Joule Logic

Renewable Energy and Environment Specialists

Cattle Hill Wind Farm

Eagle Nest Productivity Plan (ENPP)

Developed to satisfy the requirements of Condition FF5 of the State EPN 9715/1 for the Cattle Hill Wind Farm

Date	Revision	Prepared	Reviewed	Approved	Regulator reviews
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Definitions

In this Eagle Nest Productivity Plan, the following definitions apply:

Cattle Hill Wind Farm	Comprising 48 wind turbines and 147.5 MW capacity
Central Highlands Region	is that described in the EMPCA permit 7925, as the area north of Bothwell, east of Bronte Park and surrounds, south of Liawenee and west of the Great Western Tiers
Commissioning	When the Cattle Hill Wind Farm begins supplying electricity to the grid
DPEMP	Development Proposal and Environmental Management Plan
Director	Director of the Tasmanian Environment Protection Authority, holding office under Section 18 of EMPCA and includes a person authorised in writing by the Director to exercise a power or function on the Director's behalf.
DPIPWE	The Tasmanian Department of Primary Industry, Parks, Water and Environment
Eagle	Tasmanian wedge-tailed eagle (*Aquila audax fleayi*) or the white-bellied sea-eagle (*Haliaeetus leucogaster*)
EMPCA	*Environmental Management and Pollution Control Act 1994*
EPA	Tasmanian Environment Protection Authority
FPA	Forest Practices Authority
NVA	Natural Values Atlas, managed by DPIPWE
PCAB	Policy and Conservation Advice Branch of DPIPWE
Productivity	Is defined in this instance as breeding activity
The Land	Defined as that situated immediately to the east of Lake Echo and off Bashan Rd, approximately 3km southwest of Waddamana in central Tasmania and includes part or all of the following titles: 135246/1; 29897/1; 29897/3; 29897/5; 248810/1; 135247/1; 135247/2; 29888/4; 29897/6 (as defined in the EPN 7925/1)
The Proponent	Goldwind Australia (ACN 140 108 390)
WTE	Tasmanian wedge-tailed eagle (*Aquila audax fleayi*)
WBSE	White-bellied sea-eagle (*Haliaeetus leucogaster*)

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1. Introduction

1.1 The Project

The Cattle Hill Wind Farm occupies privately-owned land situated east of Lake Echo in Tasmania's Central Highlands approximately 93 km to the north-west of Hobart (Figure 1). The wind farm consists of 48 wind turbines and associated infrastructure.

The wind farm site is approximately 4,121 ha and is bounded by Lake Echo to the west and grazing and forestry land to the north, east and south. The small unpopulated settlement of Waddamana is located to the north east. The site is currently used for grazing, small forestry operations and hunting and comprises nine lots owned by two land owners.

The project was approved by Tasmanian State Regulators in April 2012 and by the (now) Commonwealth Department of Environment and Energy in December 2014.

1.2 The Proponent

The Proponent for the Cattle Hill Wind Farm is:

Goldwind Capital (Australia) Pty Ltd

ACN: 140 108 390

Suite 2, Level 23,

201 Elizabeth Street,

Sydney NSW 2000

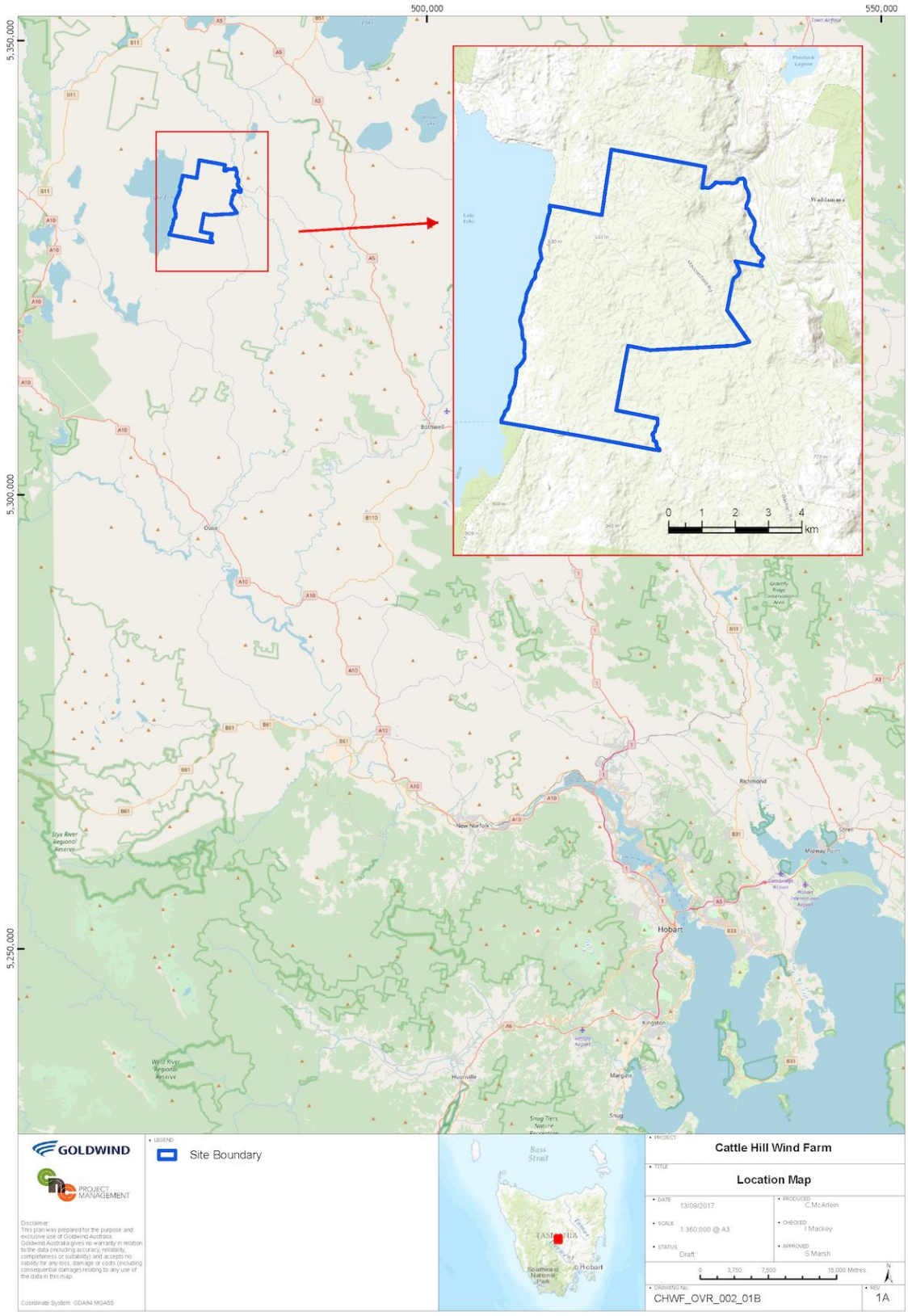

Figure 1: Location of Cattle Hill Wind Farm

1.3 The Person Responsible

The Person Responsible is the Managing Director of Goldwind Australia Pty Ltd.

1.4 Relevant Permit Condition

The Eagle Nest Productivity[1] Plan (ENPP) has been developed to satisfy the requirements of Condition FF5 of the State approval EPN 9715/1 for the Cattle Hill Wind Farm. This Condition states:

> *1 Unless otherwise specified in writing by the Director, an Eagle Nest Productivity (in and around wind farm site) Monitoring Plan must be submitted to the Director for approval 6 weeks prior to construction.*
>
> *1.1 The Eagle Nest Productivity (in and around wind farm site) Monitoring Plan is approved only when the Director indicates in writing that the submitted document adequately addresses the requirements of parts 2 and 3 of this condition to his or her satisfaction.*
>
> *1.2 The Director's approval will not be unreasonably withheld or delayed.*
>
> *2 The plan must be prepared in accordance with any reasonable guidelines provided by the Director.*
>
> *3 Without limitation, the plan must include details of the following:*
>
> *3.1 an ongoing Eagle Nest Productivity Survey to check the productivity of nests of Wedge-tailed Eagles and White-bellied Sea-eagles, within The Land and within a minimum of 10 km from the boundary of The Land;*
>
> *3.2 a table containing all of the major commitments made in the plan;*
>
> *3.3 an implementation timetable for key aspects of the plan; and*
>
> *3.4 a reporting program to regularly advise the Director of the results of the plan.*
>
> *4 The person responsible must not operate the wind farm other than in accordance with the approved Eagle Nest Productivity (in and around wind farm site) Monitoring Plan.*
>
> *5 In the event that the Director, by notice in writing to the person responsible, either approves a minor variation to the approved plan or approves a new plan in substitution for the plan originally approved, the person responsible must implement and act in accordance with the varied plan or the new plan, as the case may be.*

This plan also satisfies Commitment 69 of the DPEMP, which states:

> *An annual eagle nest productivity monitoring program will be carried out during late spring or early summer to check known nests of wedge-tailed eagles and white-bellied sea eagles, within the site and within a distance of 5km from the wind farm operating area.*

1.5 Guidelines for the ENPP

The guidelines for the Eagle Nest Productivity Plan (ENPP) were endorsed by the Tasmanian EPA on 19 June 2017. They state that the ENPP must contain the following:

[1] Note that productivity is not defined in the permit, but in this Plan it refers to breeding activity.

- *Introduction, containing the following:*
    - *Brief description of the project and its location.*
    - *The proponent and the Person Responsible.*
    - *The permit condition it satisfies.*
- *Definition of relevant terms.*
- *Objective of the ENPP.*
- *Scope – species covered by the Plan, geographic extent for the Plan.*
- *Management actions to achieve the stated objective. This needs to include:*
    - *Methods to be used to achieve the objective, including:*
        - *The location of eagle nests to be surveyed (which includes nests on "the Land" and within 10km of "the Land").*
        - *The techniques used to survey the nests.*
        - *The selection of nests beyond 10km of "the Land" to be used as a comparison to those on the land or within 10km of it.*
        - *When surveys will be conducted.*
        - *The duration of the study.*
    - *Analysis of results. Details of how this will be achieved.*
    - *Reporting requirements. Details of how the results of the study will be reported.*
- *Performance indicators. The ENPP will detail the implementation of the actions in a table and the time frames when these will be submitted to the Director or his/her delegate.*
- *Reporting. A commitment to provide all results of the management actions in an Annual Environment report to the Director or his/her delegate, which will be made publicly available.*

2. Objective of the ENPP

The objective of the ENPP is not specified in permit Condition FF5, but the DPEMP commits to surveying known eagle nests onsite and within 5 km of the wind farm operating area[2], and states that the purpose of productivity surveys are: "understanding utilisation of the site and where potential impacts from the operating wind farm are having an effect" (p. 280). The intention of productivity surveys at wind farms is usually to determine if there is an indirect impact on eagles breeding at the wind farm (that is, does the wind farm cause a change in behaviour that affects breeding success. For example, see Hull et al. 2015). This indirect effect is measured separately to direct impacts (mortalities due to collisions with infrastructure), which is managed through other Environmental Management Plans (EMPs) such as the Bird and Bat Mortality Monitoring Plan (Condition FF10).

The objective of the ENPP can be defined by two questions:

[2] Note that Permit Condition FF5 requires surveys of nests within 10km of the boundary of The Land, which overrides the commitment.

- Do eagles continue to breed and produce chicks at the site once the wind farm is operating?;
- Is the level of eagle breeding activity at the wind farm similar to elsewhere in the state?

3. Scope

Relevant species are the Tasmanian Wedge-tailed Eagle *Aquila audax fleayi* (WTE) and the White-bellied Sea-eagle, *Haliaeetus leucogaster* (WBSE).

The geographic extent of the plan is "The Land" and 10 km out from this boundary.

4. Nest Productivity Surveys

4.1 Background

Studies into the productivity of eagles breeding at wind farms have been conducted at the Bluff Point and Studland Bay Wind Farms in north-west Tasmania (called breeding success surveys at these sites). These studies highlighted a number of issues, in particular that it was not possible to conduct statistical analysis of the data comparing on-site to off-site nests because:

- There were insufficient on-site nests (i.e. in statistical terms, insufficient treatment sites); and
- Adequate control nests could not be established (to allow comparison to treatment sites). Eagle nests in Tasmania are subject to a variety of disturbing factors beyond wind farms (Wiersma et al. 2009) and it was not possible to control for these factors and therefore separate any wind farm effects from other effects (Hull et al. 2015).

These issues had two outcomes on the studies at the Bluff Point and Studland Bay Wind Farms, firstly how the data could be analysed, and secondly, the conclusions that could be drawn from the study. These same issues will apply to the studies at the Cattle Hill Wind Farm because the number of on-site (treatment) nests is small and it is very difficult to obtain an adequate representation of background variability to specifically test for wind farm effects.

These issues will be managed by:

- On-site nest data will be compared with any analogous off-site nest data collected across the State (such as that collected as part of the Cattle Hill Wind Farm permit conditions, the Forest Practices Authority or DPIPWE, or any other entity for which data can be accessed by the Cattle Hill Wind Farm. For example, the Forest Practices Authority, FPA, currently has an Annual Nest Monitoring Project where nest success, indicated by the presence of a chick, is monitored every November, Dr S. Munks pers. comm.);
- Descriptive statistical analysis, using the State data to establish the average productivity (and associated variability). The treatment nests will be compared to this distribution. This is the same comparison between on-site and off-site nests as described in Hull et al. (2015). (Note that the surveys being conducted for the FPA's

Annual Nest Monitoring Project, only monitor active nests and therefore do not include those where eagles attempted to breed, but failed early, Dr S. Munks pers. comm. Therefore, care will be required when assessing data from different sources to ensure they are comparable). Given this is not a formal hypothesis test, it can only result in qualitative conclusions;

- The use of nests 10 km of the boundary of the wind farm site (as required in Condition FF5) is unlikely to represent treatment/on-site nests as many will be a substantial distance from the wind turbines. There are no definitive distances to define a treatment nest at a wind farm (i.e. the distance at which they are potentially affected by the wind farm), but studies at overseas sites discuss a possible effect of turbines on the behaviour of birds of ranging from close to turbines (Johnson et al. 2000), out to 300 m (Petersen and Nohr 1989) and up to 500 m (Kruckenberg and Jaene 1999) from turbines. The findings from these and other studies are often inconsistent, which could be related to species or site factors (Larsen and Madsen 2000). Given that turbines cannot be located within 1 km of eagle nests at the Cattle Hill Wind Farm, a conservative buffer of 2 km of the wind turbines will be used to describe nests outside the potential influence of wind turbines. That is, any nests located beyond 2 km (i.e. those between 2 km and 10 km of the boundary of the wind farm) of a wind turbine will be used as off-site nests and those within 2 km from turbines will be treated as on-site; and
- Placing a finite duration on the studies.

Another consideration is that while the requirement of this plan is to conduct surveys of eagle productivity (i.e. whether chicks are produced), the protocols outlined in the most recent Forest Practices Authority Technical Note No.1 (2015) require that monitoring of eagle breeding should only be conducted during the second week of November to avoid causing disturbance to breeding eagles (which might result in abandonment of the breeding attempt). Therefore, it will not be possible to determine if chicks fledge from the monitored nests from the one survey.

4.2 Methods

4.2.1 Identification of nests

Both on- and off-site nests will be identified from surveys conducted as part of the DPEMP, surveys conducted for Condition FF4 (Eagle nest searches of the Central Highlands Region) and any other sources available (such as the NVA, Natural Values Atlas maintained by DPIPWE, or the FPA). Only viable nests will be used in any given year (nests of a sufficiently good condition that an eagle may use it to breed. Unviable nests are those that have no evidence of recent use or are falling from the tree. The details in FPA 2015 will be used as an indication of a viable nest). Nests will be allocated to on-site (within 2 km of a wind turbine) or off-site (further than 2 km from a wind turbine and up to 10km of the boundary of the wind farm).

The surveys will commence during the first breeding season after the wind farm is fully commissioned.

4.2.2 Field surveys

Surveys (or nest activity assessments as described in FPA 2015) will be conducted once during the breeding season, around the second week of November, using the protocol described in the FPA (2015). Surveys will be undertaken by a suitably qualified and/or experienced person (e.g. a recognised expert or someone who has undertaken eagle training with the FPA).

Surveys will be ground searches where nests are viewed from vantage points, or approval will be sought for fixed wing aerial surveys, possibly in conjunction with DPIPWE or FPA. Prior to the breeding season, vantage points (where the nests can be viewed from a safe distance, based on the FPA 2015) for the monitored nests will be established. Note that approval for ground searches of eagle nests will need to be sought from private land owners. If approval is not obtained, these nests will not be included in ground surveys. The FPA is currently assessing alternate means of surveying eagle nests using cameras and drones fitted with night vision (Dr S. Munks pers. comm.). Discussions will be had with the FPA and PCAB (Policy & Conservation Advice Branch, DPIPWE) prior to the commencement of the first surveys to determine the most suitable and practical approach (ground or aerial surveys, cameras or drones) to conduct the surveys.

The following will be noted:

- Evidence of activity at the nest (green leaves, prey remains or droppings, etc);
- The presence of eagles;
- Presence of eggs (if they can be seen) or chick/s.

The FPA nest activity form will be completed (http://www.fpa.tas.gov.au/homepage/search?queries_name_query=forms&search_page_110662_submit_button=Submit), and any relevant information provided to the Natural Values Atlas.

Observations of the presence of first year eagles during surveys will be noted. While it won't be possible to determine the source of these birds because they will not be marked, they may be a chick fledged from the nests being monitored.

4.3 Analysis of results

Formal statistical modelling of the data will not be possible for the reasons given above. Instead, a distribution of the productivity of off-site nests will be plotted and a visual comparison with on-site nests will be made (per Hull et al. 2015). If the productivity of on-site nests fall within the range of those off-site, this would suggest no evidence of an effect of the wind farm. Given the descriptive nature of the statistical analysis, any conclusions drawn will be qualitative in nature.

4.4 Duration of the study

Due to issues with this type of study, as outlined above, its duration will be limited. After three years of surveys, an assessment will be made to determine whether the study has achieved its objective of determining if the breeding activity of eagles at nests on site fall within that found offsite. The specific questions listed in the objectives will be considered:

- Do eagles continue to breed and produce chicks at the site once the wind farm is operating?;
- Is the level of eagle breeding activity at the wind farm similar to elsewhere in the state?

If the three years of data are able to answer these questions a request to cease the study will be submitted to the Director. If there are insufficient data to answer the questions, additional surveys will be conducted until the questions can be answered.

A report will be submitted to the Director following the three years of surveys and, if the surveys continue, at their completion.

5. Reporting

The results of each year's surveys will be presented In the Annual Environment Report provided to the Director, which will be made publicly available. A final report describing the outcomes of all the surveys will be provided to the Director three months after the completion of the final survey.

6. Review of the ENPP

A review of the ENPP will occur after the final report (at the completion of the field work) has been submitted. It will be determined at this time whether the objectives of the study have been met and if not, what further work is required. A new ENPP will developed and submitted to the Director for approval if an extension of the study is required.

7. Performance Indicators

Table 1 summarises actions in the ENPP, their implementation and the time frames.

Table 1: Implementation of actions and their time frames in the Eagle Nest Productivity Plan

Implementation/Action	How addressed	Time frame
Submission of ENPP six months after issue of Permit	Extension granted by the Director for submission of the ENPP until six weeks prior to construction (EPN 9715/1).	First draft of ENPP submitted 10/8/2017. ENPP finalised 29/9/2017.
Issue of Guidelines for the ENPP	Guidelines were endorsed by the Tasmanian EPA 19 June 2017	-
Productivity surveys of nests: - identification of nests on- and off-site	Detailed in Nest Productivity Surveys – identification of nests section	These will be identified (along with vantage points for the nests) prior to the first season of surveys. Discussions about the latest strategies to monitor nests will be had with FPA and

Implementation/Action	How addressed	Time frame
		PCAB at this time.
Productivity surveys of nests: - field surveys	Detailed in Nest Productivity Surveys – field surveys section	Surveys will be conducted around the second week of November for three years after the wind farm is fully commissioned.
Productivity surveys of nests: analysis	Detailed in Nest Productivity Surveys – analysis section	Analysis will be conducted at the completion of the three years of surveys
Productivity surveys of nests: reporting	Detailed in Nest Productivity Surveys – reporting section	The results of surveys will be reported annually in the Annual Environment Report. A final report will be provided to the Director 3 months after completion of the surveys (after 3 years or longer if required).
Review of the ENPP		Following submission of the report after the completion of the study.

8. References

Forest Practices Authority 2015. Fauna Technical Note No. 1 Eagle nest searching, activity checking and nest management.

Hull CL, Sims C, Stark E, Muir S. 2015. Results and analysis of eagle studies from the Bluff Point and Studland Bay Wind Farms 2002-2012. Pp 95-112 in Hull C, Bennett E, Stark E, Smales I, Lau J, Venosta M. (Eds) Wind and Wildlife. Proceedings form the Conference on Wind Energy and Wildlife Impacts, October 2012, Melbourne, Australia. Springer, Heidelberg Germany.

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Kruckenberg H, and Jaene J. 1999. Zum Einfluss eines Windparks auf Verteilung wiedender Bläßgänse im Rheiderland (Landkreis Leer, Niedersachsen). Natur und Landschaft 74: 420-427.

Larsen JK, and Madsen J. 2000. Effects of wind turbines and other physical elements on field utilization by pink-footed geese (*Anser brachyrhynchus*): A landscape perspective. Landscape Ecology 15: 755-764.

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Wiersma J, Koch AJ, Livingston D, Brown B, Spencer C, Mooney N, Munks S. 2009. Eagle near monitoring projects – Year 1 2007-08, establishing monitoring sites and investigating the relationship between nesting success of the Tasmanian wedge-tailed eagle and environmental variables. Report to Roaring 40s and the Forest Practices Authority. Forest Practices Authority Scientific Report 8.