and other material reviewed to prepare this report

In undertaking my investigations I have taken note of information contained in the following documents and reports:

1. Pomeroy area – Wind turbines and aerial. Document Number GR-PM-DWG_0093 Revision D dated 27/03/2014, depicting indicative and final locations of wind turbines in the Pomeroy section of Gullen Range Wind Farm.

2. Bird and Bat Adaptive Management Plan & Monitoring Program (GR-PM-PLN-0012) Gullen Range Wind Farm. May 2012. Report by ngh environmental for Goldwind Australia Pty Ltd.

3. Powerful Owl Management Strategy (GR-PM-PLN-0013) Gullen Range Wind Farm. January 2012. Report by ngh environmental for Goldwind Australia Pty Ltd.

4. Gullen Range Modification 1 – Draft Consent Conditions. Little Eagle Review. August 2014. Report by ngh environmental for Goldwind Australia Pty Ltd.

5. Compensatory Habitat Package (GR-PM-PLN-0014). August 2014. Gullen Range Wind Farm. January 2012. Report by ngh environmental for Goldwind Australia Pty Ltd.

6. Gullen Range Wind Farm (07_0118) Draft Order No. 18 under section 121B of the *Environment Planning and Assessment Act* 1979 issued by Department of Planning and Environment 10 October 2014.

7. Gullen Range Wind Farm Modification Application (MP 07_0118 MOD 1) Submissions Report. June 2014. Prepared for Gullen Range Wind Farm Pty Ltd by Goldwind Australia Pty Ltd.

8. Cooke, R., Wallis, R., Hogan, F., White, J. and Webster, A. 2006. Diet of powerful owls (*Ninox strenua*) and prey availability in a continuum of habitats from disturbed urban fringe to protected forest environments in south-eastern Australia. *Wildlife Research* 33: 199 - 206.

9. Debus, S. J. S. 1984. Biology of the Little Eagle on the Northern Tablelands of New South Wales. *Emu* 84: 87 – 92.

10. Debus, S. J. S. and Ley, A.J. 2009. Aspects of the Breeding Cycle of the Little Eagle *Hieraaetus morphnoides*. *Australian Field Ornithology* 26: 76 – 99.

11. Debus, S. J. S., Hatfield, T.S., Ley, A.J. and Rose, A.B. 2007. Breeding Biology and Diet of the Little Eagle *Hieraaetus morphnoides* in the New England Region of New South Wales. *Australian Field Ornithology* 24: 137 – 157.

12. Debus, S. J. S., Olsen, J., Judge, D. and Butterfield, M. 2013. Numbers of breeding Little Eagles *Hieraaetus morphnoides* in the Australian Capital Territory in relation to atlas counts. *Corella* 37: 30 – 32.

13. Kavanagh, R. P. (2002). Comparative diets of the Powerful Owl (*Ninox strenua*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*Tyto novaehollandiae*) in south-eastern Australia. In: 'Ecology and Conservation of Owls'. (Eds. I. Newton, R. Kavanagh, J. Olsen, and I. Taylor.) pp. 174 - 191 (CSIRO Publishing).

14. Olsen, J., Debus, S. J. S., and Judge, D. 2013. Declining Little Eagles *Hieraaetus morphnoides* and increasing rabbit numbers near Canberra: is secondary poisoning by Pindone the problem? Corella 37: 33 - 35.

15. Olsen, J., Fuentes, E., Judge, D., Rose, A. B. and Debus, S. J. S. 2010. Diets of Wedge-tailed Eagles (*Aquila audax*) and Little Eagles (*Hieraaetus morphnoides*) breeding near Canberra, Australia. Journal of Raptor Research 44: 50 – 61.

Persons assisting with this work

This report has been prepared by me with no assistance from any other person.

Findings

Turbine locations relative to habitat features for the two species

References to document numbers below are as per the list of references above.

Document 4 provides records of Little Eagles from Gullen Range Wind Farm site obtained during bird surveys there in autumn 2007, autumn 2011 and summer, winter and spring 2012. A single record of the species was made in the Gurrundah precinct of the wind farm in 2007. No Little Eagles were observed in the Pomeroy precinct. Two nests attributed to Little Eagles were detected in forested sections of the Pomeroy precinct in 2011, but bird surveys by ngh for the project have not detected the species (document 4, Gullen Range Modification 1 – Draft Consent Conditions. Little Eagle Review). One of the nests is in a block of forest south and west of the four turbines in question and of relevance to the question of collision risk they may pose. It is approximately 500 metres south-east of the final location of turbine POM_03. During my visit to the site I located and briefly observed a nest that was consistent in its location with the nest described by ngh in document 4. The nest's structure and position within the tree were consistent with my knowledge of Little Eagle nests, but I note that some other species build similar nests.

Document 3 provides details of an adult pair of Powerful Owls that was detected and observed to have an active nest in a gully, and a number of perch and roost sites within the same block of forest.

The locations of a nest attributed to Little Eagles; a documented Powerful Owl nest and documented perches and roosts of Powerful Owls are shown on maps in document 2 (Bird and Bat Adaptive Management Plan & Monitoring Program (GR-PM-PLN-0012) Gullen Range Wind Farm). I refer to these generically as 'potential Little Eagle and documented Powerful Owl locations'. Radial buffer distances of 200 and 500 metres from the nest attributed to Little Eagles and the active Powerful Owl nest are shown in the map Ref: 1557 – BBMP – 3. In relation to the four turbines in question, the primary area of habitat for the Powerful Owl is a large patch of forest to their south and west. Habitat for Little Eagles includes forest, scattered trees and open grassland areas. In this context, the feature of principal interest for that species is the nest south of POM_03 that is considered likely to have been built by Little Eagles, albeit that no Little Eagles have been confirmed to have used it.

Information provided in document 7 and my examination of the site shows that the final locations of the four turbines in question differ from the indicative locations for them as approved in 2010, as follows:

- Final location of POM_03 is 102.2 metres west of its indicative location.
- Final location of POM_04 is 96.2 metres south-west of its indicative location.
- Final location of POM_06 is 56.7 metres south-west of its indicative location.
- Final location of POM_07 is 23.4 metres west of its indicative location.

The final and indicative locations of the four turbines relative to patches of forest and scattered trees are shown in document 1 (Pomeroy area – Wind turbines and aerial Document Number GR-PM-DWG_0093). My examination of the site shows that the final locations of all four turbines are in open areas outside of forested areas.

My site examination of the site and reference to these maps indicates the following:

- Final location of POM_03 is to the west, essentially further around the perimeter of the patch of forest, from its indicative location. Its final location is slightly further from potential Little Eagle and documented Powerful Owl locations. The final location is now approximately 500 metres (radial distance) from the attributed Little Eagle nest, whereas its indicative location was closer to the nest.

- Final location of POM_04 has been moved south-west and is closer to the patch of forest and to the attributed Little Eagle nest. Nonetheless, its final location is substantially further from the edge of the forest patch than are the indicative or final locations of turbines POM_03 and POM_07. It does not appear to be materially different (in radial distances) than its indicative location was from Powerful Owl locations. It is also somewhat further from groups of scattered trees than was its indicative location.

- Final location of POM_06 is closer to the block of forest by the direct distance it has been moved. That has placed it closer to potential Little Eagle and documented

Powerful Owl locations. However, its final location is further than the indicative or final locations of the other three turbines from both the attributed Little Eagle nest and the Powerful Owl nest. It remains further than 500 metres from the former and appears to be more than 800 metres from the latter.

- The final location of POM_07 is further from the edge of the forest block than its indicative location. It is now further from the Powerful Owl nest and marginally closer to the attributed Little Eagle nest. It remains rather more than 500 metres from either nest.

Habitat and behaviours of the two species

Little Eagles occur widely across Australia and range over open and wooded environments. Little Eagles may live for more than twenty years and a home range is likely to be used by a pair throughout their adult lives. They frequently nest in live trees within woodlands and forests, often on hillsides. In common with many other eagle species, a pair of Little Eagles may have up to three nests within their territory and in a given year they are likely to use only one of them. Disused nests may remain for many years. Their primary prey is now rabbits, which they hunt in open areas. Little Eagles will frequently perch in scattered trees within otherwise open areas.

At Gullen Range Wind Farm site, Little Eagles would thus be likely to utilise both wooded and open areas and nests would be expected to occur within patches of forest. If the species occupies a territory it would generally be readily observable and especially so within a few hundred metres of an active nest during the breeding season. My site visit demonstrated that vantage points afford excellent views over the relevant landscape from which Little Eagles could be observed if they were present. From the information available to me it would appear unlikely that Little Eagles currently occupy the area close to the four turbines in question. There is no evident basis for predicting how Little Eagles might apportion their use of available habitats if they were to use the attributed nest in future. Relative to their indicative locations, the final locations of all four turbines do not appear to me to materially alter the collision risk they might pose to the species.

Powerful Owls inhabit densely treed environments and the great majority of their prey is arboreal mammals, primarily larger species of possums and gliders. Studies of their diet shows they almost never prey upon terrestrial species. Powerful Owls nest in hollows within large forest trees and they use routine daytime perch and roost sites in densely foliaged forest trees. As a consequence, Powerful Owls are generally confined to forests and rarely venture into open environments. Powerful Owls may live for decades and a given territory is likely to be utilised by a pair for their adult lives. I consider it would be rare for adult Powerful Owls to be at risk of collision with turbines sited outside blocks of forest, such the four turbines in question.

I agree with the suggestion outlined in document 3, that dispersal of juvenile Powerful Owls may represent the period of greatest collision risk for that species. However, I am not aware of published studies of juvenile dispersal behaviour for this species. Nonetheless, some general information about bird behaviour and survivorship are pertinent. Dispersal

of juvenile birds is usually a brief event in which young birds move away from their natal territory over a period of a few days. Where a pair of Powerful Owls breed each year this would be an annual event. In territorial birds, dispersal is usually gender specific, with juvenile females often moving greater distances than juvenile males from the natal territory. In long-lived territorial species that breed annually like Powerful Owls, mortality of juveniles, especially during the period of dispersal is naturally high. The territory occupied by parent birds offers sufficient resources for the pair and their dependent young of the year. For this reason, as juveniles of one year become independent they are forced to disperse in an attempt to locate a mate and a potential territory of their own. Since suitable habitat is often fully occupied by existing pairs who will exclude conspecifics from their territories, many dispersing juveniles are unsuccessful and naturally do not survive.

The locations of the two turbines closest to the known Powerful Owl nest (POM_06 and POM_07) have been altered by the shorter of the four relocated distances. I do not consider that the altered locations of the four turbines, when compared with their previous indicative locations, materially alter any risk of collisions posed by the four turbines to Powerful Owls.

Turbine collision risk

No quantitative turbine collision risk assessment based on bird flight data has been undertaken for the two species in question at Gullen Range Wind Farm. Information available to me suggests that data that might quantify whether one turbine location represents a different risk from that of another location is not available.

Conclusions

The key question I address is whether the risk of turbine collision for Little Eagle and Powerful Owl may have been increased by the re-positioning of the four turbines.

As no quantified collision risk is available for either species at Gullen Range Wind Farm the question of whether collision risk may have increased as a result of the re-positioning of the four turbines requires an informed qualitative assessment.

I do not consider that there is strong evidence for any collision risk for Little Eagles posed by the four turbines in question. If Little Eagles are present or were to use the nest attributed to them in future, I do not consider that any risk of collisions with the four turbines has materially altered by their relocation from their indicative locations to their final locations.

I consider that any risk of turbine collisions for Powerful Owls would be primarily for dispersing young birds that may fly out of the forest as they move away from their natal territory. This risk would relate to a matter of a few days per annum and there is no evident basis for determining whether, in fact, such birds might encounter any turbines. The minor changes from the indicative to final locations of the four turbines in question do not appear to me to materially alter any collision risk they may pose.

Declaration

I have made all the inquiries that I believe are appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld in preparation of this report.

31st October 2014

Annexure A – Qualifications and Experience Ian John Smales

Ian John Smales
Principal Zoologist
Melbourne Resource Group
Biosis Pty Ltd
Victoria

Qualifications:

MSc. University of Melbourne

Professional Experience:

Ian Smales, Principal Zoologist with Biosis Pty Ltd has over thirty years of professional experience in wildlife research and natural resource management with the public and non-government sectors. He has been with Biosis since 2003. Ian has broad field expertise investigating the ecology, distribution and habitat requirements of Australian vertebrate fauna and has undertaken comprehensive research projects for birds and reptiles. Ian has authored or co-authored multiple scientific papers and consultant reports in those fields.

Ian's career has included periods with the Wildlife Management Section of Victoria's former Fisheries and Wildlife Division (1978 - 87) and as Conservation Biologist with the Zoological Parks and Gardens Board of Victoria (1990 – 2003). He has been involved with research and management for threatened fauna throughout his career and has been a long-standing member of the national recovery teams for the Helmeted Honeyeater and the Orange-bellied Parrot.

Ian has designed and managed numerous flora and fauna assessments for multiple development projects including a number of major Government infrastructure projects.

Ornithology
Ian's research on birds has encompassed population biology and his MSc dissertation is entitled *"Population ecology of the Helmeted Honeyeater* Lichenostomus melanops cassidix*: long-term investigations of a threatened bird"*. It is based on his 20-year study of this critically endangered bird. He has investigated bird abundance, habitat use and behaviours at numerous sites for woodland birds, shorebirds, raptors, owls and almost all other Australasian taxonomic groups. Ian has designed and led long-term investigations of bird and bat utilisation of many wind energy facilities in Tasmania, South Australia, Victoria, Queensland and Fiji.

Wind turbine collision risk
Under Ian's management Biosis has led the development in Australia of numerical modelling of potential risks of bird and bat collisions with wind turbines. Biosis owns the only proprietary Avian Collision Risk Model developed in Australia for this purpose and it has been used for approximately 30 proposed wind energy projects in Australia and by authorities including the Commonwealth of Australia. Ian is the senior author of the 2013 description of this mathematical collision risk model published in the U.S. journal *Wildlife Society Bulletin*. He presented a paper on cumulative risk assessment at the first world conference on wind energy and wildlife in Trondheim, Norway in 2011 and was a member of the organising committee for the first Australian conference on the subject held in Melbourne in 2012. In 2014 Ian was invited to prepare a chapter entitled *Vulnerable species – modelling of collision risk and populations as mitigation tools* for a two-volume international book on all aspects of wind energy and wildlife to be published in the UK.

Professional Affiliations and Memberships:

IUCN Species Survival Commission, Re-Introduction Specialist Group

Birdlife Australia

Australian Society of Herpetologists

Helmeted Honeyeater National Recovery Team (1989 -)

Orange-bellied Parrot National Recovery Team (1994 – 2003)

Scientific Panel, South-west Victoria Brolga Research Project (2009 -)

'A' Class Australian Bird & Bat Banding Scheme Licence, endorsed for use of mist nets

Publications:

Ian has authored, or co-authored multiple publications. The following selection relates to wind energy and birds:

Smales, I., Quin, B., Menkhorst, P. & Franklin, D. 2009. Demography of the Helmeted Honeyeater (*Lichenostomus melanops cassidix*) *Emu* 109: 352–359.

Smales, I., Holdsworth, M., Menkhorst, P., Starks, J. & Brown, P. 2000: Re-introduction of orange-bellied parrots, Australia. *Re-introduction News: Newsletter of the Re-introduction Specialist Group of the IUCN's Species Survival Commission*. 19: 32-34.

Pavlova, A., Selwood, P., Harrisson, K.A., Murray, N., Quin, B., Menkhorst, P., **Smales, I.** and Sunnucks, P. 2014. Integrating phylogeography and morphometrics to assess conservation merits and inform conservation strategies for an endangered subspecies of a common bird species. Biological Conservation 174: 136–146.

Smales, I. in prep. *Vulnerable species – modelling of collision risk and populations as mitigation tools.*in M. Perrow (ed) Wildlife and Wind Farms: conflicts and solutions. Pelagic Publishing. UK.

Smales, I. in prep. *Fauna collisions with wind turbines: effects and impacts, individuals and populations. What are we trying to assess?* Wind and Wildlife. Springer, Holland.

Smales, I., Muir, S., Meredith, C. & Baird, R. 2013. *A Description of the Biosis Model to Assess Risk of Bird Collisions with Wind Turbines.* Wildlife Society Bulletin 37(1):59–65.

Smales, I. 2006. Impacts of avian collisions with wind power turbines: an overview of the modelling of cumulative risks posed by multiple wind farms. Biosis Research report to Australian Government Department of Environment and Heritage.

Biosis Pty. Ltd. 2013. Bat and Avifauna Management Plan for Yaloak South Wind Farm: Background & Rationale. Report for Pacific Hydro Ltd. Authors: I. Smales & D. Gilmore.

Biosis Pty. Ltd. 2013. Bat and Avifauna Management Plan for Yaloak South Wind Farm: Implementation Plan. Report for Pacific Hydro Ltd. Authors: I. Smales & D. Gilmore.

Biosis Pty. Ltd. 2013. Bat and avifauna management plan for Stockyard Hill Wind Farm: Implementation plan. Report for Origin Energy Power Ltd. Authors: D. Gilmore & **I. Smales**.

Biosis Pty. Ltd. 2013. Bat and avifauna management plan for Stockyard Hill Wind Farm: Background information and mitigation measures. Report for Origin Energy Power Ltd. Authors: D. Gilmore & **I. Smales**.

Biosis Research Pty. Ltd. 2012. Orange-bellied Parrot Collision Risk: Preliminary Scenario Modelling for TasWind Project. Report to Hydro Electric Corporation. Authors: **I. Smales** & S. Muir.

Biosis Research Pty. Ltd. 2010. Avifauna Collision Risk Update 2009 Surveys Studland Bay Wind Farm North West Tasmania. Report for Roaring 40s Renewable Energy Pty. Ltd. Authors: N. Garvey & **I. Smales**.

Biosis Research Pty. Ltd. 2010. Wedge-tailed Eagle Turbine Collision Risk Modelling Yaloak South Wind Farm. Report for Pacific Hydro Ltd. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2009. Modelled risk of Brolga collisions with turbines at the proposed Stockyard Hill Wind Farm. Report to Stockyard Hill Wind Farm Pty. Ltd. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2008. Modelled risk of Brolga collisions with turbines at the proposed Mortlake Wind Farm. Report to Acciona Energy Oceania Pty. Ltd. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2005. Bird and Bat Collision Risk Assessment for proposed Butoni Wind Farm, Sigatoka, Fiji. Report for Fiji Electricity Authority. Author: **I. Smales**.

Biosis Research Pty. Ltd. 2005. Modelled cumulative impacts on the Orange-bellied Parrot of wind farms across the species' range in south-eastern Australia. Report to Department of the Environment and Heritage. Authors: **I. Smales**, S. Muir & C. Meredith.

APPENDIX K: EXPERT WITNESS REPORT OF BRETT LANE

GULLEN RANGE WIND FARM

ASSESSMENT OF COLLISION RISK TO POWERFUL OWL AND LITTLE EAGLE

New Gullen Range Wind Farm Pty Ltd

BL&A Brett Lane & Associates Pty. Ltd.
Ecological Research & Management
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October 2014

Report No. 14182 (1.2)

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TABLES

FIGURES

APPENDICES

1. EXECUTIVE SUMMARY

This investigation aimed to compare the relative impact of two alternative positions for turbines POM_3, POM_4, POM_6 and POM_6 in the Gullen Range Wind Farm on two threatened birds, the Powerful Owl and the Little Eagle. Specifically, the two layouts comprise the positions for these turbines in the approved indicative layout and the final constructed layout.

One pair of Powerful Owls breeds in a nest tree located within an extensive (c. 2,000 ha) area of woodland near these and other turbines in the Pomeroy group of turbines (total 18). This has been confirmed during a number of monitoring surveys in the area, including one as late as mid-October 2014, just before this investigation commenced.

Two purported Little Eagle nests have been observed in the northern and southern portions of the woodland area, although no Little Eagles have been seen near these nests or in the Pomeroy group of turbines during a total of 24 days of assessment and monitoring surveys between 2007 and 2014. It is considered that evidence for the regular presence of this species in the affected area is very limited and inconclusive. For the purpose of this investigation its presence at both nests has been assumed.

The operators of the Gullen Range Wind Farm have been subject to a draft order requiring them to remove turbines POM_3, POM_4, POM_6 and POM_7 and reconstruct them in the approved indicative positions.

To compare the risk to the two species the BL&A collision risk model was applied to the two alternative turbine layouts. Based on the investigation reported herein the following findings are pertinent:

- The relative impact of the two turbine positions are not tangibly different under a range of plausible utilisation distribution scenarios for both species.
- There was a tendency for the constructed turbines to represent a slightly lower relative impact to both species except in the 'flat' utilisation distribution scenario.
- The difference in impact on the Powerful Owl and Little Eagle between the alternative turbine positions is such that there is no benefit in moving the turbines from their constructed positions as sought in the proposed order and a higher likelihood that such a change may in fact marginally increase impact rather than decrease it.

2. INTRODUCTION

New Gullen Range Wind Farm Pty Ltd (NGRWF) engaged BL&A to conduct a Collision Risk Assessment for the Gullen Range Wind Farm in relation to two species of bird listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995* (TSC Act), the **Powerful Owl** and the **Little Eagle**. Gullen Range Wind Farm is located in the Southern Tablelands region of NSW (Figure 1). There are four groups of turbines (totalling 73 turbines) over approximately 2,811 hectares of agricultural and wooded land associated with the project: Kialla, Bannister, Pomeroy and Gurrundah, however this report focuses only on four turbines in the Pomeroy group (roughly 750 hectares).

In May 2010, the Land and Environment Court of NSW granted project approval for the Gullen Range Wind Farm under part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project approval authorised the construction and operation of 73 wind turbines and associated infrastructure.

This investigation considers the *difference* in risk to Powerful Owl and Little Eagle between the indicative approved locations of turbines POM_3, POM_4, POM_6 and POM_7, and the final constructed locations of these turbines.

Specifically, the scope of the investigation included:

- Existing information on the presence of Powerful Owl and Little Eagle in the area was reviewed;
- Literature review on the behaviour and ecology of the two threatened bird species in question, in particular any research regarding home range, fight behaviour and patterns of juvenile dispersal;
- Review of the approved Bird and Bat Adaptive Management Plan and Monitoring Program for Gullen Range Wind Farm, the Powerful Owl Management Strategy and resulting monitoring reports;
- A site survey was undertaken by Brett Lane on 28th October 2014, during which the approved indicative locations and the final constructed locations of turbines were viewed and site observations recorded;
- Assessment of the difference in collision risk of Powerful Owl and Little Eagle between the approved indicative locations and the final constructed locations of turbines POM_03, POM_04, POM_06 and POM_07, using a modified version of the BL&A collision risk model (CRM). Due to the low number of observations of movements and flight behaviour in the area for both species, collision risk modelling was based on informed scenarios for habitat use surrounding the species' nest sites;
- Discussions between BL&A and Symbolix Pty Ltd (statistical and modelling consultants) were carried out to develop theoretical utilisation distributions for the two species for input into the CRM based on the review of available information.

This report is divided into the following sections.

Section 3 presents the methodology and collision risk model used for the assessment.

Section 4 presents a description of the study area, specifically the habitats surrounding the four turbines in question.

Section 5 details the Powerful Owl investigation, including brief review of ecology, status on the wind farm and development of scenarios of habitat utilisation.

Section 6 details the Little Eagle investigation, including brief review of ecology, status on the wind farm and development of scenarios of habitat utilisation.

Section 7 presents the conclusions of the investigation and implications of the findings for operations at the wind farm, including the need to decommission and reconstruct the four turbines.

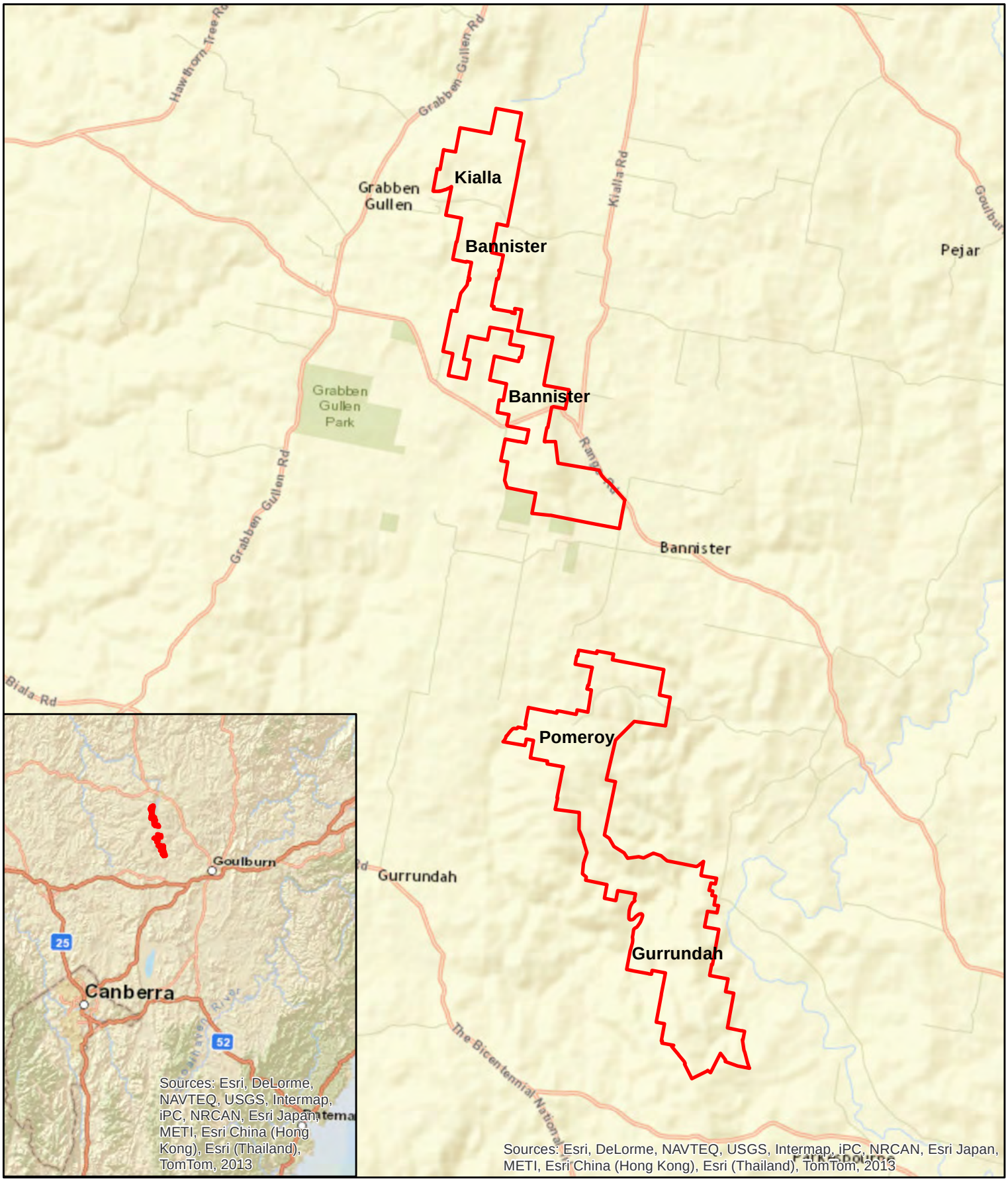
A **Statistical Appendix** provides a detailed explanation of how the comparative impacts of the alternative wind turbine positions was ascertained, including the modified application of the BL&A collision risk model that the key question necessitated (Appendix 1).

I provide my Curriculum Vitae at the end of this report (Appendix 2).

I acknowledge having read the Code of Conduct for Expert Witnesses (and having agreed to abide by it).

Signed:

31st October 2014



Legend

Wind farm boundary

0 1.5 3 6 Kilometers

Figure 1: Location of wind farm

Project: Gullan Range Wind Farm

Client: Goldwind Australia

Project No.: 14182	Date: 30/10/2014	Created By: M. Ghasemi / A. Stewart

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3. METHODOLOGY

3.1. Database and Literature Review

A literature review was undertaken that covered published papers and key reports regarding Powerful Owl and Little Eagle and management plans prepared specifically for Gullen Range Wind Farm. The following reports were considered particularly relevant:

- ngh environmental, 2012a. Powerful Owl Management Strategy, Gullen Range Wind Farm. Report GR-PM-PLN-0013 prepared for Goldwind, January 2012.
- ngh environmental, 2012b. Bird and Bat Adaptive Management Plan & Monitoring Program, Gullen Range Wind Farm. Report GR-PM-PLN-0012 prepared for Goldwind, May 2012.
- ngh environmental, 2014a. Compensatory Habitat Package, Gullen Range Wind Farm. Report GR-PM-PLN-0014 prepared for Goldwind, August 2014.
- ngh environmental, 2014b. Gullen Range Modification - Draft Consent Conditions – Little Eagle Review. Prepared for Goldwind, August 2014
- Draft Order from NSW Department of Planning & Environment addressed to Cullen Range Wind Farm Pty Ltd, dated 10th October 2014.

Existing records of Powerful Owl and Little Eagle were obtained from the New South Wales Wildlife Atlas (NSWWA), a database administered by the Office of Environment and Heritage from an area with the following co-ordinates latitude 34.44S to 35.18S and longitude 148.99E to 150.07 E. These records have been included in mapping for this report.

In addition to the NSWWA, records of Powerful Owl from the Atlas of Living Australia (2011) have also been obtain and are presented herein. These records were presented in the ngh environmental (2012a) Powerful Owl Management Strategy and including in mapping in this report.

3.2. Field survey

A site visit was carried out by Brett Lane on the 28th October 2014. During the site visit, the approved indicative locations and final constructed locations for the four turbines subject to this investigation were visited and observations on the habitat and topography of the sites were recorded.

3.3. BL&A Collision Risk Model

The Brett Lane & Associates Pty Ltd Collision Risk Model (BL&A-CRM) is a mathematical model that takes into account turbine specifications, habitat and spatial activity patterns, and biometric, behavioural and population data for species of concern, to predict the probabilities and numbers of collisions by a target species with each wind turbine in a wind farm. Of particular relevance to the current question of the difference between two turbine positions is the capacity of the model to combine a spatial utilisation distribution of a species' flights (using estimated probabilities of occurrence across a wind farm site, termed the 'utilisation distribution') with an estimate of the number of collisions for each turbine. The sum of the collision estimates for each turbine yields the predicted number of collisions for that species on the whole wind farm.

The BLA-CRM employs the Band (2001, 2007) (Scottish Natural Heritage) model to predict the rate of bird collision with each turbine given a number of bird movements through a turbine. The number of bird movement through a turbine is predicted by the utilisation distribution described in the previous paragraph combined with an estimate of the annual number of fights through the wind farm by the species.

The model works by integrating the following components:

- The estimated number of flights across the wind farm
- The spatial patterns of bird flights across the wind farm
- The probability of a flight at any given point (the utilisation distribution)
- Overlaying the turbine layout and determining the probability of interaction at any one turbine
- Adding up the probability of collision at individual turbines (based on the Band model) to gain an overall estimate of collisions for the whole wind farm.

Using this model, alternative turbine positions can be compared for their impact on birds.

In this investigation, a number of scenarios for spatial patterns of flights for Powerful Owl and Little Eagle were input into to the model to assess the differences in the risk of collision of the species between the approved indicative wind farm layout (all turbines), and the final constructed layout (all turbines).

Inputs regarding turbine engineering specifications for the GW100 WTG used for POM_03, POM_04, POM_06 and POM_07 include:

- Hub height of tower: 80m
- Rotor diameter – 99.85 metres
- Rotor speed – 10 to 14.5 rotations per minute
- Maximal chord – 3.85 metres

For each species, the following biometric, behavioural and population information normally forms a significant input to the model:

- Body length (m)
- Wingspan (m)
- Flight mode – flapping vs soaring
- Flight speed (m/s)
- Avoidance rate of turbines (%)
- Estimated maximum total population numbers for each species that could be expected over the life of the wind farm project (25 years)
- Estimated number of individuals crossing the wind farm per year
- Flights across the wind farm per annum per individual – how many times would one individual be expected to cross the wind farm in a year
- Proportion of flights expected to be within RSA
- Utilisation preference

For this investigation, the main aim was to determine the *difference* in risk between the approved indicative layout and the final constructed layout of the turbines. Under both turbine layouts, the biometric, behavioural and population input data for each species is expected to be exactly the same. That is, the same number of individuals utilising the wind farm, making the same number of flights per year, with the same flight speed and heights, and avoidance rate for any given utilisation distribution.

For this reason, these particular input values did not need to be defined to enable comparison of the probability of collision between the two turbine positions. Rather utilisation distributions were developed based on what is known about the species' behaviour during the breeding and non-breeding seasons, and the pattern of juvenile dispersal. Specifically, given the lack of observations of bird flights over the wind farm by the two species of concern, a conservative approach was adopted and a number of utilisation distributions were developed that represent the full range of likely spatial behaviour of the two species concerned.

Any difference in the level of collision risk that the alternative turbine positions show is therefore not related ultimately to the biometric, behavioural and population information inputted to the model but to the probability of occurrence at the alterative turbine locations, determined by the utilisation distributions considered here. This is described in greater detail in the attached statistical appendix prepared by Symbolix Pty Ltd.

The specific utilisation distributions that have been developed are described in the relevant following report sections for Powerful Owl and Little Eagle.

4. STUDY AREA

The Pomeroy group of turbines in the Gullen Range Wind Farm occur in the NSW Southern Tablelands, approximately 25 kilometres north east of Gunning. The group has been constructed in mostly cleared, agricultural land used for stock grazing. However, areas of remnant indigenous ground cover persist near some turbines. The Pomeroy group is located in places within several hundred metres of a large area (approximately 2,000 hectares) of remnant woodland in which there are records of Powerful Owl, including a nest tree and several roost trees (ngh environmental 2012a), as well as observations of purported[1] Little Eagle nests (ngh environmental 2014b). The turbines sit in a landscape with significant numbers of scattered, mature trees, separate from the core woodland area.

The approved indicative locations and final constructed locations of the four turbines in question is detailed in Table 1 and shown in Figure 2.

Table 1 Location of approved indicative and final constructed turbine layout

Turbine	Approved Indicative		Constructed Final		Difference
	Easting	Northing	Easting	Northing	
POM_3	726165	6166270	726063	6166277	102m west of approved indicative layout
POM_4	726553	6166383	726461	6166355	96m west south-west of approved indicative layout
POM_6	727076	6165895	727033	6165858	57m south west of approved indicative layout
POM_7	727130	6165603	727112	6165618	24m north west of approved indicative layout

The setting and habitat characteristics of each turbine site and the differences between the alternative turbine locations are described below.

POM_3

This turbine (Photo 1) is located approximately 102 metres west of the approved indicative position. The woodland immediately south of this turbine is regrowth, even-age stand eucalypt woodland that lacks hollow-bearing trees. For this reason, this area of forest is unlikely to have a higher density of tree-dwelling mammals, the main food source for the Powerful Owl. Relatively open pasture lies north of this turbine with a few scattered trees.

POM_4

This turbine (Photo 2) is located approximately 96 metres WSW of the approved indicative position. The final location is further from stands of scattered trees in the valley and equidistant from the woodland to the south. The woodland near this turbine is similar to that near POM_3 and lacks any larger, hollow-bearing trees. Woodland nearby

[1] Note that no evidence was provided in ngh environmental (2014b) for the regular occurrence of the Little Eagle in the vicinity of the Pomeroy group of turbines and no explanation was provided for why the mapped Little Eagle nests in fact belonged to this species. There is only reference to John Young, a raptor consultant, but no report or written explanation is provided for the judgement made (in the absence of the species utilising the nest).

is therefore unlikely to support higher densities of tree-dwelling mammal prey for the Powerful Owl. Within 150 metres of the constructed turbine position is open grazed pasture with a scattering of larger trees.

POM_6

This turbine (Photo 3) is sited 57 metres SW of the approved indicative location. It is 50 metres further away from the edge of the large woodland to the SE and 50 m closer to the edge of the woodland to the SW. Vegetation here has larger trees that may bear hollows but they are unlikely to be large enough for the Powerful Owl to use or for higher densities of the owl's prey. This turbine is closer by about 50 metres to the purported Little Eagle nest, putting it about 600 metres from that nest.

POM_7

This turbine (Photo 3) is located 24 metres W of the approved indicative location. It has been moved to the top of the ridge and out of a pre-existing, constructed drainage basin. This turbine is surrounded on three sides by woodland. Woodland here is similar in age and tree height, girth and hollow-bearing potential to that at POM_6. Risk to woodland dwelling species is reduced slightly to the east by the movement of the turbine eastwards. However, this puts it equally closer to woodland to the west. The net result is no change in the risk to any species using nearby woodland areas. The turbine position is approximately 20 metres closer to one of the purported Little Eagle nests, putting it about 700 metres from that nest.

Photo 1: POM_3 from POM_4 showing woodland to the south. The arrow marks the approximate approved indicative layout position.

Photo 2: POM_4 viewed from the west

Photo 3: POM_6 from the north west

Photo 4: POM_7 viewed from the north

5. POWERFUL OWL

5.1. Ecology

The Powerful Owl prefers moderately tall to tall eucalypt forests with sheltered gullies and areas of old growth forest that provides large, old, hollow-bearing trees required for nesting (Higgins 1999). The species is also found in dry forests with box-ironbark eucalypts and River Red-gum, and may also occur in urbanised areas and pine plantations (Webster *et al.* 1999, Garnett and Crowley 2000). The Powerful Owl breeds from May to September.

The habitat and population size of the Powerful Owl has declined mainly due to the clearing of forests for agricultural purposes (Garnett and Crowley 2000). Powerful Owls select home ranges with more large trees containing hollows rather than the forest at large. Home range varies according to quality of habitat and density of prey. Range radius reportedly varies from three kilometres (Holland 2008) to up to nine kilometres (Soderquist and Gibbons 2007). In NSW, two Powerful Owls were radio tracked for a period of seven months with the majority of flights ranging between 3 and 4.1 km (Kavanagh 1997). Within the home range, the Powerful Owl generally has one nest tree and several roost trees (Webster *et al.* 1999, Kavanagh 2002). Home ranges are up to 3,000 hectares (Higgins 1999).

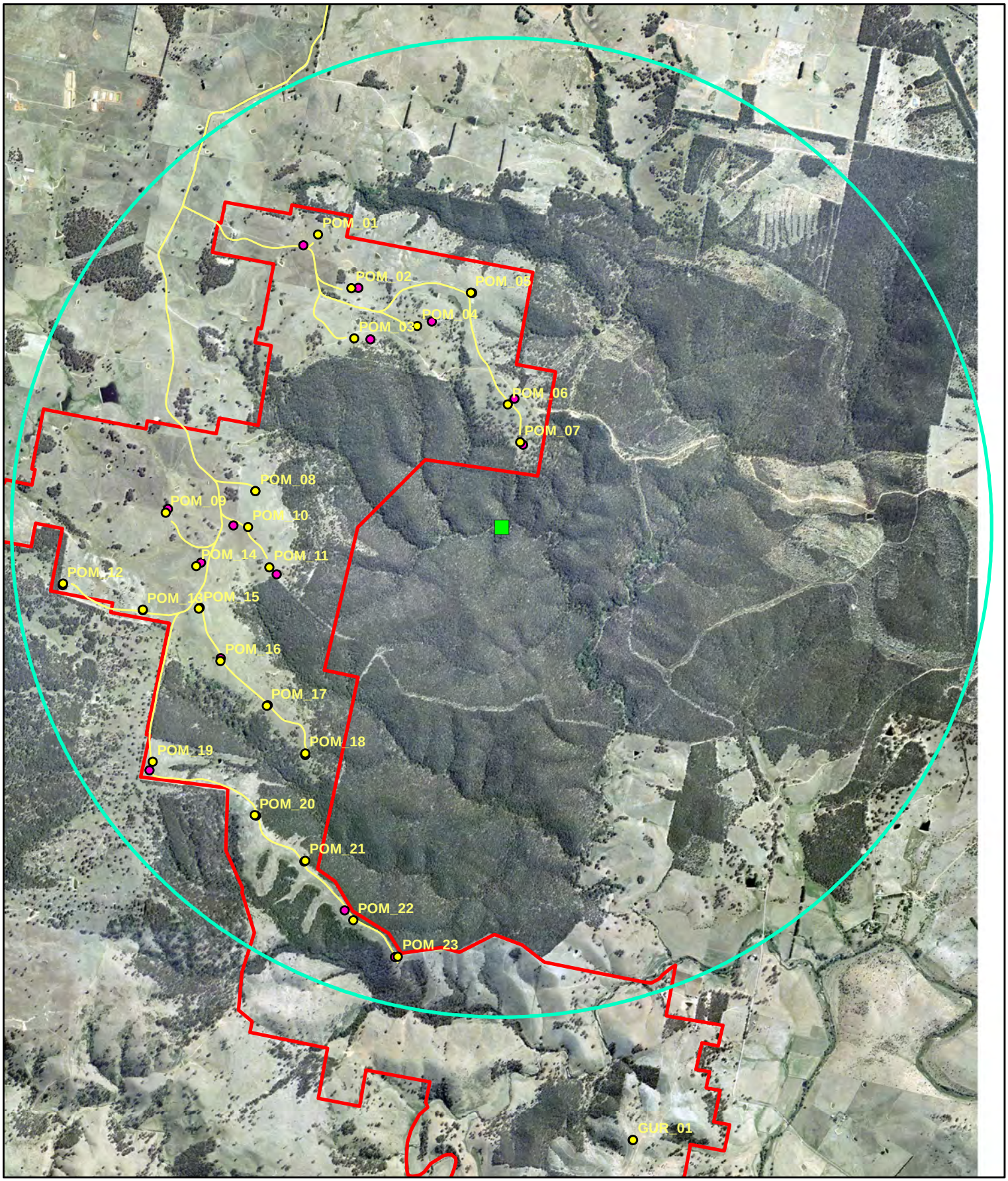
Powerful Owls breed during late autumn/winter, with a single clutch of one to two eggs being laid between mid-May and mid-July. Juveniles fledge from August to January. Little is known of juvenile dispersal, however it is expected to be at least 10 - 20km (Higgins 1999, NHG Environmental 2012).

Tree-dwelling mammals form a high percentage of its prey, with the Common Ringtail Possum, Common Brushtail Possum and Greater Glider being the main prey items (Higgins 1999). The hollow-dependency of most of its prey species in forests means that the owl will occur more frequently in forests with a higher density of hollow-bearing trees.

5.2. Status on the wind farm and surrounds

Within and near the Pomeroy group of turbines, one Powerful Owl pair utilises the forest. Figure 3 shows the location of Powerful Owl roost trees and observations, recorded by ngh environmental from 2007 – 2014. Historical records suggest the pair have used the same nest tree for several years, which is located more than 500m from the nearest turbine (including the relocated POM_07) (Figure 4). The most recent survey was carried out in mid-October 2014, during which the pair was found but no juvenile bird was seen.

The location of Powerful Owl records beyond the wind farm area is shown in Figure 4. The closest other record to the Pomeroy turbine group is from roughly 10 km north-north-east near Grabben Gulley. Within 50 km there are a few records to the west, south and south-east.



Legend

- Wind farm boundary
- Tracks
- Approved indicative turbine locations
- Final constructed turbine locations
- Powerful Owl nest

Nest buffers

- 3.1 Km

Metres

0 500 1,000 2,000

Figure 2: Turbine locations and Powerful Owl nest buffers

Project: Gullan Range Wind Farm

Client: Goldwind Australia

Project No.: 14182	Date: 31/10/2014	Created By: M. Ghasemi / A. Stewart

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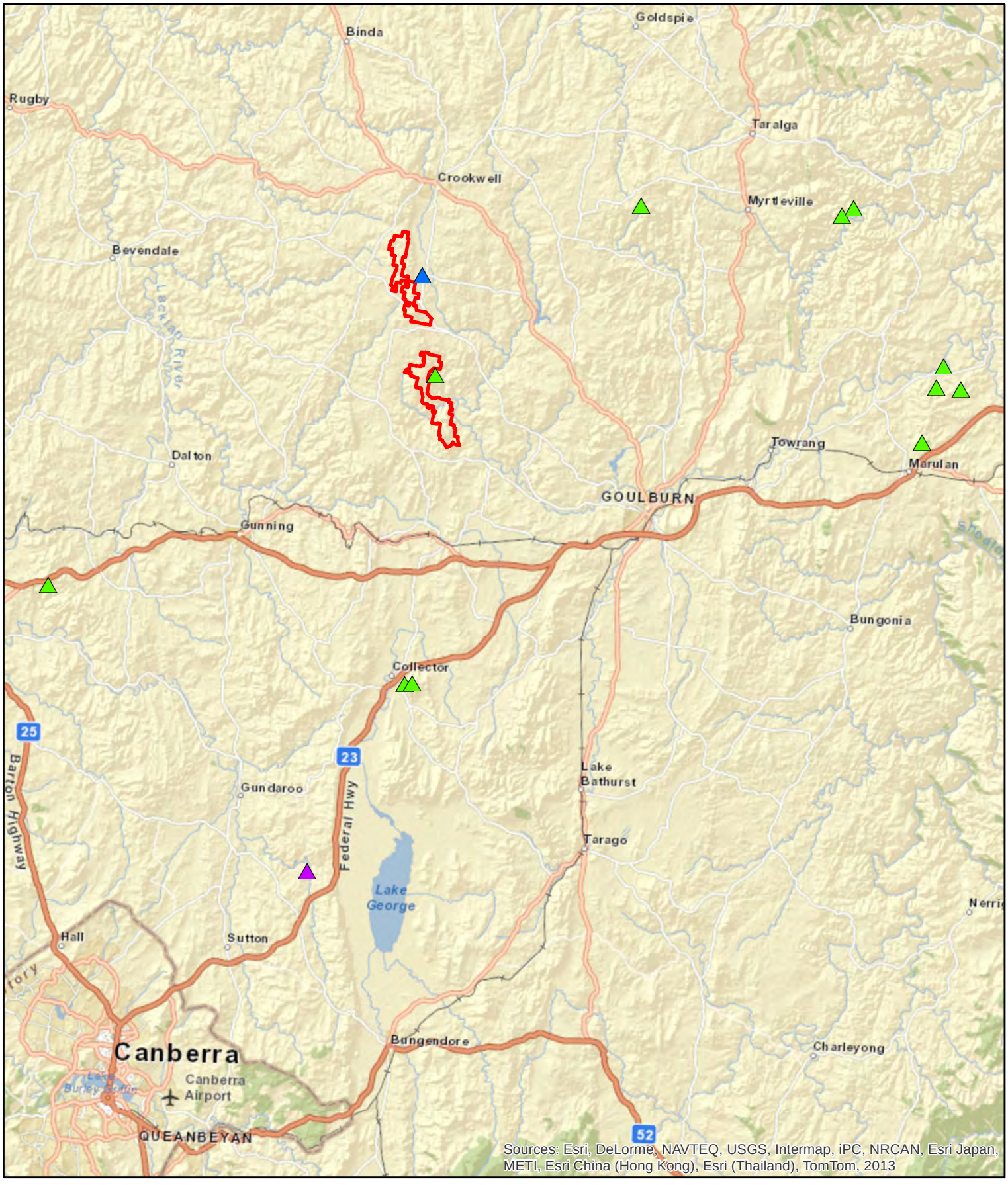
5.3. Spatial activity scenarios

Based on the above literature review and empirical evidence regarding Powerful Owl home range and nesting behaviour, three spatial activity scenarios were modelled for the species:

- A 'flat' utilisation distribution, with flights moving out from the nest with an equal probability of occurring to any distance from the nest up to 3.1 km (total area in circle equates to a 3,000 hectare home range), then rapidly falling to zero at the predicted edge of the home range. Juvenile dispersal flights are all expected to involve a flat distribution, with equal probability of flights of up to 20 kilometres.
- A 'bell curve' utilisation distribution (NPS or 'normal probability surface', see statistical appendix), with higher activity nearer the nest out to three kilometres, reducing to near zero at around nine kilometres. This scenario reflects a non-breeding Powerful Owl pair, whose home range radius is up to a maximum of nine km (Soderquist and Gibbons 2007), but more frequently around the three kilometre mark (Hollands 2008, taken from the Powerful Owl Management Strategy).
- A 'concentrated' utilisation distribution (MDS or 'mean deviation surface'), whereby 50% of flights occurred within 500 metres of the nest with the number of flights decreasing rapidly with increasing distance. This scenario reflects a breeding Powerful Owl pair that remains close to the nest during the nesting and nestling period.



Legend

Wind farm boundary

Database result for Powerful Owl

- Atlas of Living Australia (2011)
- NSW Wildlife Atlas (2014) & Atlas of Living Australia (2011)
- NSW Wildlife Atlas (2014)

Kilometers

0 5 10 20

Figure 3: Database result for Powerful Owl

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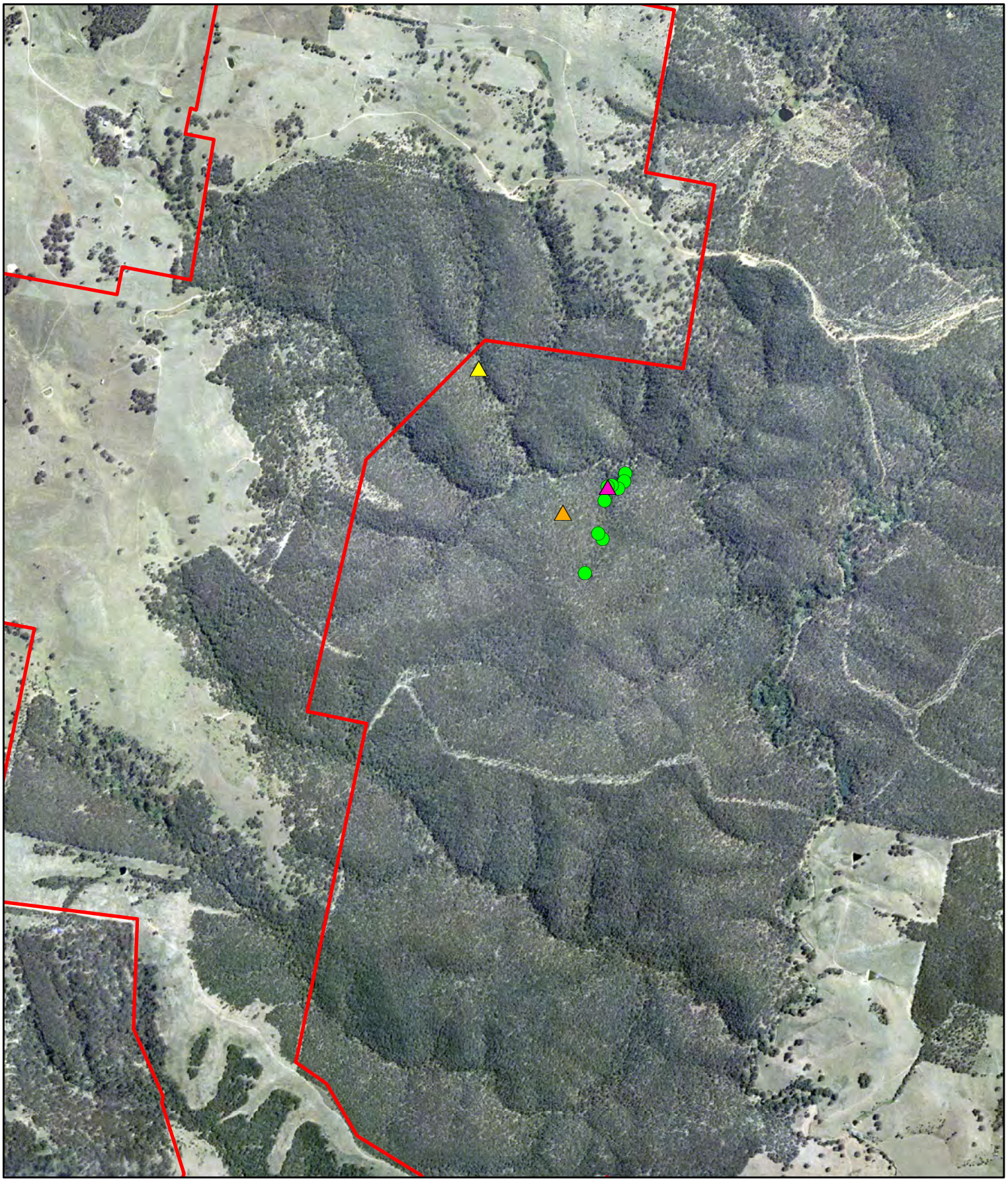

Legend

- Wind farm boundary
- Powerful Owl roost trees

Confirmed Powerful Owl records

- Confirmed Powerful Owl roosting
- Powerful Owl heard to the east
- Powerful Owl pellet

Kilometers

0 0.25 0.5 1

Figure 4: Powerful Owl surveys (ngh environmental)

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5.4. Findings

The findings for each of the three utilisation distributions are summarised below based on the results in the statistical appendix. It is noteworthy that some of the turbines have moved slightly closer to the Powerful Owl nest (assumed to be the centre of activity) and some have moved further away. In the findings below, the ratio of the expected 'impact'[2] ('relative impact') from the final constructed locations to that of the approved indicative locations will be '1' of there is no difference.

- None of the alternative turbine positions has moved outside the flat utilisation distribution likely to be used by the Powerful Owl pair breeding in nearby woodland. Therefore, under this scenario, there is no impact due to the change in layout.
- The relative impact of the final constructed layout (compared with the approved layout) based on the 'bell curve' utilisation distribution is 0.9979, which is not dissimilar and with a tendency to be less for the final constructed layout.
- The relative impact of the final constructed layout (compared with the approved indicative layout) based on the 'concentrated' utilisation distribution is 0.9984, which is not dissimilar and with a tendency to be less for the final constructed layout.

There is no tangible difference in impact between the two layouts on the Powerful Owl. All ways of interpreting the utilisation distribution suggest zero, or an improvement, to the risk to the two bird species of the final constructed turbine locations over the approved indicative turbine locations.

[2] The statistical appendix defines 'impact' as the summation of the likelihoods of bird collision (interaction) with all turbines in the Gullen Range Wind Farm.

6. LITTLE EAGLE

This chapter presents background information on the ecology of the Little Eagle and the methodology used for this investigation, including how values for utilisation distribution scenarios were derived.

6.1. Ecology

The Little Eagle is a medium sized bird–of–prey (raptor) inhabiting woodland, forest and open country in Australia (Marchant and Higgins 1993) that is listed as threatened in NSW.

Adults occur in two colour morphs, light and dark. The light morph has pale upperparts and underside with obscure underwing patterns. The dark morph has dark upperparts and underside with a rusty head and a distinctive underwing pattern of Rufous leading edge, pale 'M' marking and black-barred wing tips. Both morphs have a black streaked head with a slight crest, a pale shoulder band on the upper wing, a rather short and square-tipped barred tail and feathered legs (Department of Environment and Heritage 2011).

The species is monogamous and usually lives in a long-term pair bond. Pairs will hold a well spaced territory throughout the year. They hunt singly and some birds are solitary after the breeding season. At Armidale in NSW home ranges have been reported at 16 km^2 (equivalent to a radius of 2.25 km). It hunts during the day and preys on rabbits, birds, lizards, possums and sometimes rats, mice and insects (Marchant and Higgins 1993, Olsen *et al* 2012).

Nesting sites are in woodlands or along water courses and sometimes in pine plantations. Nests are built in large, live eucalypts generally not in solitary trees (Marchant and Higgins 1993). Nests are high up in trees and can be in forks, mistletoe and are sometimes based on the old nest of other birds including Australian Raven and other raptors. Nests are generally small for the size of the eagles and are inconspicuous and are about the same size as a ravens nest (Debus *et al* 2007).

Eggs are laid between August and October with a peak in September (Marchant and Higgins 1993). The estimated incubation period is 37–39 days (Debus et al 2007). Fledging occurs from early December but can be up until early January with a nestling period of 8.5 to 9.5 weeks (Debus 1984).

Once fledged, juvenile eagles fly short distances to begin with and gradually increase the distances they will fly from the nest. The fledged young will practice soaring in the nest area (low over the tree canopy at first) and will then soar to greater heights to food-beg from high-soaring parents (ngh environmental 2014). By week nine after fledging, the young are less dependent on their parents for food and start hunting independently and rarely return to their nesting area.

6.2. Status on the wind farm and surrounds

The location of Little Eagle in the surrounding area is shown in Figure 5. The closest record is roughly 17 kilometres south. Several records exist within 100 km of the wind farm to the west and to the south.

The presence of Little Eagle on the wind farm site has only been confirmed once during a total of five surveying periods between 2007 and 2012, totalling some 24 days of survey

effort. The location of the Little Eagle recorded in 2007 is shown in Figure 6. The record was from the Gurrundah region, located south of the Pomeroy group of turbines.

Two Little Eagle nests have been identified on the site within the Pomeroy region (Figure 7). The identity of the nests on the site was undertaken through ngh environmental Pty Ltd by consultant John Young. No documentation has been provided and no rationale or explanation has been provided for the conclusion that the stick nests concerned actually belong to the Little Eagle. The lack of records of the species on the site suggests that there is a possibility that the nests may belong to other raptor or raven species, particularly when it is considered that the species has permanent territories from which it rarely moves. The Little Eagle is a conspicuous bird to the trained surveyors who undertook the monitoring surveys and the lack of records probably reflects the absence of breeding pairs from the Pomeroy group of turbines during the survey period (2007 – 2012).

Notwithstanding this uncertainty, for the purpose of this exercise it has been assumed that the nests concerned belong to the Little Eagle.

6.3. Spatial activity scenarios

Three spatial activity scenarios were modelled for both members of the adult pair listed below.

- A 'flat' utilisation distribution, with flights moving out from the next with an equal probability of occurring to any distance from the next up to 2.25 km (calculated from home range of 16km^2), then rapidly falling off at the predicted edge of the home range.
- A 'bell curve' utilisation distribution, with higher activity nearer the nest, gradually declining out to 2.25 km. This approach has been used for the Red Kite in the UK (Eichhorn and Drechsler, 2010).
- A 'concentrated' utilisation, whereby most flights occurred close to the nest with the number of the flights decreasing steeply with distance from the nest.

6.4. Findings

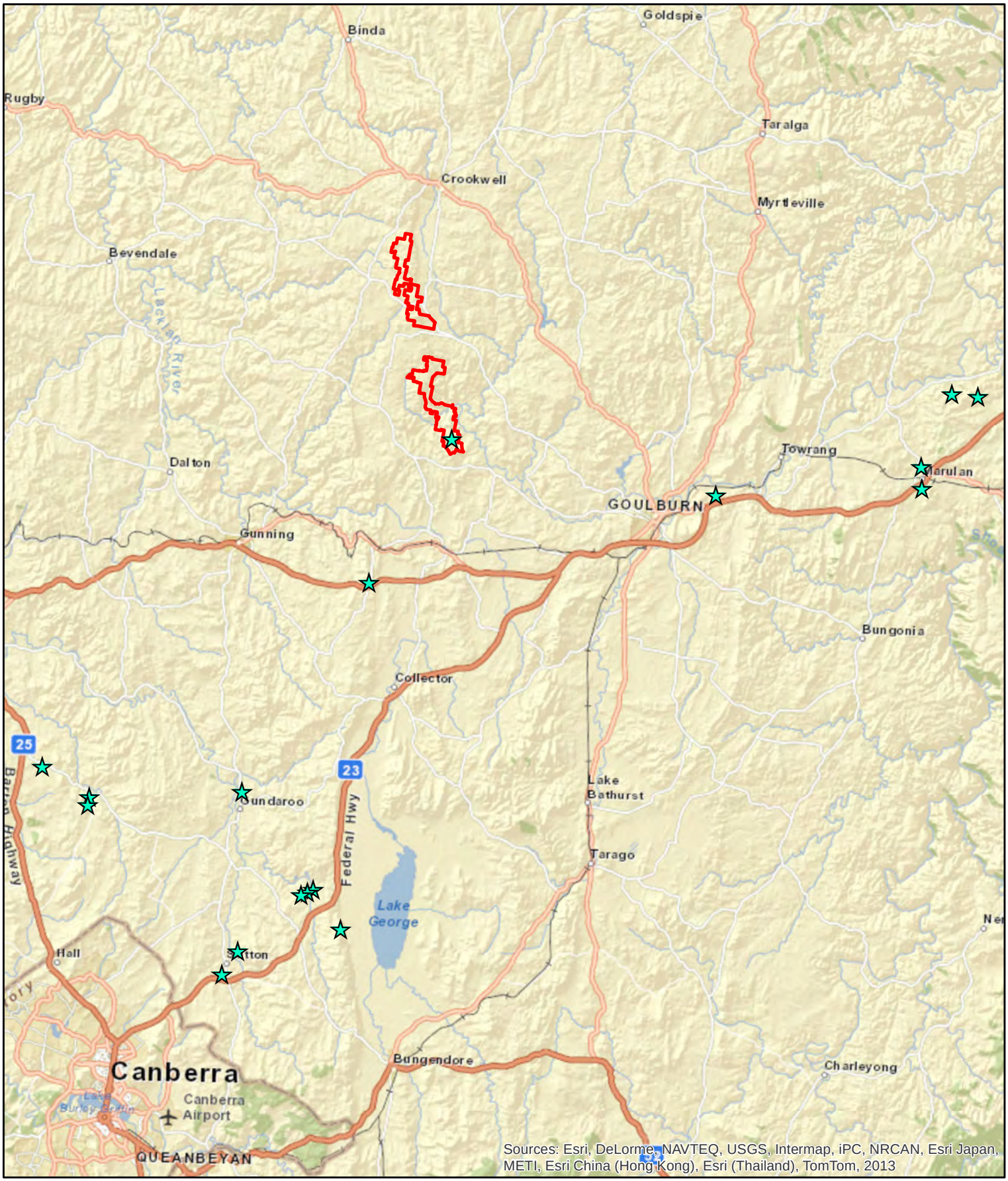
The findings for each of the three utilisation distributions are summarised below based on the results in the statistical appendix. It is noteworthy that some of the turbines have moved slightly closer to the Little Eagle nests (assumed to be the centre of activity) and some have moved further away. It is also significant that the nest closest to the subject turbines (the northern nest) contributed the bulk of the risk, with the tails of the utilisation distribution from the southern nest indicating occasional interaction of this pair with the subject turbines. In the findings below, the ratio of the expected 'impact'[3] ('relative impact') from the final constructed locations to that of the approved indicative locations will be '1' if there is no difference.

- None of the alternative turbine positions has moved outside the flat utilisation distribution likely to be used by the northern Little Eagle pair. They both lie outside the flat utilisation distribution for the southern pair. Therefore, under this scenario, there is no impact due to the change in layout.

[3] The statistical appendix defines 'impact' as the summation of the likelihoods of bird collision (interaction) with all turbines in the Gullen Range Wind Farm.

- The relative impact of the final constructed layout (compared with the approved indicative layout) based on the 'bell curve' utilisation distribution is 0.9990, which is not dissimilar and with a tendency to be less for the constructed layout.
- The relative impact of the final constructed layout (compared with the approved indicative layout) based on the 'concentrated' utilisation distribution is 0.9940, which is not dissimilar and with a tendency to be less for the final constructed layout.

There is no tangible difference in impact between the two layouts on the Little Eagle. All ways of interpreting the utilisation distribution suggest zero, or an improvement, to the risk to the two bird species of the final constructed turbine locations over the approved indicative turbine locations.



Legend

Wind farm boundary

Database result for Little Eagle

NSW Wildlife Atlas (2014)

Kilometers

0 5 10 20

Figure 5: Database result for Little Eagle

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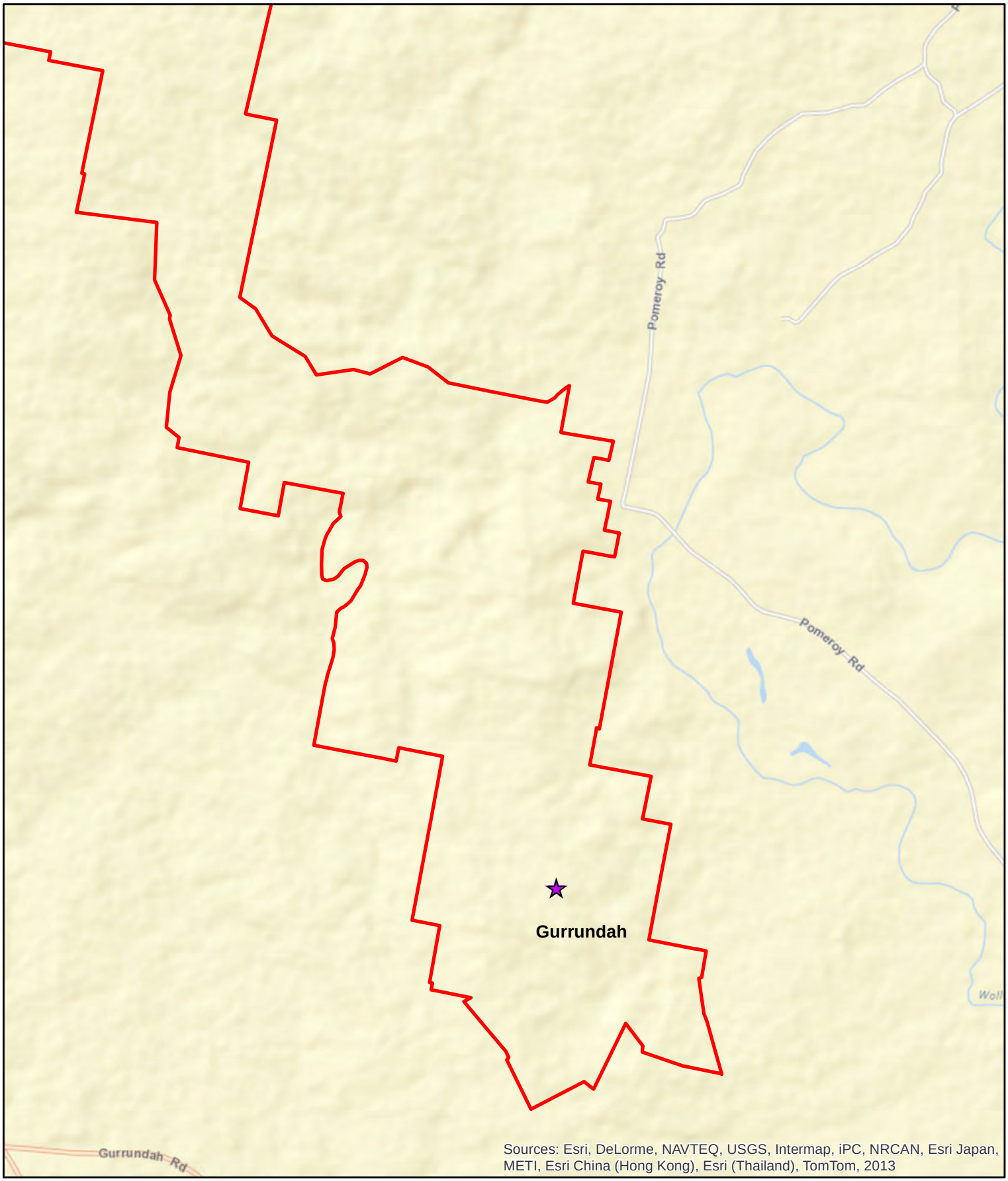

Legend

- Wind farm boundary
- Little Eagle observation (2007)

Kilometers

0 0.5 1 2

Figure 6: Little Eagle observation

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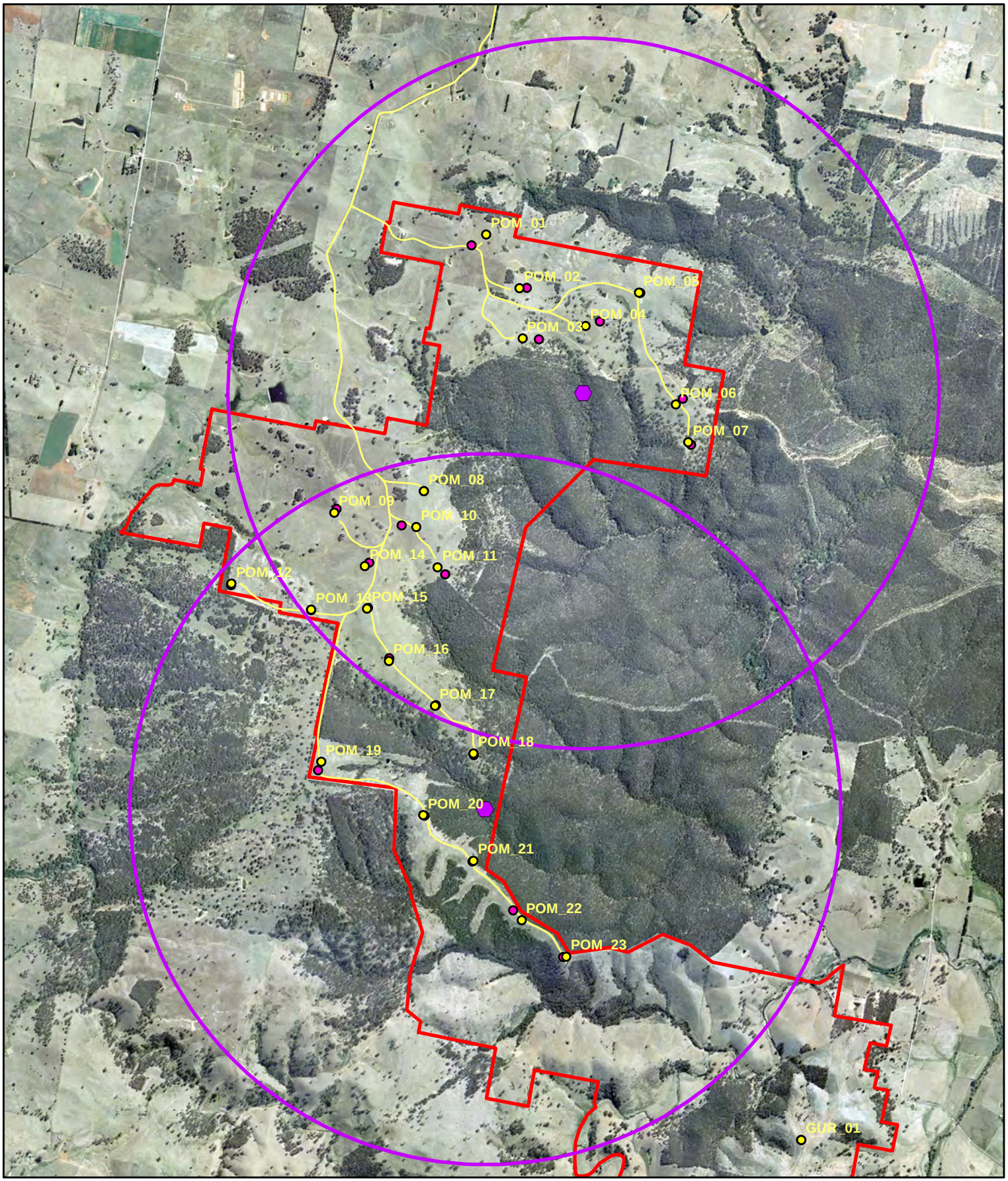

Legend

- Wind farm boundary
- Tracks
- Approved indicative turbine locations
- Final constructed turbine locations
- Potential Little Eagle nest (Unconfirmed)

Nest buffers

- 2.25 Km

Metres

0 500 1,000 2,000

Figure 7: Turbine locations and Little Eagle nest buffers

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7. CONCLUSIONS

This investigation aimed to compare the relative impact of two alternative positions for turbines POM_3, POM_4, POM_6 and POM_6 in the Gullen Range Wind Farm on two threatened birds, the Powerful Owl and the Little Eagle. Specifically, the two layouts comprise the positions for these turbines in the approved indicative layout and the final constructed layout.

One pair of Powerful Owls breeds in a nest tree located within an extensive (c. 2,000 ha) area of woodland near these and other turbines in the Pomeroy group of turbines (total 18). This has been confirmed during a number of monitoring surveys in the area, including one as late as mid-October 2014, just before this investigation commenced.

Two purported Little Eagle nests have been observed in the northern and southern portions of the woodland area, although no Little Eagles have been seen near these nests or in the Pomeroy group of turbines during a total of 24 days of assessment and monitoring surveys between 2007 and 2014. It is considered that evidence for the regular presence of this species in the affected area is very limited and inconclusive. For the purpose of this investigation its presence at both nests has been assumed.

The operators of the Gullen Range Wind Farm have been subject to a draft order requiring them to remove turbines POM_3, POM_4, POM_6 and POM_7 and reconstruct them in the approved indicative positions. Based on the investigation reported herein the following findings are pertinent:

- The relative impacts of the two turbine positions are not tangibly different under a range of plausible utilisation distribution scenarios for both species;
- There was a tendency for the constructed turbines to represent a slightly lower relative impact to both species except in the 'flat' utilisation distribution scenario.
- The difference in impact on the Powerful Owl and Little Eagle between the alternative turbine positions is such that there is no benefit in moving the turbines from their constructed positions as sought in the proposed order and a higher likelihood that such a change may in fact marginally increase impact rather than decrease it.

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Appendix 1 Statistical Appendix (Symbolix Pty Ltd)

Gullen Range Windfarm

Prepared for Brett Lane and Associates, 30th Oct 2014, Version 1.1

symbolix

Privileged and Confidential: For the purpose of legal advice or anticipated proceedings

We have been asked to assess any collision risk between the wind turbines and the Powerful Owl and Little Eagle, having regard to the Indicative Locations and the Final Locations of the turbines.

The standard approach to predict the number of collisions that might occur is to use the following estimate:

$$C = n \times P(I) \times P(C|I)$$

Where

- C is the expected number of collisions
- n is the estimated number of flights per annum
- P(I) is the probability of a flight interacting with rotor swept area, given that a flight occurs. This term depends on the spatial flight density distribution (the *utilisation density*) and the turbine locations.
- P(C|I) is the probability of collision, given that an interaction occurs. This term depends on the physical parameters of the birds and the turbines.

In this individual case, the key objective is not to estimate the absolute collision risk, but to assess the change in collision risk from the change in turbine locations and specifications from the permit conditions (scenario 1) to the current layout (scenario 2).

Between scenario 1 and 2 we do not expect a change in the number of flights per annum (n), the spatial distribution of flights, the physical characteristics of the birds nor turbines. Therefore the relative risk can be described as

$$\frac{C_2}{C_1} = \frac{P(I)_2}{P(I)_1} = \frac{\alpha \sum L(\hat{d})}{\alpha \sum L(d)}$$

Most importantly, we seek to understand whether the current turbine scenario represents a measurable increase in collision risk to either species, deemed "impact". This "impact" measure can be deduced as a sum of the contributing likelihoods (L), with a scaling constant (α) that we can safely ignore without loss of generality.

The assumptions involved in comparing Scenario 1 and 2 in this fashion are that:

- The population on site remained unchanged
- The utility of the landscape is identical under the two layouts
- The turbines are the same dimensional units

Measuring the change in probability of interaction

The probability of interacting with a turbine (P(I)) is a function of the spatial probability of bird flights and the location of the turbines. If we know that a flight occurs somewhere in the region, each point in space within that region has a specific probability of the flight passing through it.

The utilisation probability density will not change between the two scenarios, but we must calculate it so that we can assess the difference in the probability of interaction between the two turbine layouts. In the absence of observation data of flight paths for both species, we will need to rely on an ecological understanding of flight distribution.

Broadly speaking, to calculate the utilisation probability density using ecological knowledge, we need to know

- The centroid(s) of activity. These are local nest sites for both species.
- The 'shape' of the probability surface. For example, do the birds roam over the entire territory evenly or does the utilisation decrease suddenly (or gradually) from the centroid?
- A measure of the statistical dispersion. In this case we use the spatial equivalent of the standard deviation (Neft (1966)[1]), the population standard distance deviation. The figure below shows three utilisation probability curves (as a function of distance from a central nest) with different shapes but the same dispersion.

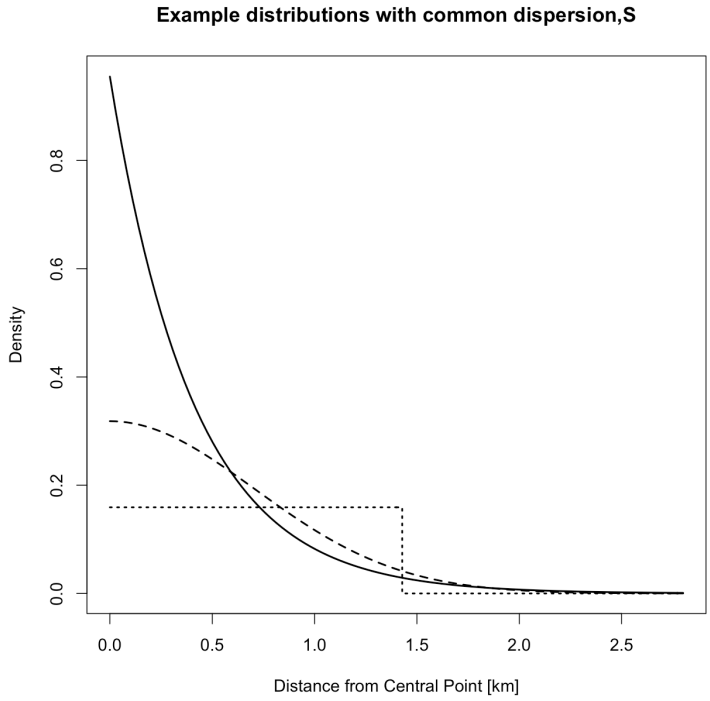

Figure 1: Three possible utilisation curves, all with a common dispersion

[1] *Neft,D. 1966 Statistical Analysis for Areal Distribution: Monograph Series #2, Regional Science Research Institute Pennsylvania USA*

[2] *Eichhorn M. & Drechsler, M. (2010) Spatial Trade-Offs between Wind Power Production and Bird Collision*

The shape of the curve is often the factor that is hard to quantify so we will consider a range of shapes with the same dispersion.

An example:

> *For the Powerful Owl the total range may include an area up to 3000ha (Hollands 2008, in Powerful Owl Management Strategy). This equates to an average flight distance of 2185 m. We can envisage this as a 'top-hat' where the birds may be found anywhere in the area with equal probability, up to 3090 m in range.*
>
> *Alternatively we can envisage the flight density as higher around the nest, tapering to a low probability at large distances. The density is higher near the nest, as there is less landscape near the nest. To maintain the same average flight distance, the birds may range outside 3090m, but infrequently (Fig 1).*

Following on from the work of Eichhorn and Drechsler (2010)[2], which is in turn addressing the work of Nachtigall (2008), we can assess the impact of a given WTG as being the contribution of likelihoods from each nest. Again, the likelihood is dictated by the propensity to disperse from the nest, being the central focus of activity in the landscape.

Eichhorn et al. employ a likelihood proportional to the *exp(-(d/k)^2*), where *d* is the distance, and *k* some scaling parameter. We refer to this as the Normal Probability Surface (NPS – dashed line in Figure 1), in the nomenclature of Neft (1966). There are another two probability surfaces we are interested in. One is the uniform distribution surface (UDS, dotted line in Figure 1), which is not particularly physical but easily envisaged and interpreted, and the MDS (Mean Deviation Surface, solid line in Figure 1).

In terms of precedence of application, the NPS has been used to simulate dispersion of Red Kites from their nest (Eichhorn et al 2010), it also has been employed to describe colonial style population behaviours with good accuracy (Neft (1966) and sources within). The MDS describes a more urban population behaviour. This is more "peaked" around the nest site with occasional, longer range forays.

The use of a summation of likelihoods to determine "impact" is precisely the mechanism of spatial dependence employed within the CRM model.

[2] *Eichhorn M. & Drechsler, M. (2010) Spatial Trade-Offs between Wind Power Production and Bird Collision Avoidance in Agricultural Landscapes, Ecology and Society **15**(2):10*

Little Eagles

The Little Eagle has a hard range limit (given by the flat distribution) of 2.25 km. This, in turn, implies a dispersion (Population Standard Distance Deviation) of 1.591 km. This is a typical range of 1600 ha.

There are two nests attributed to Little Eagles.

Behaviours

It is important to understand just what the behaviours imply. The chart below shows the central tendency of each of the assumed distributions (MDS in solid and NPS as a dashed line). One can see that 50% of the MDS flight activity is less than about 500 metres from the nest, whereas NPS assumes this value as closer to 1.33 km. However, the MDS displays a greater likelihood of activity beyond 4 km, than the NPS assumption. Although both are uncommonly flying this far from the nest, the MDS is more likely to experience extreme distances. This is due to them having the same average dispersion length.

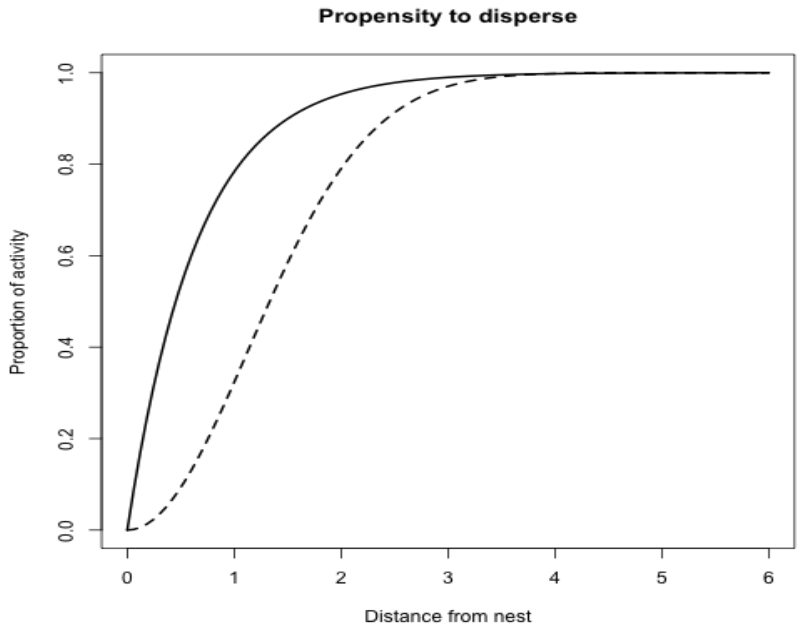

Figure 2: Measure of total activity, i.e likelihood of finding an entity within a given distance. Note that this is an instantaneous distribution, and not the distribution of extremal flight lengths

WTGS

Specifically, the order refers to POM_03, POM_04, POM_6 and POM_7 as having moved. Collision Risk modelling is done at a landscape level usually, and so it makes sense to look at the total impact of all changes, and then specifically at just these four.

Uniform utilisation (UDS) assumption

Under the initial assumption of uniform home range utilisation, we can generate the landscape impact score (as per Eichhorn (2010)) of the Original layout (2.0120082 × 10-6 units), and the latter layout (2.0120082 × 10-6). These scores consist of the sum of the distances from each nest to every turbine,

weighted by the relevant density curve. The ratio of new to old is 1.00, implying that there **is no global change to the impact between the two layouts**. It is unchanged as, although turbines have moved, none have moved out of range of the nests when they were previously within range, or vice versa.

This is precisely as one would expect. If there is no spatial dependence on behaviour (other than the "hard edge" of the home range), then moving WTGs within that space will not affect the risk.

Under the more physical MDS and NPS assumptions, the impact of the layout are 2.23 × 10-6 (NPS) and 2.59 × 10-6 (MDS). **The relative impacts of the new layouts are 0.999 and 0.994 respectively.**

There is no tangible difference in impact between the two layouts on the Little Eagle. All ways of interpreting the base utilisation behaviour suggest zero, or an improvement, to the landscape impact of the new turbine layout over the old.

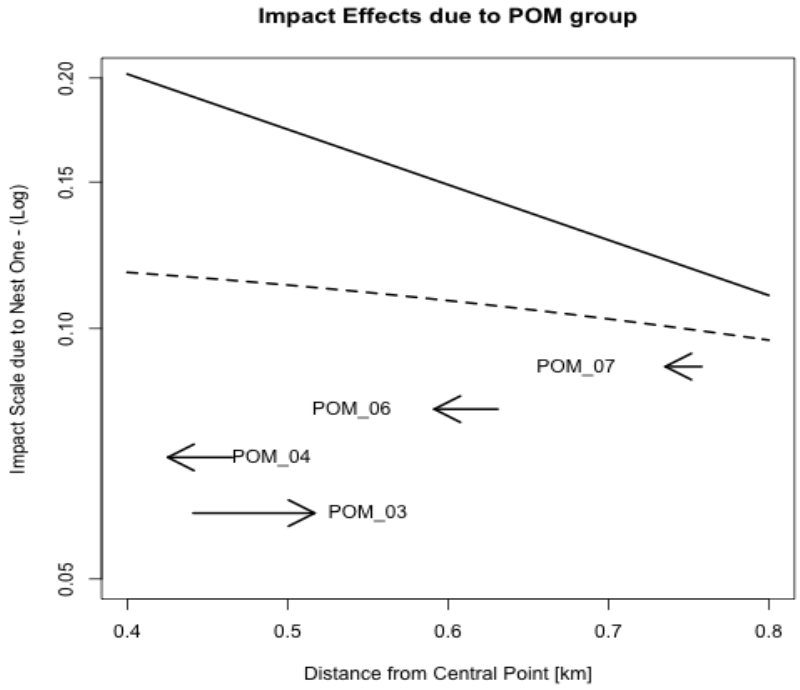

Figure 3: Schematic looking at the four named WTGs. Arrows indicate movement relative to Nest One. Curves indicate the Impact (density) curve at that vicinity - dashed for NPS and Solid for MDS assumptions

The reason the overall landscape effect is so small, is that the NPS is very flat in this region. For a bird with regular kilometre+ flights, moving less than 100 metres is not a large impact. Further, one can see that the increase impact due to POM_07 and POM_4 is almost completely obviated by the movement of POM_03 (Figure 3). Note that the Change in impact is measured by the change in the height of the curve over the arrow's course, not the length of the arrow. Even the most extreme changes dues to the MDS assumption, are minor when examined on the scale of the re-locations. This is due to the large ranges that the birds actually use, relative to these relocations.

Powerful Owl

The Powerful Owl has a Hard Range limit (given by the flat distribution) of 3.1 km. This, in turn is a dispersion (Population Standard Distance Deviation) of 2.185 km. This is a typical range of 3000 ha.

Nests

There is only one nest attributed to the Powerful Owl.

Behaviours

It is important to understand just what the behaviours imply. The chart below shows the central tendency of each of the assumed distributions (MDS in sold and NPS as a dashed line). One can see that 50% of the MDS flights are less than about 500 metres, whereas NPS assumes this value as closer to 1.8 km. However, the MDS displays a greater likelihood of activity beyond ~5 km, than the NPS assumption. These percentages relate to the probability of instantaneous location of the animal. Given it regularly initiates and finishes flights at the nest, this particular geographical location generates the strong peak.

Time spent at greater than 9 km from the nest is expected to be less than 0.004% (MDS assumption). Around 1.13 in 100 hours will be greater than 4 km from the nest (MDS) assumption, although this elevates to 3.50% in the NPS assumption.

This are the figures for a ~3000 ha home range.

All behaviours have a dispersion distance of 2.185 km, which gives an activity of "one utilisation" per 3000 ha.

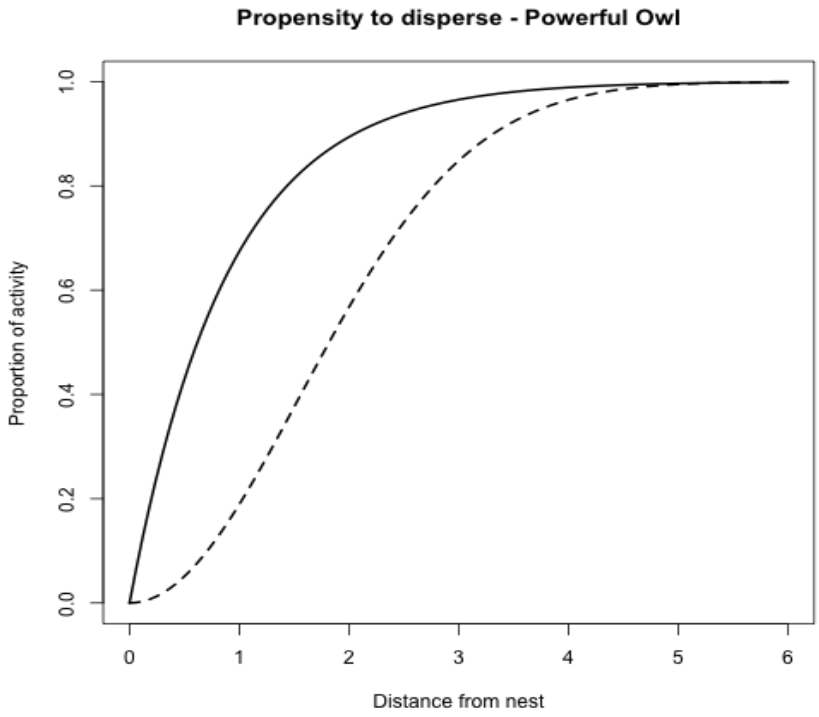

Figure 4: showing instantaneous location relative to the nest for the Powerful Owl, under various assumptions used

Impacts

As with the Little Eagle, the edge of the home range is such that no turbines have changed their within/out status between the two layouts. Again, **under a flat utility assumption, there is no impact due to the change in layouts**.

The relative impacts of the new layouts are 0.9979 (NPS) and 0.9984 (MDS).

There is no tangible difference in impact between the two layouts on the Powerful Owl. All ways of interpreting the base utilisation behaviour suggest zero, or an improvement, to the landscape impact of the new turbine layout over the old.

Conclusions

We have excluded discussions regarding general CRM inputs, such as avoidance rate, on-site population and activity rates. Under the assumption that none of these will change between the two layouts, they can be safely be quarantined from the models, which now revolve only around the spatially dependent components of risk. This has to do with the fixed effect of site utilisation as a function of distance from the nest/s. By using this construct, local variations in behaviour are considered to be fluctuation about this core tendency, and like the other parameters can be considered a constant between the two layout scenarios.

All species are modelled using either an MDS, or an NPS scenario. The flat distribution is employed only circumspectly, to generate a relevant dispersion. This dispersion is taken from the flat distribution that is required to generate the correct home range/ utilisation range. From this single parameter, the base utilisation becomes fixed. To increase a species' tendency to range, necessitates a re-assessment of the home range. There are no maximum ranges in the model. Species are assumed capable, but unlikely, to roam any distance freely provided the overall dispersion amounts to a fixed home range value.

The measure of impact used is that of Eichhorn et al (2010). The distributions employed are those of Neft (1966) and references therein. The NPS assumption is common to both sources.

- Assuming an unbounded, flat utilisation, there is no impact change between the two layouts.
- Assuming a bounded flat utilisation, there is no change to the impact between the two layouts.
- Under an MDS assumption, the new layout is technically of lesser impact than the original approved layout, although tangibly there is very little change
- Under an NPS assumption, the new layout is technically of lesser impact, although tangibly unchanged

Appendix 2 Curriculum Vitae for Brett Lane

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

Brett Lane
Principal Consultant and Director

Profile

Brett has over 30 years' experience in ecological research and management. He has worked in a range of positions with environmental consultancies in Melbourne and Brisbane and with non-government environmental groups in Australia and East Asia. He has specialist knowledge in birds and wetlands, and extensive experience in ecological impact assessment, including in the infrastructure, property development, and energy and mining industries. Brett has undertaken and managed many hundreds of ecological assessments and prepared and reviewed documents that have accompanied development applications on behalf of private companies, government infrastructure agencies and private individuals. His extensive experience has given him an excellent knowledge of the regulatory environment relevant to native vegetation, flora and fauna and he can advise on the scope of scientific information needed to inform the development assessment and decision-making process. He has also defended his scientific work as an expert witness in courts and tribunals. Brett has been working at BL&A since the company was founded in 2001.

Biography

Working in industry since 1979

Qualifications

BA (Zoology & Physical Geography) *Monash University*

Certificates and Licenses

Management Authorisation – Salvage and Translocation
Victorian Animal Ethics Approval

Employment History

2001 – present
Director, *Brett Lane & Associates Pty Ltd, Melbourne*
1999 – 2000
Natural Resource Specialist, *PPK Environment & Infrastructure Pty Ltd, Melbourne*
1996 – 1998
Senior Ecologist, *Ecology Australia Pty Ltd, Melbourne*
1993 – 1996
Principal Terrestrial Ecologist, *WBM Oceanics Australia, Brisbane*
1991 – 1993
Assistant Director (East Asia), *Asian Wetland Bureau, Kuala Lumpur, Malaysia*
1987 – 1991
Director, *Brett A Lane Pty Ltd (Melbourne)*
1980 – 1986
Wader Studies Co-ordinator, *Royal Australasian Ornithologists' Union (now Birdlife Australia) Melbourne*
1979 Research Assistant, *Kinhill Planners Pty Ltd., Melbourne*

Key Skills

- Project Manager including budgeting, staffing, client liaison, production of high quality technical reports
- Ornithologist specialising in shorebirds
- Terrestrial fauna assessment
- Ecological Risk Assessment
- Expert flora and fauna witness for VCAT and planning panels
- Constraints analysis
- Project design recommendation
- EPBC Act and EES Referrals
- State and national regulatory framework
- Offset site selection
- Preparation of mitigation measures
- Preparation of assessment reports (preliminary documentation, public environmental report and environmental impact statement)

Suite 5, 61 - 63 Camberwell Road, Hawthorn East, VIC 3123
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enquiries@ecologicalresearch.com.au

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

Project Examples

Property Development

Eynesbury Township, Eynesbury, Victoria: Flora, Fauna and Habitat Hectare Assessment, Targeted Flora Surveys, Growling Grass Frog Survey, Plains-wanderer Survey and Development of an Offset Tracking Tool. Net Gain Analysis for Planning Permit Applications of subsequent stages and advice on offset management (2003 – present)

Taylors Rd, Sydenham, Victoria (Broadcast Australia): EPBC Act Referral, preparation of EPBC Act Public Environment Report (PER), Offset Site Search and Offset Management Plan, Spiny Rice-flower Propagation and Translocation Plans, Seed Collection (2006 – present)

Somerfield Estate, Keysborough, Victoria: Flora, Fauna and Growling Grass Frog Survey and Offset Plan Preparation, preparation of offset tracking reports for each stage of development (2008 – present)

Burnside North Development, Burnside, Victoria: Flora and Fauna Assessment, targeted threatened species surveys, EPBC Act referrals and assessment, development of offset and mitigation plans (2002 – present)

Renewable Energy

Dundonnell Wind Farm, Dundonnell, Victoria: Overview and Targeted Assessments including Brolga, bat, migratory bird, Striped Legless Lizard, Flora Surveys, assessment of powerline route and road access options, EPBC Act Referral, Input to EES Referral, preparation of EES technical appendix on flora and fauna, Brolga impact assessment, collision risk modelling (2009 – present)

Granville Wind Farm, Granville Harbour, Tasmania: Overview Assessment, targeted surveys including Orange-bellied Parrot and bat surveys, EPBC Act Referral and advice for regulator negotiations (2011 – present)

MacArthur Wind Farm, MacArthur, Victoria: Overview assessment, detailed flora and fauna surveys, impact assessment, input to EPBC Act Referral and state EES, assessment of powerline and road rout options, appearance at state Planning Panel hearings as expert witness, preparation of pre-construction and operational flora and fauna management plans, net gain analysis and identification of suitable offsets (2004 – 2012)

Cherry Tree Wind Farm, Victoria: Overview assessment, native vegetation and threatened flora surveys, targeted threatened fauna surveys, assessment of powerline and road route options, offset site sourcing and assessment, preparation of expert witness statement and appearance at VCAT (2010 - 2013)

Mt Gellibrand Wind Farm, Mt Gellibrand, Victoria: Overview assessment, detailed flora and fauna surveys, including targeted Brolga and migratory bird surveys, and Striped Legless Lizard tile grid surveys, input to state planning permit application, preparation of witness statement and appearance at state Planning Panel hearing, preparation and early implementation of pre-construction flora and fauna management plans, including bat and avifauna management plan, native vegetation mapping, offset mapping, development of Brolga monitoring and mitigation strategies (2004 – present).

Road and Rail Infrastructure

Avalon Airport Rail Link, Little River, Victoria: Flora and Fauna Mapping, Constraint Analysis and Net Gain Analysis (2011 – present)

Dingley Bypass, Keysborough, Victoria: Flora and Fauna Assessment, including targeted flora surveys, habitat hectare assessment and Net Gain analysis (2008 – 2009)

Nagambie bypass, Nagambie Victoria: Flora and Fauna Assessment, including habitat hectare assessment and Net Gain analysis (2008)

Second Murray River Bridge Crossing at Echuca-Moama: Detailed Flora Assessment, Targeted Flora Survey (2008 – present)

Ecosystem Monitoring and Management

Scientific Review Panel, Kerang Lakes Bypass project (North Central Catchment Management Authority, Goulburn Murray Water): Scientific review of detailed technical reports to inform decisions of water savings plans and associated watering plans for five wetlands that form part of the Ramsar-listed Kerang Lakes wetlands system. (2013)

Northern Victoria Irrigation Renewal Program (NVIRP): Assessed the impact of a major federal water industry investment project on Matters of National Environmental Significance, including threatened flora, threatened fauna and listed migratory birds using wetlands located in the potential impact area. (2009-2011)

Cardinia Road, Officer, Victoria: Growling Grass Frog Management Plan (2009 – 2010)

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APPENDIX L: INDEPENDENT ECOLOGICAL ADVICE

Gullen Range Wind farm Pty Limited Project Approval (078-0118)
Expert Advice on Order to relocate wind turbines

Kevin Mills, Kevin Mills & Associates **31 October 2014**

Results of site inspection

A site incepting was undertaken on 30 October 2014 of four (4) turbine sites in the Pomeroy turbine array within the Gullen Range Wind Farm (GRWF). These turbines have been constructed and recently commissioned. The relevant turbines were constructed at varying distances from the approved locations for their construction.

The following four turbines were the subject of the inspection; variation to approved locations taken from the report by the Department of Planning and Environment dated July 2014. Photographs of the sites are provided below.

Turbine	Distance relocated	Direction moved
POM03	102.2 m	west
POM04	96.2 m	southwest
POM06	56.7 m	southwest
POM07	23.4 m	west

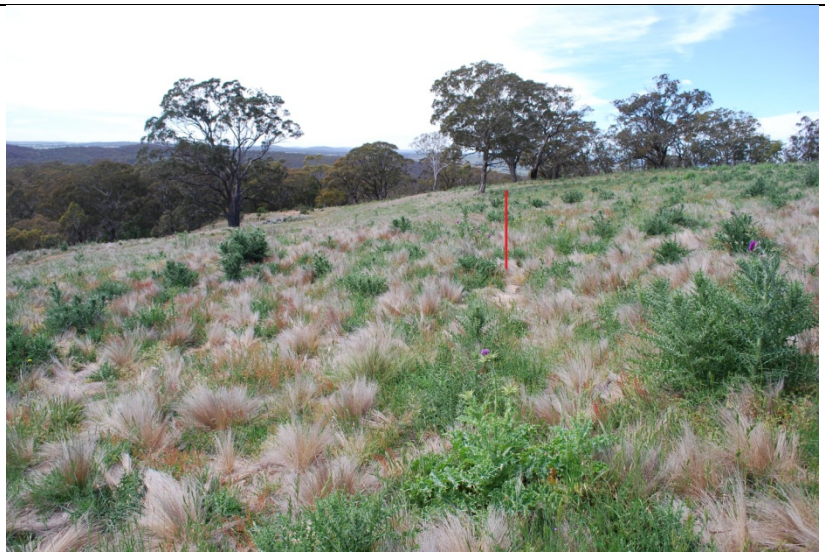
The locations of the approved sites were indicated by star pickets and were readily identified. These locations have been shown on the photographs below.

Assessment

The draft order states that GRWF "is to decommission and remove or relocate the turbines and associated infrastructure (excluding access) identified in Schedule A." The reasons in the order to apply to the four Pomeroy turbines states they "have been relocated closer to known habitat for the powerful owl and little eagle resulting in an increased risk to biodiversity." Having investigated the locations of the built turbines and the approved locations, the following conclusions have been made.

Photographs, 30 October 2014

	Approved site for POM03, indicated by the vertical red line.
	View across to POM03, red line shows approved location.
	Approved site for POM04, indicated by the vertical red line.

	View across to POM04, red line shows approved location.
	Approved site for POM06, indicated by the vertical red line.
	Approved site for POM07, indicated by the vertical red line, this is on the edge of the exiting hardstand for the built turbine.

POM03
The built site is on a ridge while the approved site in on the side of that ridge on a gully slope. The ridge location is preferable as if constructed on the gully slope, the blades would be located between patches of woodland in the gully and there is more likelihood that birds would move along the gully and increase risk of blade strike. Because of the slope, the footprint of the pad required for the turbine would be greater and more trees would be cleared.

Conclusion: The built site results in a better biodiversity outcome than the approved site.

POM04
Similar to POM03, the built site is on a ridge, while the approved site is downslope towards a gully and further into a treed area. Construction of the turbine on the slope would cause more environmental impact than where it has been built.

Conclusion: The built site results in a better biodiversity outcome than the approved site.

POM06
The approved and the built sites are similar, the approved site is slightly dowsnlope and less level ground than the built site.

Conclusion: Both sites have similar environmental attributes and the same minor biodiversity issues.

POM07
The approved site is on the edge of the pad of the constructed turbine, see last photograph above. The built site has been moved up the ridge and mostly out of the treed area. Use of the approved site would have resulted in a much greater loss of trees, as seen in the photograph above.

Conclusion: The built site results in a better biodiversity outcome than the approved site.

APPENDIX M: INDEPENDENT NOISE REPORT

WILKINSON MURRAY

8 May 2014

WM Project Number: 14201
Our Ref: [Click here to insert]
Email: jeff.parnell@planning.nsw.gov.au

Mr Jeff Parnell
NSW Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Dear Jeff

Re: Gullen Range Wind Farm - Modification of the Project Approval - Technical Review

The Department of Planning and Environment (DPE) has requested that Wilkinson Murray Pty Ltd (WMPL) provide expert noise advice with respect to the Gullen Range Wind Farm, Modification of the Project Approval.

The Gullen Range Wind Farm was approved by the NSW Land and Environment Court (L&EC) on the 4th of August, 2010, following assessment under Part 3A of the NSW Environment Planning and Assessment Act 1979 (EP&A Act).

The proponent of the Gullen Range Wind Farm is proposing to relocate some of their wind turbines from the original environmental assessment layout to maximise wind yield and wake loss; localised engineering and topographic constraints; avoidance of visual impacts; and avoidance of localised flora and fauna impacts. This detail design process of relocating wind turbines to optimum positions is generally referred to as miro-siting.

The proponent of the Gullen Range Wind Farm has requested a modification of the Project Approval to allow a new turbine layout. A modification consistency report with supporting documentation has been provided to DPE to request the modification of the Project Approval.

WMPL was provided the following documents:

1) Consistency Review, Changes to Turbine Layout: Gullen Range Wind Farm, ngh Environmental, 17 December 2013;

A consistency review examining the environmental issues that could be affected as a result of the changes to the turbine layout, with reference to L&EC conditions and the Environmental Assessment and supporting documents.

2) Gullen Range Wind Farm Revised Noise Impact Assessment Marshell Day Acoustics (MDA) (Rp 002 R03 2012154SY, 25 September 2013);

A detailed noise impact assessment for the Final Design Layout is documented in Marshell Day report Rp002 r03 2012154SY Gullen Range Wind Farm Revised Noise Impact Assessment dated 25 September 2013. The noise assessment concludes that predicted noise from the wind farm achieves compliance with the relevant noise limits at all of the assessed receivers.

3) Gullen Range Wind Farm Modification of the Project Approval MDA (RP 003 2012154SY, 25 March 2014).

A noise assessment reviewing the difference in predicted noise levels between the approved layout and the final design layout, to support the modification application.

4) Review of Noise Impact Assessment Documents – Gullen Range Wind Farm Modification 1 (Jeff Parnell, 7 May 2014).

The DPE's review of noise impacts from the modification of the turbine layout conducted by their noise specialist, Jeff Parnell.

THE PROPOSED PROJECT MODIFICATION

The Gullen Range Wind Farm consists of 73 turbines. There are 47 identified non-associated receivers within 2 kilometres of the wind turbines. The turbines are a combination of Goldwind GW82 and GW100 turbines. It is proposed that 69 of the wind turbines be relocated. Of the 69 wind turbines that are proposed to be relocated, 17 are proposed to move less than or equal to 10 metres and 22 were moved more than 50 metres. The largest movement in a wind turbine is 187m for turbine BAN_08.

NOISE ASPECTS WITH REGARD TO THE MODIFICATION

Wilkinson Murray has reviewed all the documentation described above. The MDA noise assessment to support the modification has provided the difference in predicted noise levels, between the approved layout and the proposed modified layout, at each of the 47 identified non-associated receivers for a range of hub height wind speeds between 3m/s to 12m/s. A summary of the difference in predicted noise levels for 9m/s hub height speed is presented in Table 1, below. 9m/s hub height noise predictions are typically the worst case noise predictions.

Table 1 MDA Noise level difference between approved turbine layout and the proposed modified layout (Hub height wind speed of 9m/s).

ID	MDA Difference	ID	MDA Difference
K1	0	B31	0.1
K14	-0.1	B32	0.1
K18	0	B5	0
K19	0.1	B54	0.1
K2	0.1	B55	0.3
K20	0.1	B7	0
K3	0	B77	0.4
K4	0.2	PW29	-0.1
B10	0	PW34	0.1
B11	0	PW4	0
B12	-0.1	PW8	0
B124	0.1	PW9	0
B13	0	G26	0
B14	0	G28	0
B17	0	G31	-0.1
B19	0	G32	0.1

ID	MDA Difference	ID	MDA Difference
B21	0	G33	0.1
B22	0	G35	0.1
B23	0	G36	0
B24	0	G38	0
B26	-0.1	G39	0
B28	0.2	G40	0
B29	0.3	G43	0.1
B30	0.1		

The MDA report concludes "*In the context of the difference in layouts reviewed, changes in predicted noise level of this magnitude are not considered to be significant*".

Wilkinson Murray has conducted noise modelling using the CADNA A model for the approved and proposed turbine layout using the information in the reports presented above to verify the presented difference noise levels. Table 2 presents the results of the MDA difference noise levels and those predicted by WMPL. It is noted that it was possible to conduct this independent review based on publicly available information presented in the MDA report without the need for any other external requests or external information.

Table 2 Comparison of MDA noise level differences and WMPL noise level differences (Hub height wind speed of 9m/s).

ID	MDA Difference	WMPL Difference
K1	0	-0.1
K14	-0.1	-0.1
K18	0	0
K19	0.1	0
K2	0.1	0
K20	0.1	0
K3	0	-0.1
K4	0.2	0.3
B10	0	0
B11	0	0
B12	-0.1	-0.2
B124	0.1	0.1
B13	0	-0.1
B14	0	-0.1
B17	0	0
B19	0	0
B21	0	0
B22	0	0
B23	0	0
B24	0	0
B26	-0.1	-0.1
B28	0.2	0.2
B29	0.3	0.3
B30	0.1	0.1
B31	0.1	0.1

ID	MDA Difference	WMPL Difference
B32	0.1	0.1
B5	0	0
B54	0.1	0
B55	0.3	0.2
B7	0	0
B77	0.4	0.3
PW29	-0.1	-0.1
PW34	0.1	0.2
PW4	0	0
PW8	0	0
PW9	0	0
G26	0	0
G28	0	0
G31	-0.1	-0.1
G32	0.1	0.1
G33	0.1	0
G35	0.1	0
G36	0	0.1
G38	0	0
G39	0	0
G40	0	0.1
G43	0.1	0

The noise level difference predictions conducted by MDA and WMPL are very similar. Of the 47 receivers assessed, 25 receivers were exactly the same. All receivers were within 0.1 dB indicating a very good correlation.

It is WMPL's opinion that the proposed relocation of the wind turbines result in an insignificant increase in noise level and that the wind turbine noise from the Gullen Range Wind Farm would be capable of meeting the noise criteria in the Approval.

REVIEW OF NOISE IMPACT ASSESSMENT DOCUMENTS – GULLEN RANGE WIND FARM MODIFICATION 1 (JEFF PARNELL, 7 MAY 2014)

The DPE's review of noise impacts from the modification of the turbine layout conducted by their noise specialist, Jeff Parnell concludes *"that compliance with approved criteria is achievable at all non-associated residential properties and based on information supplied, there is no reason to believe that the project is not capable of meeting the noise goals established by the approval."*

WMPL supports the conclusion of the DPE review and the reasons that support the conclusions.

I trust this information is sufficient. Please contact us if you have any further queries.

Yours faithfully
WILKINSON MURRAY

John Wassermann
Director

APPENDIX N: LEGAL ADVICE

GULLEN RANGE WIND FARM

MEMORANDUM OF ADVICE

NSW Government Planning & Environment
Legal Services Branch
23-33 Bridge Street
Sydney NSW 2000

Attention: Ms Jennifer Smith

GULLEN RANGE WIND FARM

MEMORANDUM OF ADVICE

INTRODUCTION

1. On 10 October 2014 a notice to show cause why an order should not be issued was served on New Gullen Range Wind Farm ("NGRWF").

2. The draft order, consistent with the advice then available to the Department, required the relocation or removal of nine turbines, which the Department asserted (with solid foundation) that their relocation was other than minor, and that there were environmental consequences of the relocation.

3. Of a total of 73 approved turbines, 69 were constructed in locations other than the locations determined precisely by the co-ordinates set out in the Project Approval. The 60 relocated turbines which were not the subject of the notice to show cause were, however, constructed in locations in accordance with the Project Approval, because the Approval itself authorised "minor" relocation, and the re-locations were, in my opinion, minor.

4. The draft order required relocation or removal of turbines BAN_08, BAN_09, BAN_12, BAN_13 and BAN_15 due to the horizontal and vertical extent of their relocation and the consequential increased visual impact on residences B12 and B29.

5. The draft order also required relocation or removal of turbines POM_03, POM_04, POM_06 and POM_07 due to their extent of horizontal movement and a potentially increased ecological impact.

6. NGRWF was given until 31 October 2014 to respond.

7. The following matters have occurred since the draft order was served:

   (a) the Department has obtained independent advice concerning visual impact/planning and ecology in relation to the relocation of the nine turbines;
   (b) residences B12 and B29 have ceased to be non-associated residences, in that residence B29 has been acquired by an entity associated with NGRWF and a financial arrangement has been entered into between the owners of residences B12 and NGRWF such that those owners do not object to the presence of the wind farm;
   (c) NGRWF lodged a detailed and lengthy submission accompanied by a number of expert reports on 31 October 2014;
   (d) the decision of the Minister by her delegate the Planning & Assessment Commission of New South Wales ("PAC") to refuse approval to modify the approval for the wind farm was set aside by the Land and Environment Court on 6 March 2015;
   (e) as a consequence of the orders of the Land and Environment Court, the application to modify the approval is to be determined again by the PAC;
   (f) on 13 April 2015 NGRWF submitted a considerable amount of material in further support of the modification application.

8. I am asked to advise whether the Minister should issue an order in the terms of the draft order dated 10 October 2014.

9. In my opinion, for the reasons which follow, the Minister should not issue the order.

SHOULD AN ORDER BE ISSUED?

10. The Land and Environment Court (LEC) frequently deals with appeals against orders under the *Environmental Planning and Assessment Act* (EPA Act) and the *Local Government Act* (LG Act) where unlawful work has allegedly been carried out. It is appropriate that the Minister adopt the approach of the LEC in deciding whether or not to issue an order, not only because that reflects best practice, but also because if an order is issued, NGRWF will almost certainly appeal and the LEC will determine the matter.

11. The approach of the LEC is to ask itself whether development consent (or in this case an approval under Part 3A) would have been granted for the development if an application had been made before the work was carried out – that is, consider a hypothetical development application or application for approval as if the work does not exist.

12. In circumstances where unlawful work is alleged to have been carried out, that assumed fact is nevertheless a neutral matter in the determination of an appeal – the proponent does not obtain a benefit by being able to argue that, for example, it will be expensive to rectify or demolish allegedly unlawful work. Similarly, the enforcement body gains no advantage in the balancing exercise by asserting that the alleged unlawful work was carried out.

13. The two residences which were the subject of adverse visual impact by the relocations are now associated residences. It has always been the Department's (correct) approach that impacts upon associated residences are not relevant for the determination of whether or not a particular impact is acceptable. Therefore, as a consequence of the affected residences becoming associated residences, the visual impact of the relocations of these turbines is now acceptable. There is no environmental harm from the relocation.

14. The independent, and other, advice in relation to visual impact is, now, irrelevant to the decision whether or not to issue an order.

15. In the present case, having regard to residences B12 and B29 now being associated residences, there is no matter of visual impact which would prevent the hypothetical approval being granted and so an order, if made, would be very unlikely to be upheld by the Court.

16. That means, because visual impact was the only potential impact, that in relation to the BAN turbines there are no environmental grounds to issue an order.

17. The advice received from Dr Kevin Mills the independent ecologist in relation to the POM turbines is also telling. In respect of turbines POM_03, POM_04 and POM_07, in his view the environmental/biodiversity outcome is better with the turbines relocated than it was as approved. In relation to turbine POM_06 the impact is the same in environmental/biodiversity terms.

18. The potential biodiversity impact was the only impact relied upon in relation to the POM turbines to require their relocation or removal in the draft order.

19. It therefore follows that again there is no environmental impact to which the Minister can point to justify the issue of an order in circumstances where the hypothetical application would have been approved.

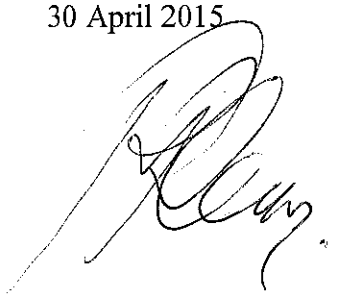
20. The EPA Act makes provision for the modification of development consents and approvals, effectively retrospectively, where the relevant work has already been carried out. This is so because it is recognised that the primary goal of the Act is to ensure there is an appropriate environmental outcome rather than the taking of a strict technical approach.

21. It follows, that if there has been an alleged breach of the *EPA Act* which has been remedied by a modification of a consent or approval, or in respect of which there is no environmental harm, then any civil enforcement proceedings are very unlikely to succeed.

22. Consideration of the very lengthy and detailed submissions from NGRWF reinforce the conclusions I have otherwise reached. Whilst expert minds may differ on certain matters, the opinions proffered on behalf of NGRWF are consistent with the independent advice given to the Department. To the extent that there was any likelihood at all that an order would be upheld on appeal , that likelihood is extinguished by the quality of analysis and conclusions reached by the experts in support of NGRWF's modification application.

23. Even putting the Applicant's material to one side, in my opinion, it is actually because the affected residences have become associated, and the independent advice on ecology given to the Department, that an order should not be issued.

30 April 2015



Philip Clay
Martin Place Chambers

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