Woolnorth Wind Farm Holding Pty Ltd

Musselroe Wind Farm
Annual Environmental Review 2017-18

Date: 1 October 2018

Contents

1. General Manager's Statement

This is the 9th Annual Environmental Review (AER), including the 2013 and 2016 Public Environment Reports, published for the Musselroe Wind Farm (MRWF). The AER has been prepared according to condition G5 of the Environment Protection Notice (EPN) for the project (EPN 8657/2). According to G5, an Annual Environmental Review, that is also publically available (www.woolnorthwind.com.au), must be submitted to the Director of the Environment Protection Authority (EPA) within 3 months of the end of the reporting period each year.

I acknowledge and endorse this report.

for

Stephen Ross
General Manager
Woolnorth Wind Farm Holding Pty Ltd

1 October 2018

2. This Report

This AER covers the period 1 July 2017 – 30 June 2018 and is provided to fulfil condition G5 of the MRWF EPN (8657/2) and relevant conditions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) approval number 2002/683. The report also provides a summary of additional work undertaken at the site to address any environmental issues and/or to improve environmental values of the site. Table 1 contains details of the sections within this report and the specific purpose of each section.

Table 1. Sections contained within this report and details of reporting requirements met under Condition G5 of the EPN.

Sections of this report	Compliance details
1. Statement from General Manager of Woolnorth Wind Farm Holding Pty Ltd	In response to 1.1
2. This report	General information
3. Introduction 3.1 Background 3.2 MRWF	General information
4. General Environmental Management 4.1 Public complaints	In response to 1.2
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4.3 Summary of the amounts (tonnes or litres) of both solid and liquid wastes produced and treatment methods implemented. Initiatives or programs planned to avoid, minimise, re-use, or recycle such wastes	In response to 1.4
4.4 Non-trivial environmental incidents	In response to 1.5
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4.6 Identification of breaches of limits specified in these conditions and significant variations from predicted results contained in any relevant DPEMP or EMP	In response to 1.7
5. Other Environmental Actions and issues 5.1 Eagle Management 5.2 Other Actions and Issues	In response to 1.8
6. Environmental Management Plans	
7. State Environmental Management Plans	In response to 1.9
8. Commonwealth Environmental Management Plans	Information for the Commonwealth Department of Environment and Energy (DoEE)
9. Community consultation and communication undertaken	In response to 1.10
10. Review of the activity over the next 12 months	In response to 1.11
11 &12. Glossary and References	General inclusion

3. Introduction

3.1 Background

Musselroe Wind Farm is located in far north-east Tasmania (Figure 1), and is owned by Musselroe Wind Farm Pty Ltd (MRWF), a subsidiary of Woolnorth Wind Farm Holding Pty Ltd (WNH). WNH is a joint venture between Hydro Tasmania and Shenhua Clean Energy Holdings (formed in 2012). WNH acquired the MRWF project in February 2013 and has been operating the site since it was commissioned in October 2013.

WNH manages the MRWF including compliance with its obligations under the EPN and EPBC approval conditions. The regulatory compliance obligations of MRWF are the focus of this report.

3.2 MRWF

The MRWF consists of:

- 56 Vestas (3MW) wind turbines.
- Underground 33 kV power collection system.
- An electrical substation, control room and associated buildings.
- Roads, fences and other associated infrastructure.
- A 110kV single circuit transmission line (49km in length, Figure 2), connecting the wind farm to the national electricity grid at the Derby substation.

Construction of the wind farm commenced in March 2009 and completion of the wind farm was contractually executed on 9 October 2013. For the purposes of several EPN requirements bound by the term 'commissioning/ed', July 1 2013 is used (as 55 of the 56 wind turbines were operating by that time).

MRWF has been issued a Municipal Planning Scheme Permit (PLN/03-0161 & PLN/08-0714), an EPN (8675/2, replacing conditions attached to PLN/03-0161) and an EPBC approval (2002/683). These regulatory instruments are administered by the Dorset Council, the EPA and the DoEE respectively. Attached to these legal instruments are environmental conditions with which MRWF must comply. The preparation of this AER is a requirement of the EPN. Environmental Management Plans that have been approved in accordance with the EPN and EPBC Approval also outline reporting commitments and requirements. This report contains the relevant reporting requirements for the MRWF and the associated 110 kV transmission line.

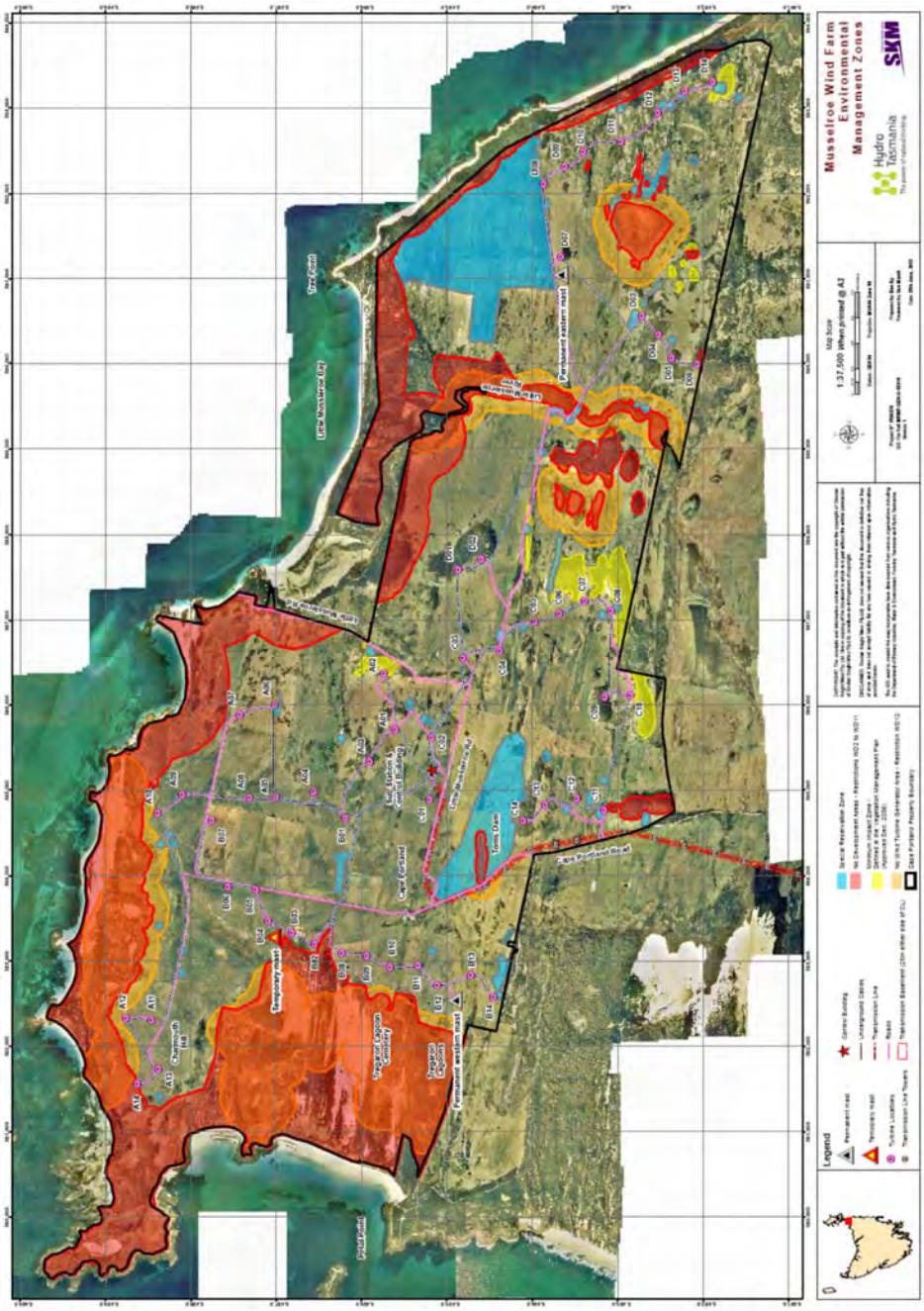

Figure 1. Musselroe Wind Farm layout

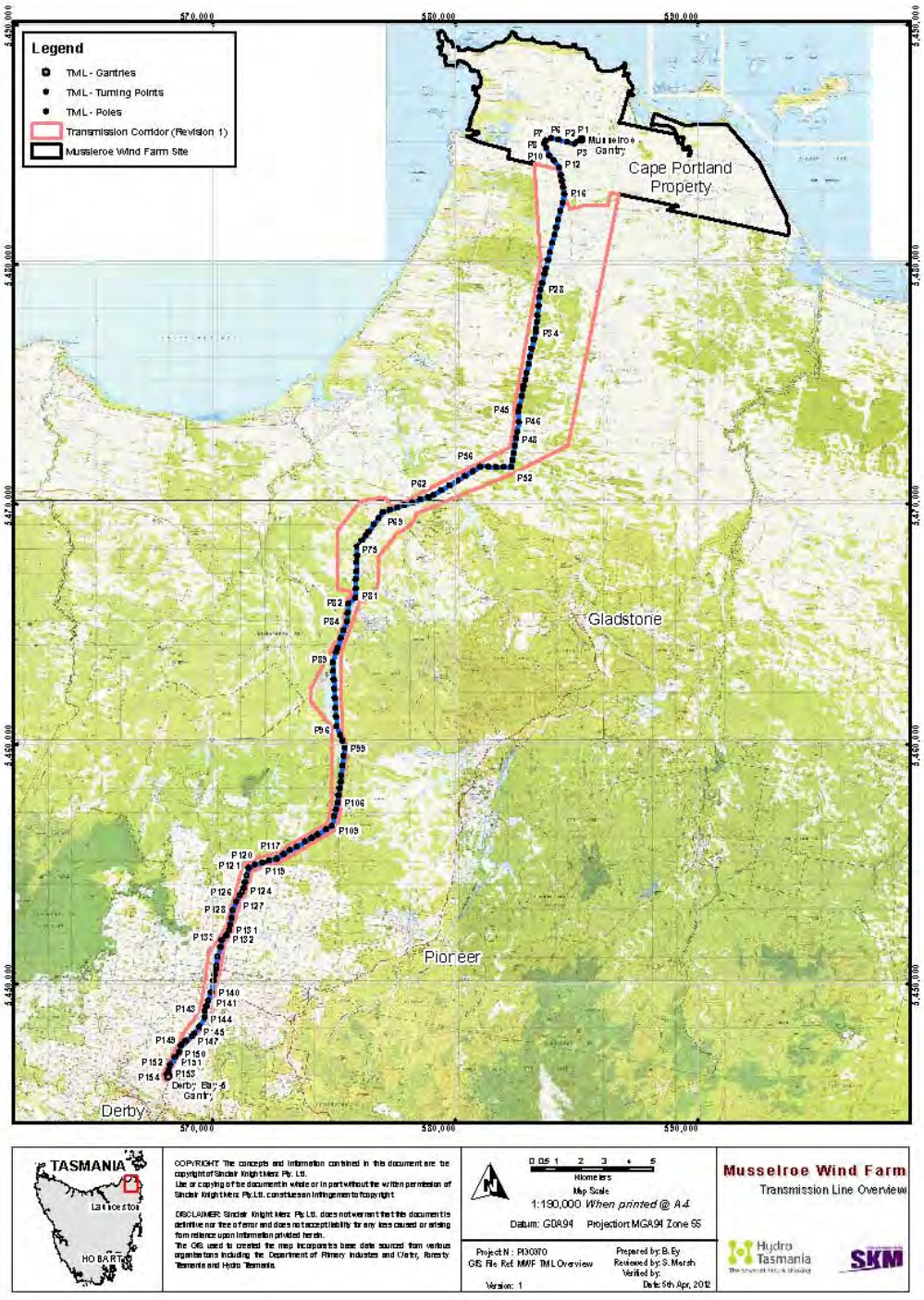

Figure 2. Transmission line route

4. General Environmental Management

4.1 Public Complaints

There were no public complaints in relation to environmental or other matters received by WNH during the 2017-18 reporting period.

4.2 Environmental Procedural or Process Changes

As highlighted in the previous AER (2016/17) in November 2016, the suite of State approved environmental management plans for the project were reviewed, consolidated into a single Plan ('State Environmental Management Plan 2016') and submitted for approval. The Plan was approved by the EPA in July 2017. This review primarily focussed on removing the information and commitments relating to the planning, construction and commissioning phases of the wind farm which are/were no longer relevant.

One significant environmental procedural or process changes during the 2017-18 reporting period was the removal of the additional mortality monitoring surveys conducted in the 'North West Wader Zone' of the wind farm. Further details on this change are provided in section 7.4 and 8.2. The change did not come into effect until December 2017 following the re approval of the Bird Utilisation, Behaviour and Mortality Monitoring Plan (pursuant to Condition 4 of the EPBC approval).

4.3 Solid and liquid wastes

Solid and liquid wastes are divided into the following waste streams; general rubbish, steel, hydrocarbon waste (liquid and solid), com-mingled recyclables and cardboard. The quantity of each of these streams produced during the reporting period is shown in Table 2.

Table 2. Solid and liquid waste generated from the MRWF during the reporting period

Waste Stream	Quantity
General rubbish (m^3)	23
Steel (tonne)	0.5
Hydrocarbon Liquid (L)	0
Hydrocarbon solid (m^3)	15
Co-mingled recyclables (m^3)	4
Cardboard (m^3)	15

4.4 Non-trivial environmental incidents

There were five non-trivial environmental incidents identified at the MRWF during the 2017-18 reporting period. These incidents were:

1. Wedge-tailed eagle collision, September 2017
2. Wedge-tailed eagle collision, October 2017
3. Injured Wedge-tailed eagle identified, turbine collision yet to be confirmed, February 2018
4. Wedge-tailed eagle collision, March 2018
5. Wedge-tailed eagle collision, April 2018

Other bird and bat collisions were recorded as incidents during the reporting period and managed according to the EPN and the approved Bird and Bat Mortality Monitoring Plan (see section 7.4.1) and the equivalent DoEE approved plan. Other 'trivial' environmental incidents were documented and managed by WNH.

4.4.1 Incident follow-up, mitigation and preventative measures

The wedge-tailed eagle incidents were managed according to the requirements outlined in the EPN and other approved management plans for the reporting of threatened species. Reporting of the incidents occurred within the required time frames. Corrective actions and offsets are required (see Sections 7.3 and 8.2.3).

A number of additional actions were undertaken following the identification of the injured eagle in February 2018:

- A thorough and complete assessment of the injured eagle was undertaken by an experienced specialist. The assessment identified the eagle had no left wing tip and therefore could not be rehabilitated for return to the wild. The eagle was otherwise in excellent condition and was allocated to a suitable facility.
- A detailed investigation was conducted and a report written to capture all the information that could be identified that related to the incident. This report included site investigations, weather analyses, specialist advice and assessments, and analyses of previous collision data.
- A wing tip was identified 2 months later approximately 1.8km (in vegetation near wind turbine A02) from where the injured eagle was identified in February. The wing tip was assessed against the injured bird and both appeared well matched (plumage similarities, correct wing part assemblage, primary feather measurements match). A molecular genetic analysis was being conducted at the time of writing (September 2018) in order to confirm relatedness of the wing tip to the injured bird.

As a broad response to the number of eagle mortalities in the reporting period and from a cumulative perceptive, the EPA and Woolnoth agreed on conducting an Eagle Impact Review (EIR) to assist in determining whether the wind farm mortalities are impacting on the local wedge-tailed eagle populations in the Musselroe/Cape Portland region. The EIR is discussed in section 5.1.

Woolnorth continue to review technologies that may assist in the mitigation of eagle mortalities at its wind farms. An update is included in this report, Section 5.4.

4.4.2 Non-compliance

During the reporting period there were no non-compliances identified with the EPN or other approval conditions. Internal and external audits conducted during the reporting period evaluated and examined compliance with EPN and other approval conditions with the objective of validating compliance. The external audit (December 2017) was conducted specifically against the ISO 14001 standard and the site remains certified to this standard.

4.5 Monitoring data and record keeping

Monitoring and records of various parameters and activities are maintained by MRWF. These include (but are not limited to):

- Energy consumption and generation.

- Waste (including movements and disposal of controlled waste).
- Audits and emergency exercises.
- Incidents and non-compliances.
- Chemical inventory.
- Training and competencies (including inductions).
- Database of EPN and Approval conditions.
- Weed management activities.
- Records of wind turbine and monitoring tower bird mortality survey effort.
- Records of any dead birds found on the land (as defined in EPN 8657/2).

4.6 Identification of breaches of limits

There were no breaches of limits identified during the reporting period.

5. Other Environmental Actions and Issues

5.1 Eagle management

Wedge-tailed eagle mortalities at MRWF are recognised by WNH as a significant issue and concern. Woolnorth, as an experienced wind farm operator, understands the complexity of the issue, the difficulties in understanding it and the various aspects and pitfalls of trying to establish mitigation solutions that have, or are likely to have, tangible and success outcomes. Various technologies and mitigation options have been tested or implemented by Woolnorth and the previous owners of Bluff Point and Studland Bay Wind Farms. Several workshops were held with Department of Primary Industries, Parks, Water and Environment (DPIPWE - EPA and Policy, Conservation and Assessment Branch) to evaluate all possible options. The joint and collaborative evaluation didn't establish any new concepts to pursue or significant gaps where further information is required or can be readily obtained.

A number of measures remained in place throughout the reporting period such as promptly removing animal carcasses from the landscape and monitoring of stock including increased monitoring during periods of calving.

Several other measures have been developed or implemented during this reporting period as summarised below.

5.1.1 Eagle Impact Review (EIR)

The EPA and Woolnorth agreed on conducting an EIR to assist in determining whether the wind farm mortalities are impacting on the local wedge-tailed eagle populations in the Musselroe/Cape Portland region. Woolnorth proposed five projects to provide streams of information to assist and the EPA endorsed these projects. See Table 3 for a summary of the EIR projects.

We highlight that some of the projects are collecting data/metrics that could, however, be considerably impacted by other landscape influences for which we cannot measure or fully understand. Therefore our ability to clearly and unequivocally determine the impact of wind farm eagle mortalities will be difficult.

Table 3. Eagle impact review projects and status

Project title and description	Status at the end of the reporting period
Eagle observation study – single study A repeat of the two eagle movement studies conducted at the site. See Section 7.1.3 for summary of previous study. The study will contribute to the EIR by determining a current rate of utilisation for comparison with previous periods of observation (and corresponding rates of utilisation).	Observations had been completed and the field data being compiled and digitised for further analysis. A final report had not yet been finalised. A summary is included in Section 5.1.2 below.
Where, where, wedgie (http://naturetrackers.com.au/**) – multi-year study** *Where, where, wedgie* is a state-wide eagle observation study. WNH participated in the study by placing observers in the Musselroe/Gladstone regions to collect eagle data. This study will contribute to the EIR by providing data for a regional level comparison of eagle data (e.g. count of observations, count of individuals) collected in the Musselroe/Gladstone Region with other regions in Tasmania.	Observations were completed in May 2018. Data was being complied by the project team, no separate analysis had commenced as per the EIR.
Wedge-tailed eagle nest checks – multi-year study This study will assess the nest activity and breeding success of up to 15 known eagle nest sites in an approximate 30km radius from the wind farm site. This study will contribute to the EIR by providing regional level nest activity and breeding success data for comparison with state-wide data.	All known nest sites in the study area were checked to validate whether they still existed.
Genetic assessment of collision victims and nest 'cast-off' material. – multi-year study All collision victims have been sampled for DNA. Off-cast material collected from nest sites such as excreta, feathers, egg shell, pellets can sometimes yield DNA. Using DNA finger printing the collision victims will be compared with DNA extracted from 'off-cast' material. This study will contribute to the EIR by providing details on the origin of the collision victims (e.g. local vs itinerant).	Nest sites determined, some nest off-cast material collected from nest sites and stored. Confirmed study with UTAS (university of Tasmania)
Assessment of individuals through remote stations on the wind farm. Following the techniques of Driscoll and Koronkiewiscz (2016), cameras located at fixed stations will be used to collect basic eagle characteristics (count, species, age, time of day) and possibly identify individuals based on plumage or other unique features. This study will contribute to the EIR by providing site level data on the age and number of individuals using the wind farm site. If successful, off site installations may provide a comparative data set.	The camera systems were designed, procured and trial units deployed on the wind farm site. See Figure 3.

Figure 3. Top left - a camera station installed on the Southern boundary of the wind farm site, Top right - an image collected from the same camera station, Bottom - is the second wind farm based camera station located near the Little Musselroe River.

5.1.2 Eagle observation study summary

A final report on the Eagle Observation Study conducted in April/May 2018 had not been completed at the end of the 2017/18 reporting period. The data assessment was still being conducted. A short summary of the study and preliminary results is included below:

Objectives
The eagle avoidance study has the following core objectives:

1. Determine if the current site utilisation areas are similar/ or the same to that documented by the previous eagle flight path studies.
2. Determine if eagle flight metrics measured are similar to previous observational studies.
3. Determine how many at-risk flights occur and their frequency (to warrant an immediate or future deployment of a method of shutdown).

4. Determine if there are any new or current turbine operational or environmental factors that affect the eagle avoidance rate.
5. To evaluate the effectiveness and practicality of a 4 observer approach (the previous study used 2 observers at paired locations).

Methods
There have been two eagle flight observation studies conducted at the MRWF (described in Hull and Muir 2013, one unpublished). Both studies used 8 observation locations across the wind farm site. The last survey conducted in 2016/17 used two observers at paired locations. This study used 4 observer locations with all observers observing simultaneously. The 4 locations were chosen to represent the best spatial separation possible as well as providing the most optimum observation locations. Each location was surveyed evenly and observers were randomly distributed to an observation location for each observation session. An observation session lasted 100 minutes with up to 4 sessions per day. All observers were in radio communication and a lead observer defined to start and end of an observation session. A dedicated observation sheet and maps were used to document WTE and WBSE flights and associated data. The length of study was fixed at 20 observation days to ensure a similar survey effort to the previous two studies. The study was conducted over a four week period, commencing in late April 2018 and running until mid-May 2018.

Summary of results
- 67 (approximately 100 minute surveys) were conducted, a total of 449 observer hours.
- 357 WTE and 54 WBSE flights were observed. This compares with 287 WTE and 29 WBSE flights recorded in the 2016/17 study.
- No significant changes detected in flight distribution across the day or in fight duration.
- The detection rate of the 4 observer method is considered better.
- There is no evidence that the activity rate on site has altered significantly.
- There is no evidence that the rate of risk flights has altered.

5.1.3 Workshop to assess site opportunities

A site based workshop was undertaken by Woolnorth in June 2018 to evaluate potential options that could be implemented to reduce eagle collisions. The workshop focussed on identifying opportunities for modifying eagle behaviours on the wind farm site such as the installation of tall perches to provide additional opportunities for birds to perch (rather than fly). Four possible opportunities were identified for further discussion internally and with the EPA. None of the opportunities had been implemented at the end of the reporting period.

5.1.4 Noise deterrent trials

Noise deterrents have been trialled ineffectively at Bluff Point and Studand Bay Wind Farms. This initially included a vineyard type PA (personal announcement) scaring system and later a military grade device (Long Range Acoustic Device or LRAD, see www.lradx.com/).

Despite previous conclusions that noise deterrents were not effective, a trial of currently available technologies (upgraded from the first trial) was considered worthwhile. During the reporting period a HyperSpike HS-10 (https://www.ultra-hyperspike.com/HS-10) was trialled on site and arrangements to bring the most powerful unit to site were also made. At the time of writing, the HyperSpike HS-18 (https://www.ultra-hyperspike.com/HS-18-Acoustic-Hailing-

Device) is being trialled on site. The site trials of the HS-10 determined this device was not an effective or reliable deterrent device.

5.1.5 Eagle nests at MRWF

No new nests were identified during this reporting period. Observations of the existing nests on the property found that the WBSE nest (#2323) was active throughout the breeding season. WTEs were observed sitting on both nest #2322 and #2466 in November 2017 but both nests appeared unoccupied during late December checks. Two other previously inactive nests on the property were also checked but no changes to the nest structures were observed and therefore these nests determined inactive.

Figure 4. WTE observed during the last breeding period (November 2017) at nest #2466 on the eastern part of the wind farm.

Prior to the 2018/19 breeding season nest access restrictions commencing, a trial of small (mobile network enabled) wildlife cameras commenced to monitor nest activity at selected nests onsite. Some pre-breeding activity was observed at the selected nest sites and monitoring will continue throughout the breeding season.

5.1.6 Technological investigations

WNH continued to monitor technological advances and strategies being used at wind farms around the world to monitor effects on birds and bats, and mitigation strategies to reduce impacts. A clear focul area for WNH are strategies to understand and mitigate eagle collisions.

During the early part of the 2017/18 reporting period a meeting was held with Western Advance to gain an update on a number of developing technologies including the Robin Radar systems, laser dazzlers (hazing device), Identiflight (detection device) and smart balloons (detection device).

In late 2017 an eagle collision mitigation workshop (Musselroe Wind Farm focus) was conducted by WNH in conjunction with DPIPWE staff. The workshop explored the technological options available but also other novel ideas. The workshop output provided some guidance on areas where continued development or monitoring of certain technologies

remains valid whilst also provided direction on those approaches that have little to no merit (for one or many reasons).

Of the literature reviewed throughout the reporting period the most useful summary of current research and relevant information was published by the National Wind Coordinating Collaborative (NWCC) and the American Wind Wildlife Institute (AWWI). The publication was the Proceedings of the Xl Wind and Wildlife Research Meeting held in November 2016. Meeting information is available at All meeting details, and the proceedings were published mid-2017 and are available at meeting proceedings.

The Proceedings summarise several developing advanced technologies to minimising impacts however the two discussed of relevance to minimising eagle impacts were papers on IdentiFlight and DT Bird. Websites for these technologies are included below and the website content contains considerably more information than what is contained in the proceedings. There were also number of papers on innovative approaches to obtaining supportive information about eagle impacts such as innovative survey methods and methods of determining the size of local eagle populations and identifying individuals.

Another general publication of interest published in 2017 (also published by NCC/AWWI) was '*Wind Turbine Interactions with Wildlife and Their Habitats'*. The publication is not specific to technologies or eagles. It is available at the following link Wind turbine interactions with wildlife and their habitats June 2017.

In April 2018, Woolnorth commenced detailed evaluations of the available technologies. Woolnorth concluded that three technology providers - Robin Radar, DT Bird and IdentiFlight were the only technologies currently on the market with any potential to mitigate or reduce eagle mortalities at MRWF (see web links below). Discussions and further evaluation of these technologies continued during the reporting period. The evaluation process has been focussed on establishing whether these technologies would provide a reliable and effective mitigation solution based on the available performance characteristics of each system. Also key to the evaluation is whether the technologies can be feasibly and practically installed at MRWF or whether there are significant gaps or technical issues to overcome or resolve. By the end of the reporting period, it was clear that none of the technologies could be implemented at MRWF with a high level of confidence/low risk of failure and without significant site works (either technical or physical works). Woolnorth are committed to continuing the evaluation of these technologies in order to resolve the current practical and technical considerations identified.

- Robin Radar
  www.robinradar.com/
- IdentiFlight camera systems
  www.res-group.com/en/services-products/identiflight/
- DT Bird
  www.dtbird.com/

In addition, WNH will continue to monitor research projects, relevant literature and outputs from organisations such as the NREL, AWWI and NWCC for new information. The Xll Wind and Wildlife Research Meeting is due to be held in 2018.

5.2 Other actions and issues

The road kill removal program (along the Cape Portland Road), trialled and developed in recent years, was again implemented in the 2017/18 reporting period. The project was initiated due to a number of WTE being killed in the area as a result of vehicle collisions and numerous observation of WTE feeding on road kill. Woolnorth are not aware of any WTE mortalities on Cape Portland Rd during the reporting period.

The program involves a dedicated technician (whilst travelling to and from MRWF) relocating road kill to safer area such as the non-road side of an adjacent farm fence or to the edge of the bush line. Fifty to 70 carcasses are typically removed each month, some of which are observed to have eagles feeding on them at the time of discovery.

In addition to the focus being placed on local eagle population management, a number of collaborative relationships have been developed with organisations such as the Save the Tasmanian Devil Program, Wombats Rescue Tasmania, Threatened Species Unit (Flora), Tasmanian Museum and Art Gallery and DPIPWE officers studying feral cats, forester kangaroos and wombats. In all cases WNH supports these agencies and organisations by facilitating land access, through to in-kind and financial support. In the case of the devil program, WNH donated $10,000 towards the purchase of numerous virtual fencing units for the protection of released tumour free devils against road collisions. The units were initially deployed for the Mt William/Wukalina release near MRWF but the devil program have relocated the units to the Circular Head area to assist with collision management around Woolnorth.

6. Environmental Management Plans

All necessary Environmental Management Plans (EMPs) for MRWF were prepared and approved prior to commissioning of the wind farm, as required by the approval conditions, permit and/or EPN. As highlighted above (section 4.2) in November 2016, the suite of State environmental management plans for the project were reviewed, consolidated into a single Plan (‘State Environmental Management Plan 2016’) and submitted for approval. The Plan was approved by the EPA in July 2017. The review and consolidation of the Plans, primarily focussed on removing the information and commitments relating to the planning, construction and commissioning phases of the wind farm which are/were no longer relevant.

Also relevant is the Bird Utilisation, Behaviour and Mortality Monitoring Plan which was submitted and re-approved by DoEE during the reporting period. The Plan was primarily amended to reflect the changes made in the State Environmental Management Plan 2016 (Section 7.4, Bird and Bat Mortality Monitoring Plan).

The following table (Table 3) summarises the relevant management plans and their details (the current Departmental names are used).

Table 3. Status of State Environmental Management Plans for the MRWF.

Environmental Management Plan and relevant permit condition	Authority	Years of Approval/ Review	Status	Reporting required in AER?*
Wader Monitoring Plan	EPA	2008, 2016**	Active, but all requirements completed	Yes
Fauna Monitoring Report	EPA	2007	Requirement completed	No
Avian Collision mitigation Report (Transline)	EPA	2007	Requirement completed	No
Schayer's Grasshopper surveys	EPA	2007	Requirement completed	No
Construction Rehabilitation Plan	EPA	2008	Requirements completed	No
Weed and Disease Management Plan	EPA	2008, 2016**	Active	Yes
Construction Solid Waste Management Plan	EPA	2009	Requirements completed	No, internal auditing
Hazardous Materials Management Plan	EPA	2009, 2016**	Active	No, internal auditing
Eagle Impact Offset Plan	EPA	2008, 2016**	Active	Yes
(Wind Farm) Vegetation Management Plan	EPA	2008, 2016**	Active	No, general comments included
Transmission Line Vegetation Management Plan	EPA	2008, 2016**	Active	No, general comments included
Wind Monitoring Tower Avifauna Management Plan	EPA	2012	Requirements completed	No
Bird and Bat Mortality Monitoring Plan	EPA	2011, 2016**	Active	Yes
Final Wind Farm Design Report	EPA	2012	Requirements completed	No
Final Transmissions Line Design Report	EPA	2012	Requirements completed	No
Construction and/or Operational Environmental Management Plan	Internal	Not Required	Active	Internally approved

** Plans reviewed and consolidated to ***State Environmental Management Plan 2016***

Table 3 (cont). Status of Commonwealth Environmental Management Plans for the MRWF.

Environmental Management Plan and relevant permit condition	Authority	Years of Approval/ Review	Status	Reporting required in AER?*
CEM2 Turbine 6 Migratory Bird Impact Mitigation Plan	DoEE	Not approved	Not Required	Turbine 6 on Tank Hill was not built
CEM3 Wind Farm Listed Species Impact Mitigation Plan#	DoEE	2012	Active	No, summary and general comments included (some monitoring is reported as part of the Bird behaviour, Utilisation and mortality Monitoring Plan)
CEM4 Bird Utilisation, Behaviour and Mortality Monitoring Plan#	DoEE	2017	Active	Yes
CEM5 Transmission Line Listed Species Impact Mitigation Plan#	DoEE	2009	Active	No, general comments included.
CEM6 Wedge-tailed Eagle Impact Offset Plan#	DoEE	2009	Active	No, general comments included

#compliance reporting is also conducted in accordance with Condition 7 of the EPBC Approval, e.g. "On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with".

In summary, the following Sections of the State Environmental Management Plan 2016 require reporting are:

- Wader Monitoring Plan.
- Weed and Disease Management Plan.
- Eagle Impact Offset Plan (a consolidated version of the Wedge-tailed Eagle Impact Offset Plan and the White-bellied Sea Eagle Impact Offset Plan).
- Bird and Bat Mortality Monitoring Plan.

Relevant aspects of the Commonwealth Bird Utilisation, Behaviour and Mortality Monitoring Plan are also reported in this AER.

All of the above are reported in Sections 7 and 8 of this report.

Summary and general comments for the following plans are provided section 7 of this report:

- (State) Wind Farm Vegetation Management Plan.
- (State) Transmission Line Vegetation Management Plan.
- (Commonwealth) Wind Farm Listed Species Impact Mitigation Plan.
- (Commonwealth) Transmission Line Listed Species Impact Mitigation Plan.
- (Commonwealth) Wedge-tailed Eagle Impact Offset Plan.

7. State Environmental Management Plan

7.1 Wader Monitoring Plan

7.1.1 Bird Utilisation studies

The required post construction bird utilisation surveys have been completed. A summary of the results was included in the 2016/17 AER and also reported separately to the EPA and the DoEE.

7.1.2 Crepuscular and nocturnal movements

Monitoring of bird and bat collisions (see Section 7.4.1) has not detected a significant impact to priority species (or any species) known to be crepuscular or nocturnal in behaviour, hence no action has been required.

7.1.3 Avoidance behaviour around turbines

The previous AER (2016/17) provided a summary of the findings of the eagle avoidance study. This report can be found at MRWF AER 2016/17. The final report on the study was complete during the reporting period and provided to both the EPA and DoEE. A summary of the final report is provided below.

The objectives of the study as described in the Wader Monitoring Plan are to:

1. Attempt to quantify the avoidance rate of eagles (or if possible other priority species) at the MRWF.
2. Compare the avoidance rates of eagles at MRWF with those obtained for the Bluff Point and Studland Bay Wind Farms.
3. Determine if there are any turbine operational or environmental factors that affect the eagle avoidance rates.
4. Determine if the current site utilisation areas are similar/or the same to that documented by the previous eagle flight path study.

The study collected data over 10 days in each of the 4 season, commencing in autumn 2016 and finishing in summer 2016/17. The study utilised methods and observation locations consistent with the pre-construction study however learnings from the 'observer effects' study conducted at Bluff Point (BPWF) and Studland Bay (SBWF) wind farms were incorporated to lessen observer fatigue and associated issues. The study consisted of approximately 240 hours of daylight observations (60 session/10 days/season). The study was focussed on collecting eagle movement information however other species of birds were document.

In summary the study returned the following findings:

- 287 wedge-tailed eagle (WTE) flights, 29 white-bellied sea eagle (WBSE) flights.
- By comparison slightly less WTE flights, but considerably more WBSE flights were observed in the pre-construction surveys. It is not clear why less WBSE were observed in the post construction surveys.

- Large fluctuations from month to month in numbers of WTE flights with WBSE flights being more constant (and obviously less frequent).
- Average flight time of 8 minutes.
- Digitised flight paths demonstrate clear and obvious avoidance of turbine infrastructure.
- Changes apparent in zones of higher utilisation from pre- to post-construction surveys, the reasons remain unclear however seasonal and environmental variables (e.g. nests being used, wind influences) are likely contributors.
- There were no daily patterns observed in the data (e.g. periods of higher utilisation) and because of the lack of variation in the weather data (combined with low flight counts) no assessment could be made of the influence of such factors.
- Over 400 flights were counted for other species of birds during the study however no interpretation of the data was completed beyond extracting the number of flights counted. Only flights within 200m of a turbine were counted.
- There is an apparent and discernible difference in the density of flights close to turbines (out to roughly 90m) in the post-construction data. There is also a discernible difference in the density of flights further away from turbines. Both these findings indicate a positive avoidance behaviour.
- Following the avoidance analysis technique developed from similar data collected at BPWF, SBWF and MRWF (pre-construction control), an effective avoidance rate (EAR) was calculated for WTEs – 86.6%. This compares with the SBWF EAR of 81.3% and the BPWF EAR of 90.3%.
- A comparison between the MRWF EAR and the BPWF EAR/SBWF EAR (separately) revealed no significant differences.
- Similar to BPWF and SBWF, the MRWF post-construction data suggested a localised alienation affect with WTEs demonstrating a preference to fly in areas where no turbines were sited (between turbines). This is despite the fact that pre- and post-construction data displayed similar utilisation rates at the whole-site level.

With respect to the objectives of the study:

1. **Attempt to quantify the avoidance rate of eagles (or if possible other priority species) at the MRWF.**

   The EAR for the WTE was quantified as 86.6%, significantly higher than the pre-construction avoidance rate of 0.9%. Avoidance rates for other species could not be determined due to the lack of data.

2. **Compare the avoidance rates of eagles at MRWF with those obtained for the Bluff Point and Studland Bay Wind Farms.**

   The avoidance rate quantified at MRWF for WTEs is not significantly different to EARs calculated from similar studies at BPWF and SBWF. A broader confidence interval exists for the MRWF EAR (compared to BPWF and SBWF) as an artefact of the low number of flight counts.

3. **Determine if there are any turbine operational or environmental factors that affect the eagle avoidance rates**.

   Low flight counts coupled with a lack of variability in weather over the observation periods prevented modelling to determine if any environmental factors affected the EAR.

4. **Determine if the current site utilisation areas are similar/or the same to that documented by the previous eagle flight path study.**

   The current utilisation areas are visually different from the pre-construction utilisation areas. (see figure 6 and 7 of Attachment 1). Key difference include:

   - An obvious lower level of WBSE utilisation in the post-construction period.
   - The WTE flights observed during the pre-construction surveys visually show three areas of higher utilisation. In comparison the post-construction observations visually show are areas preferential utilisation but overall the utilisation is more dispersed.
   - The strong north-west utilisation area (around Charmouth Hill) that was observed during pre-construction remains evident but potentially at a lower level of utilisation.
   - The area of higher utilisation observed toward the centre of the southern property boundary of the property appears to have reduced.
   - The area of utilisation around the most south-eastern nest site appears to have strengthened. It is difficult to determine why this has occurred but it could be because of the nest site (present now but previously unknown) and/or the difference in the time of year of the observations.
   - A greater level of utilisation was observed in the post-construction surveys towards the central region and eastern region of the site. It is unclear why these differences are notable but it is possible they result from the presence and activity status of the nesting sites these areas.

7.2 Weed and Disease Management Plan.

7.2.1 Operational Phase Commitments

All areas of disturbance associated with the construction footprint are regularly surveyed for the existence of weeds. From time to time there have been small outbreaks of listed weeds (namely gorse), as a result of construction activities, within the wind farm footprint. These have been targeted rapidly once identified and will continue to be monitored. In addition, routine road and hardstand maintenance through the reporting period has included herbicide treatment to remove unwanted weeds and grasses.

Sections of the transmission line corridor are managed for thistles and various other weed species through chemical application and mechanical removal. Transmission line weed populations are best described as localised with small numbers of individual plants. Monitoring of the transmission line for various issues, including weeds, is ongoing and conducted on a regular/ annual basis.

7.2.2 Controlling the spread of weeds

Now that the wind farm and transmission line are in an operational phase, the majority of works undertaken on either the wind farm or on the transmission line infrastructure are accessed via formed, all weather roads. Therefore there are no significant controls required to manage the spread of weeds and soil borne diseases. The exception to this are weed management works, vegetation management works and bird mortality surveys, where off-road access is required. Standard wash-down guidelines, as per the *Tasmanian Wash-down Guidelines*, and internal environmental management procedures are applied to these tasks where required.

Weed management works across the property have continued during the reporting period (outside of the construction and operational footprint). Works have continued to focus of African boxthorn and gorse, with the long term view to eradicate or significantly reduce the extent of both noxious weed species. A property based weed management plan is being followed to manage the approach. Recent works have included the finalisation of treatment of all known stands of boxthorn and gorse within the Cape Portland Wildlife Sanctuary (CPWS - to the west of the site). CPWS weed management activities were directed by Officers of NRM North (Natural Resource Management - North) in close consultation with WNH. Weed monitoring activities will continue to be undertaken and treated if any re-emergence of these weeds occurs.

7.3 Eagle Impact Offset Plan

All initial actions outlined in this Plan (relating to both wedge-tailed eagles and white-bellied sea eagles) have been completed. This includes the nest protection program and the study into the effectiveness of nest protection management prescriptions. The objectives and outcomes of these actions are detailed in the MRWF Public Environment Report 2013. The plan remains active for the purpose of providing guidelines for offsetting eagle collisions (specifically nest protection projects).

Since the commissioning of the wind farm through to the end of the current reporting period, eleven wedge-tailed eagles and one white-bellied sea eagle had been identified as turbine collision victims. The 'base' offsets that were required in accordance with the initial state and commonwealth WTE Offset Plans were designed to mitigate the impacts of 6 WTE mortalities. WBSE offsets to mitigate the impacts of 3 mortalities were also required pursuant to the State permit conditions.

The revised Eagle Impact Offset Plan (included in the revised and approved State Environmental Management Plan, 2016) committed to maintaining the offset arrangements inherent in the original approval of one offset for each mortality. The offset prescribed, either the protection of one eagle nest site (and surrounding habitat) through a conservation covenant, or an alternative project approved by the Director (EPA).

With respect to the EPBC Approval obligations for WTE mortalities over the 'base' offset of 6, these requirements are outlined in the BUBMMP as 'corrective actions'. According to the Plan, the corrective action required for mortalities over the original 'base' (or at a higher rate than anticipated) is the protection of two eagle nest sites (and surrounding habitat) through a conservation covenant, or an alternative project approved by the DoEE. This therefore means that the obligations of the EPBC Approval resulting from a WTE mortality are significantly greater than those specified in the State Environmental Management Plan, 2016.

The following projects/actions have been completed or are currently being implemented to fulfil MRWF's offset/corrective action obligations:

- Protection of 2 nest sites
- Financial contribution, equivalent value to 2 nest sites, to UTAS eagle research project
- Financial contribution, equivalent value to 2 nest sites, to Bookend Trust/Nature Trackers citizen science project 'Where, where, Wedgie?"
- Protection of 1 nest site currently in progress

- Proposal currently before EPA/DPIPWE for approval, equivalent value of 2 nest sites (to determined)

As there has only been one WBSE mortality recorded, no further offset actions have been required.

7.4 Bird and Bat Mortality Monitoring Plan

7.4.1 Operational Phase Wind Turbine Mortality Monitoring

As outlined in Section 4.2 of this report, during the reporting period the monitoring regime for detecting bird and bat collisions with the wind turbines was modified. The initial regime required more intensive surveys to detect migratory wader birds in the North-West Wader Zone (NWWZ, which comprises turbines A10-A14). All other turbines were assigned to one of four groups, and one group was surveyed fortnightly. Following a significant review of the bird mortality data in mid-2016, following 3 years of monitoring, only one (non-priority or migratory) wader bird had been detected and documented in the bird and bat collision record. On this basis, a new regime was proposed and approved, removing the obligation to undertake the intensive NWWZ surveys. The NWWZ turbines were randomly assigned to one of the four existing groups and the existing fortnightly survey schedule continued with each group being survey every 8 weeks (as per the previous survey methodology).

During the 2017/18 reporting period there were 462 unique formal turbine surveys undertaken. The majority of carcasses detected were identified as part of the formal monitoring program, however, some were also identified outside the formal monitoring program by personnel working on site.

In total, 28 carcasses or feather spots (finds) were found in formal surveys, equalling a find at 6.1% of surveys (Table 5). 433 surveys were conducted where nothing was identified. The number of finds during the 2017/18 reporting period are generally comparable to previous years, see Table 4 below.

Table 4. Summaries of finds across all survey years

Year	Dead bat	Dead bird	Feather Spot
13/14	2	26	4
14/15	1	28	4
15/16	1	33	5
16/17	0	21	5
17/18	0	23	5

10 carcasses or feather spots and one injured bird was identified outside of the formal surveys. No bats were observed in this reporting period. Table 5 below summarises the species identified during formal surveys and Table 6 summarises the species identified outside of formal surveys.

Table 5. Species identified during formal bird mortality surveys during the 2017/18 reporting period.

Common name	Number found
Australian Pelican	9
Unknown	5
White-faced Storm Petrel	4
Wedge-tailed Eagle	3
Brown Falcon	3
Cape Barren Goose	2
Forest Raven	1
Eastern Great Egret#	1

*A native hen (flightless bird) was also detected during formal surveys.
Found 173m from the closest WTG, next to farm fence

Table 5. Species identified outside of the formal bird mortality surveys during the 2017/18 reporting period.

Common name	Number found
Australian Pelican	5
Wedge-tailed Eagle	1
Short-tailed Shearwater	1
Silver Gull	1
White-faced Heron*	1
White-faced Storm Petrel	1

*Found 165m from the closest WTG next to/in farm fence

One injured WTE was also identified outside of formal surveys, however it was difficult to determine if the injuries resulted from a turbine collision. Further information on the injured WTE is provided in Section 4.4.1.

In addition to these records, there were a number of records identified within close proximity to the transmission line:

- One musk duck, two cape barren geese, one pacific gull, one black swan and one Australian pelican.

Generally speaking, species identified (through formal and informal methods) during the 2017/18 reporting period are similar to previous reporting periods. One species that had not been identified previously is the White-faced Storm Petrel. The species was also not recorded in the pre or post construction bird utilisation surveys conducted at the site. The species is known to breed in colonies on several small, remote Furneaux islands but is otherwise strictly pelagic. It is only known to be observed on coastal fringes or headlands when forced by poor

weather. Poor weather (but not extreme) was recorded around the time many of the petrels were identified, suggesting weather may have played a role in these finds.

An assessment of the expected number of finds per turbine circuit was also conducted for both the new and old survey methodologies. The assessment concluded (under both survey methodologies) that there is no discernible difference in the expected number of finds across the 4 turbine circuits and therefore no specific turbine circuit presents a discernibly greater collision risk.

Reporting

All birds and bats detected in the monitoring (formal and informal finds) were reported as required in the Plan, by:

- Any birds and bats listed under the Threated Species Protection Act were reported to the Director of the EPA by telephone within 24 hours of their discovery, and to the EPA Project Officer by email or telephone within 24 hours of their discovery.
- A Bird/Bat Strike Report Form was submitted to the Director within three days of discovery of a dead or injured threatened species.
- Any dead or injured EPBC listed bird species listed were reported to the Commonwealth DoEE within seven days of discovery.

7.5 Wind Farm Vegetation Management Plan

Beyond the initial clearing of the site for construction of the wind farm no additional clearing has been necessary. From time to time, some vegetation slashing for the purposes of property level fire management is undertaken, however none was conducted during the 2017/18 reporting period. The rehabilitation of disturbed areas has been successful.

7.6 Transmission Line Vegetation Management Plan

Similarly to the wind farm, no further clearing of vegetation has been required in the transmission line easement during the 2017/18 reporting period. A ‘cut and paint’ program to remove individual coppicing Eucalypt saplings (<2m) was completed in various parts of the easement. The program was completed by a small work party using hand-based tools and equipment.

8. Commonwealth Environmental Management Plans

8.1 Wind Farm Listed Species Impact Mitigation Plan

This Plan covers requirements relating to mitigating impacts on the habitats of listed migratory birds and listed threatened species during construction and maintenance of the wind farm (condition CEM3). There are no specific reporting requirements for the Plan beyond the requirements of Condition 7 of the EPBC Approval (“*On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the*

conditions of this Approval have been complied with"). The only relevant information to report is included below:

- Bird and Bat collisions with turbines, identified during the reporting period, are summarised in Section 7.4.1 of this report.
- Discussion of activities relating to soil, vegetation and weed management are reported in Section 7 above.
- No new WTE nests were identified on or close to the wind farm site during the 2017/18 reporting period but section 5.1.5 describes wind farm nests.

8.2 Bird Utilisation Behaviour and Mortality Monitoring Plan

This Plan covers requirements relating to the monitoring of utilisation, behaviour and mortality of Commonwealth listed threatened and migratory bird species at the MRWF site (condition CEM4). The sections of the Plan that require reporting (beyond the requirements of Condition 7 of the EPBC Approval "*On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with")*, are detailed below. The Plan was re-approved in September 2017, following a long review. The only noteworthy change was the removal of the intensive surveys of the NWWZ (as described above in Section 7 of this report).

8.2.1 Bird utilisation and behaviour surveys

The post-commissioning bird utilisation surveys have been completed and a summary included in the 2016/17 AER.

8.2.2 Mortality surveys for listed birds

A general summary of the mortality surveys conducted during the reporting period is included in Section 7.4.14.1. Four WTEs moralities and one injured WTE were identified during the reporting period, representing the only EPBC listed species found. These incidents and any follow up investigation were reported to the DoEE in the manner required by the Plan.

One injured WTE was also identified outside of formal surveys, however it was difficult to determine if the injuries resulted from a turbine collision. Further information on the injured WTE is provided in Section 4.4.1.

8.2.3 Management Responses and mitigation

A component of this plan is to outline the corrective action (offset) obligations associated with any wind turbine related mortality impacts on Commonwealth listed species. Since the commissioning of the wind farm, the WTE has been the only Commonwealth listed species identified through the mortality monitoring program. Two WTEs collisions were recorded in 2013 and 2014, however this number of collisions remained under the threshold for corrective actions on the basis that offsets had already been completed for these impacts. Nine WTE mortalities have been recorded through to the end of the current reporting period, and this number represents an exceedance and activation of the 'Level 1' corrective actions (described further below and specified in the Plan). The Level 1 corrective action required, for each mortality, is the protection of two WTE nest sites or an approved alternative action.

At the completion of the reporting period the following projects/actions have been completed or are currently being implemented to fulfil MRWF's offset/corrective action obligations:

- Protection of 2 nest sites
- Financial contribution, equivalent value to 2 nest sites, to UTAS eagle research project
- Financial contribution, equivalent value to 2 nest sites, to Bookend Trust/Nature Trackers citizen science project 'Where, where, Wedgie?"
- Protection of 1 nest site currently in progress
- Proposal currently before EPA/DPIPWE/DoEE for approval, equivalent value of 2 nest sites (to determined)

8.2.4 Benchmarks

As stated above the number of collisions of WTEs has exceeded the base threshold described in the Plan. The threshold was exceeded on the basis that the rate of mortality exceeded the expected rate as well as the total number. The specific details in relation to benchmarks are outlined in Section 5.3.1 (see table on page 27) of the Plan.

8.3 Transmission Line Listed Species Impact Mitigation Plan

This Plan covers requirements relating to mitigating impacts on the habitats of listed migratory birds and listed threatened species during construction and maintenance of the Transmission Line (condition CEM5). There are no specific reporting requirements for the Plan beyond the requirements of Condition 7 of the EPBC Approval ("*On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with*"). The following information is provided to summarise activities and actions, relevant to the plan, undertaken during the reporting period.

8.3.1 Management of listed threatened fauna

The construction of the transmission line was completed in 2013 including installation of the avian collision mitigation (see the MRWF Public Environment Report 2010-13).

No spotted-tailed quoll or Tasmanian devil den sites, or new active WTE nests have been located. Therefore no action has been required.

8.3.2 Avian collision and electrocution mitigation

All avian collision mitigation has been installed as outlined in the MRWF Public Environment Report 2010-13.

8.4 Wedge-tailed Eagle Impact Offset Plan

This Plan satisfies the requirements of condition 6 (CEM6), which requires that a Plan be prepared to offset the impacts of the proposal on WTEs. The sections of the Plan that require

reporting (beyond the requirements of Condition 7 of the EPBC Approval "*On 1 July of each year after the date of this approval, the person taking the action must provide a certificate stating that the conditions of this Approval have been complied with")*, are detailed below.

All the actions in this Plan (nest protection, aerial searches and the study into the effectiveness of nest protection management prescriptions) have been completed. Details of these studies were reported in the MRWF 2013 Public Environment Report.

9. Community consultation and communication undertaken

9.1 Environmental Management activities and meetings

A summary of environmental management activities and meetings for the reporting period is provided in Table 7.

Table 7. Summary of environmental management activities and meetings during the reporting period 2017-18

Date	Activity or meeting	Comment
Activities undertaken and outlined in the approved EMPs are outlined in the relevant sections of this report. Other management activities and meetings held in conjunction or addition to the approved EMPS are listed in this table.		
August 2017	Meeting - Western Advance	Update on latest technologies
September 2017	Meeting with Southern Rural Enterprises	Annual grazing license review
October 2017	DoEE meeting	BUBMMP review
October 2017	Workshop with EPA	Finalisation of discussions on eagle collision mitigation
November 2017	DoEE meeting	BUBMMP review
November 2017	Green Army and Dorset Council	Site Tour with emphasis on environmental management
December 2017	ISO14001 audit	External ISO 14001 audit
December 2017	University of Tasmania	Site visit and eagle nest checking for satellite tracking project
December 2017	EPA site visit to Woolnorth	General wind farm visit to discuss issues
January 2018	NRM North	On-site weed management meeting
February 2018	Threatened Species Unit	Botanical Survey
February 2018	Meeting with DPIPWE	To discuss offset projects
March 2018	EPA site visit	Familiarisation trip for new staff

May 2018	EPA meeting	Discussion on recent WTE collision
May 2018	Where, where, wedgie?	Workshop and participation in surveys

9.2 Other stakeholder activities

Table 8 below provides a summary of other stakeholder communication and educational activities undertaken in relation to the MRWF during the reporting period.

Table 8. Summary of other stakeholder communication and educational activities undertaken during the reporting period.

Event and comments	Date
Support to Scottsdale Show	June 2017
Northeast River Festival Support	October 2017
Mannalargenna Day support and wind farm tours	December 2017
School educational visit	January 2018

10. Review of the Activity over the next 12 months

The MRWF will continue to operate in the manner it currently is. The required monitoring actions will continue to be undertaken. There are no anticipated changes to the operation of the wind farm or transmission line in the next 12 months.

11. Glossary

AER	Annual Environmental Review
BUBMMP	Bird Utilisation, Behaviour and Mortality Monitoring Plan
DoEE	Commonwealth Department of Environment and Energy
DPIPWE	Department of Primary Industries, Parks, Water and Environment
EIR	Eagle Impact Review
EMP	Environmental Management Plan
EPN	Environment Protection Notice
EPA	Tasmanian Environment Protection Authority
EPBC	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPN	Environmental Protection Notice
Feather spot	A collection of ten feathers and / or three flight feathers (primaries, secondaries, tertiaries, rectrices)
MRWF	Musselroe Wind Farm
NRM North	Natural Resource Management North
UTAS	University of Tasmania
WBSE	White-bellied Sea-Eagle (*Haliaeetus leucogaster)*
WNH	Woolnorth Wind Farm Holding
WTE	Wedge-tailed Eagle (*Aquila audax fleayi)*

Plants

African boxthorn *Lycium ferocissimum*
Thistles *Carduus tenuiflorus & Silybum marianum*
Gorse *Ulex europeaus*

Birds

Australian Pelican *Pelecanus conspicillatus*
Black Swan *Cygnus atratus*
Brown Falcon *Falco berigora*
Cape Barren Goose *Cereopsis novaehollandiae*
Eastern Great Egret *Ardea alba modesta*
Forest Raven *Corvus tasmanicus*
Pacific Gull *Larus pacificus*
Short-tailed Shearwater *Ardenna tenuirostris*
Silver Gull *Larus novaehollandiae*
Wedge-tailed Eagle *Aquila audax fleayi*
White-bellied Sea-Eagle *Haliaeetus leucogaster*
White-faced Heron *Egretta novaehollandiae*

Mammals

Tasmanian devil *Sarcophilus harrisii*
Spotted tail quoll *Dasyurus maculatus*

12. References

Driscoll, D., Koronkiewicz, T. 2016. Estimating the Minimum Number of Eagles Utilizing a Site in Northern Arizona Using Trail Cameras Deployed on Bait Stations. SWCA Environmental Consultants.

Hull, C.L. and Muir, S.C. 2013. Behaviour and turbine avoidance rates of eagles at two wind farms in Tasmania, Australia. *Wildlife Society Bulletin* 37(1): 49-58.