EPBC 2018/8289 Kaban Green Power Hub - 2025 Annual Compliance Report

6 August 2025

Kaban Wind Farm Pty Ltd ACN 637 687 622 as trustee for the Kaban Wind Farm Trust

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Document Management

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Declaration of accuracy

In making this declaration, I am aware that Sections 490 and 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed	
Date	09/08/2025
Full Name	Pedro Goncalves
Position	Director
Organisation	Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust ACN 637 687 622

1 Introduction

1.1 E2M Scope of Works

E2M has prepared the fourth Annual Compliance Report (ACR) on behalf of Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust, ACN 637 687 622, for the Kaban Green Power Hub (the Project). This annual compliance report has been prepared in accordance with the requirements outlined in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) conditions of approval (EPBC 2018/8289). The objective of this report is to determine if the Project has achieved compliance with all relevant conditions.

The scope of works included reviewing the Project conditions of the latest approval (EPBC 2018/8289, 10 August 2022) and assessing compliance by reviewing documentation provided by Neoen Australia during the twelve-month period ending on 19 May 2025 (the reporting period).

1.2 Kaban Green Power Hub Status

The Kaban Green Power Hub approved action is to construct and operate a wind farm with up to 29 turbines and associated infrastructure southwest of Cairns, in Kaban, far north Queensland. A total of twenty-eight turbines were installed for this Project.

Commission/ing means the first date in which is the first date in which a turbine is installed, which occurred in August 2022.

Turbines 1 to 17 were energised and operational by January 2023. An additional ten turbines were operational by 20 May 2023, with the last (Turbine 18) becoming operational August 2023.

During this reporting period (20 May 2024-19 May 2025), the Project was operational with all 28 turbines energised.

1.3 Compliance Assessment Methods

For each condition of the approval, a decision was made to determine if the condition was ‘Open’, ‘Closed’ or ‘Not Applicable’. If the condition is ‘Open’ the compliance was rated as per the rationale outlined in Table 1.

Table 1: Compliance Scoring

Rating	Abbreviation	Rationale
Compliant	C	Demonstrated compliance with Condition
Non-compliant	NC	Not compliant with Condition
Not Applicable	N/A	Condition not activated at the time of the compliance assessment or Condition not applicable.

The scope of works was subject to several limitations, including:

- The findings of this report represent E2M’s opinion based on the information made available for review and assessment, which is assumed to be true and correct. Information provided was not independently verified.

- The scope of assessment was limited to review of:
  - the documents, images, registers provided by the Principal Contractor responsible for construction and operational activities (Vestas Australia Wind Technologies Pty Ltd)
  - documentation provided by Neoen
  - information collected during site visits by E2M that were required as part of ongoing monitoring works
- Sampling or laboratory analysis were not conducted as part of this compliance assessment.

2 E2M Compliance Assessment Results

2.1 EPBC Conditions Compliance

Assessment of the Project against the conditions of approval (EPBC 2018/8289) was conducted. As outlined in Table 2, compliance was assessed for a total of 42 conditions. Of these, a total of 18 were not applicable as the stage of the project had not yet activated response to conditions or the condition has previously been met and closed.

The results of the compliance assessment are included in Table 3, with supporting information provided in the Appendices.

Table 2: Summary of Compliance Results

Total Conditions	Total Non-applicable conditions	Total Applicable Conditions	# Compliant	# Non-compliant	% Compliant
42	18	24	41	1	97.62%

2.2 Performance Criteria Assessment

An assessment of effectiveness of the performance criteria within the Project Vegetation Management Plan (VMP) (E2M, 2020b), Fauna Management Plan (FMP) (E2M, 2020a), Bird and Bat Adaptive Management Plan (BBAMP)(E2M Pty Ltd, 2025), and Offset Area Management Plan (OAMP)(E2M Pty Ltd, 2021) is required by the EPBC Conditions of Approval. These assessments are included in Appendix A. The assessments determined that the mitigation measures have been effective in avoiding and minimising impacts of the Project upon Matters of National Environmental Significance (MNES). The following key findings for this period were noted, namely:

- **Vegetation Management Plan:** while some weed abundance targets have not been met as per the Vegetation Management Plan, a Weed Management Plan (WMP) was developed in August 2024. The WMP ensures priority weed infestations across the Project are monitored and treated, at the most appropriate times, to continually reduce the overall abundance of weeds. The WMP has been effective for weed control and total weed cover across the project has decreased from 5.55% to 2.75% from February 2024 to February 2025. Some areas of underperforming rehabilitation in the disturbance footprint have been noted throughout the Project Area (see Appendix O) and strategies to improve this are currently being discussed with relevant contractors and Neoen.
- **Fauna Management Plan:** mitigation and management measures were considered appropriate. The Kaban wind farm wildlife interaction register identifies that no fauna interactions were observed during this reporting period. No new risks were identified during this reporting period. However, the Magnificent Brood Frog (MBF) Management Plan, a sub-plan incorporating MBF monitoring requirements outlined in the FMP, is undergoing revision in conjunction with the Fire Management Plan to mitigate impacts of fire on known MBF populations within the Project Area.
- **Bird and Bat Adaptive Management Plan:** the BBAMP is currently under revision, taking into account all bird and bat data collected over an eight-year period, from baseline Bird and Bat Utilisation Surveys (BBUS) during January 2017 through to January 2025. The previous years mortality data (September 2023 to August 2024) identified a potential trigger for white-throated needletail mortalities. However,

these mortality observations were assessed against older population estimates (10,000). When compared against the most currently accepted population estimates of 41,000 individuals this would not action a trigger event. This trigger event was closed out by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), herein referred to as 'the Department', in November 2024.

- **Offset Area Management Plan:** While some offset area monitoring sites indicate an increase in weed cover, overall, there has been a significant decrease in weed biomass. Ongoing weed treatment via herbicides and ecological burns has been effective in reducing weed populations and encouraging the return of native grasses, forbs and shrubs. Ecological burns have reduced fuel loads to make offset areas less susceptible to intensive fires that can destroy large hollow-bearing trees essential for greater glider denning. Using ecological burns has been withheld around known MBF habitat, due to the potential susceptibility of MBF impacts from fire. The Fire Management Plan and MBF Management Plan are currently being revised to incorporate fire management actions within known brood frog habitat. Ten (10) greater glider nest boxes were installed in Offset Area 2 during July 2024 to increase greater glider denning opportunities. It has been recognised that site access tracks may inhibit some mobility of greater gliders throughout the Project Area. Discussions between ecologists and the approval holder representative/s are taking place to assess ways to improve greater glider mobility, such as the addition of greater glider mobility poles.

2.3 New Environmental Risks

As required by the Department's Annual Compliance Report Guidelines (DCCEEW, 2023), new environmental risks require consideration. The following new, and continued, risks have been identified:

- Continued rehabilitation targets are not being met in several locations within the disturbance footprint. Areas with inadequate ground cover are at risk of further erosion. Weed infestations are being reduced and managed across the Project but some infestations are at risk of expanding if the weed management plan is not followed.
- The watershed catchment into some MBF habitat sites has increased, subsequently increasing the water flows from the disturbance footprint discharged into impacted MBF habitat. The MBF Management Plan is currently being updated to address and monitor this.
- The wide access roads may reduce the opportunity for greater glider mobility throughout the Project Area and may possibly impact forest connectivity. Mitigation measures are currently being discussed with the approval holder.

Table 3: EPBC Conditions

No.	Condition	Active	Compliance	Evidence
	Maximum clearing limits			
1	To minimise impacts on **EPBC Act listed threatened species and communities**, the approval holder must not **clear** more than 129 hectares (ha) of habitat for **EPBC Act listed threatened species and communities** within the **project area**, including no more than: a) 95.2 ha of **Prostanthera habitat**. b) 3 ha of **Magnificent Brood Frog habitat**. c) 61.2 ha of **Greater Glider habitat**. d) 100 ha of **Northern Quoll habitat**, including no more than 5.6 ha of **Northern Quoll denning habitat**.	Open	C	No additional disturbance has occurred within this reporting period. As per the 2023 Annual Compliance Report (E2M Pty Ltd, 2023), disturbance limits were not exceeded with shapefiles/spatial assessment provided by Vestas, 23 May 2022. Refer to Appendix 2 of the 2023 Annual Compliance Report (E2M Pty Ltd, 2023) for map series depicting the total project footprint clearing and areas of habitat cleared.
	EPBC Act listed threatened and migratory species management			
2	The approval holder must implement the **Vegetation Management Plan** and **Fauna Management Plan** for the duration of this approval.	Open	C	The requirements of the VMP and FMP were implemented throughout this reporting period. A Weed Management Plan was developed to help address the management of priority weed infestations, see Appendix F.
3	The approval holder must report against each performance criterion specified in the **Vegetation Management Plan (VMP)** and **Fauna Management Plan (FMP)** and provide an evaluation of the effectiveness of the measures implemented to avoid and mitigate impacts of the action on **EPBC Act listed threatened species and communities** and **EPBC Act listed migratory species** in each annual **compliance report** required under condition 35.	Open	C	Refer to Appendix A for a report against each performance criterion included within the FMP and VMP as well as an assessment of effectiveness of these measures. A summary is included in Section 2.2.
4	To minimise **impacts** on *Prostanthera clotteniana*, the approval holder must undertake **pre-clearance surveys** of all potential **Prostanthera habitat**. The approval holder must prevent any direct or indirect impacts to any *Prostanthera clotteniana* individual.	Closed	N/A	Pre-clearance surveys were conducted in 2021 (refer to the 2022 Annual Compliance Report (E2M Pty Ltd, 2022)). No additional clearing has occurred during this reporting period.

No.	Condition	Active	Compliance	Evidence
				A review of the VMP and FMP mitigation and management measures against site practices was conducted and determined that the measures for the protection of *Prostanthera clotteniana* resulting from direct or indirect impacts are being effectively implemented.
	Turbine strike monitoring and management			
5	The approval holder must submit a Bird and Bat Adaptive Management Plan (BBAMP) for the **Minister's** approval prior to **commissioning**. The approval holder must not commence **operation** of the wind farm unless the **Minister** has approved the BBAMP in writing. The approval holder must implement the approved BBAMP throughout **operation**.	Open	C	The BBAMP was approved in writing prior to operation of the wind farm, as reported in the 2023 Annual Compliance Report (E2M Pty Ltd, 2023). The approved BBAMP was implemented for operations for the duration of this reporting period.
5A	The BBAMP must build on the **Bird and Bat Management Plan** to propose and justify methods and procedures which ensure that the action does not cause significant mortality by turbine strike on any **EPBC Act listed bird or bat species** within the life of the action by ensuring that the effects of wind turbines are managed, monitored and limited such that **impacts** to **EPBC Act listed bird and bat species** are reliably detected, quantified, reported and responded to**.**	Open	C	Monitoring requirements within the BBAMP (E2M Pty Ltd, 2025) have been implemented during the compliance audit period, including Bird and Bat Utilisation Surveys (BBUS) and monthly carcass searches. The results of these monitoring events have been used to calculate mortality estimates and determine any significant impacts on EPBC listed migratory birds and threatened species. The mortality dataset and BBUS results have been used to inform the revision of the BBAMP monitoring programs and evaluation of impact triggers and trigger response protocol. The data consolidation and analysis report for all bird and bat data can be viewed in Appendix E.
6	To inform the risk **profile** of each turbine, the approval holder must undertake bird and bat utilisation surveys, including: a) Prior to **commissioning**, the approval holder must undertake pre commissioning bird and bat utilisation surveys over a period of at least 24 months, including at least one survey undertaken at or adjacent to each	Closed	N/A	Compliance with this condition was demonstrated in the 2023 Annual Compliance Report (E2M Pty Ltd, 2023). No further assessment is required.

No.	Condition	Active	Compliance	Evidence
	proposed wind turbine location in each of at least one wet season and one dry season in succession.			
	b) Commencing within 3 months after **commissioning**, the approval holder must undertake post-commissioning bird and bat utilisation surveys over a period of at least 24 months, including at least one survey at or adjacent to each wind turbine in each of at least two wet seasons and two dry seasons in succession.	Open	C	As reported in the 2023 Annual Compliance Report (E2M Pty Ltd, 2023), commissioning occurred in August 2022. BBUS have since been conducted throughout the following periods: • March 23 – Wet season • September 23 – Dry season • February 24 – Wet season • October 24 - Dry season Appendix 2 of the previous Annual Compliance Report (E2M Pty Ltd, 2024) contains the first three BBUS surveys. The latest survey is included in Appendix B. It is recommended that in following Annual Compliance Reports this action be closed as all requirements have been met.
7	At least one survey in each 12 month period of bird and bat utilisation surveys required under condition 6 must be conducted within the **migratory period** of each **EPBC Act listed migratory species**.	Open	C	As above, surveys have been conducted twice each year, during wet and dry seasons, with the most recent BBUS survey conducted during this reporting period in October 2024. These months are suitable for detection of all EPBC Act listed migratory species: see Appendix D of BBUS reports in 2024 Annual Compliance Report and Appendix B of this report.
8	The approval holder must report on the results of the bird and bat utilisation surveys required under condition 6 in each annual compliance **report** required under condition	Open	C	Refer to reports for post-commissioning BBUS surveys in Appendix B and Appendix 2 of the 2024 Annual Compliance Report (E2M Pty Ltd, 2024). Pre-commissioning survey reports were reported

No.	Condition	Active	Compliance	Evidence
	35 until all bird and bat utilisation surveys have been reported on.			in previous Annual Compliance Reports as per Condition 6a.
9	All bird and bat utilisation surveys must be conducted by a **suitably qualified ecologist.**	Open	C	As above, refer to the 2024 Annual Compliance Report (E2M Pty Ltd, 2024) regarding previously conducted BBUS surveys. Surveys within this period were conducted by suitably qualified ecologists, including: • Dean Jones, a Principal ecologist with over 25 years' experience. A Class bird bander. • Laura Dee, terrestrial ecologist with over 7-years' bird banding experience.
10	Prior to commissioning, the approval holder must assign a risk profile to each turbine within the project area using the results of the pre commissioning bird and bat utilisation surveys required under condition 6(a).	Closed	N/A	Compliance with this condition was demonstrated in previous annual compliance reporting periods. No further assessment is required.
11	If, during bird and bat utilisation surveys required under condition 6 or during any other monitoring or incidental observation during operation, one or more individual of an **EPBC Act listed bird or bat species** is detected within the **vicinity** of a **low-risk turbine**, the approval holder must assign that turbine to be a **high-risk turbine** within five **business days** of the detection	Open	C	Turbine risk profiles were updated as required following significant findings from site observations. During this reporting period, some high-risk turbines were reassigned as low-risk in accordance with the EPBC Approval risk profile definitions. Current (May 2025) risk profiles can be viewed in Appendix C.
12	During **operation**, the approval holder must include a list of the **risk profiles** of each turbine within the **project area** in each annual **compliance report** required under condition 35.	Open	C	Current turbine risk profiles can be viewed in Appendix C.
13	During **operation**, the approval holder must undertake turbine strike monitoring in accordance with the **Bird and Bat Management Plan** at monitoring sites identified in the **Bird and Bat Management Plan** and at all **high-risk turbines** identified as required under conditions 10 and 11.	Open	C	Turbine strike monitoring was carried out throughout this reporting period via twice-monthly carcass surveys and incidental discoveries. These were conducted in accordance with the BBAMP and all high-risk turbines were monitored accordingly.

No.	Condition	Active	Compliance	Evidence
14	The approval holder must annually evaluate the effectiveness of the measures implemented to avoid and mitigate impacts of turbine collision on EPBC Act listed bird and bat species and report on that evaluation, and performance against the impact triggers, in each annual compliance report required under condition 35.	Open	C	Annual mortality assessments are performed after a 12-month monitoring period. The report was completed for a period of September 2023 to August 2024 (Appendix D).
15	If an **impact trigger** is reached or exceeded, the approval holder must implement the adaptive management procedure described in the Bird and Bat Management Plan. The approval holder must, on each occasion that an **impact trigger** is reached or exceeded, report on the steps taken and outcomes of implementing the adaptive management procedure, including details of the mitigation measures that have been or will be implemented and an assessment of their likely effectiveness in the first annual **compliance report** required under condition 35 following an **impact trigger** being reached or exceeded.	Open	C	The Annual Mortality Assessment (Appendix D) and Second Annual Impact Trigger Assessment (Appendix I) identified no impact trigger was reached against the conditions of the BBAMP. One potential impact trigger reported in the previous Annual Compliance Report (E2M Pty Ltd, 2024) was closed out by the Department in November 2024 and no mitigation measures were deemed necessary. Refer to Condition 36.
16	Within 20 **business days** of an **impact trigger** being reached or exceeded, if application of the adaptive management procedure required under condition 15 identifies, in respect of any wind turbine or number of wind turbines, that additional mitigation measures are required but no alternative mitigation measures can or will be implemented; and a) If the additional mitigation measures are required in respect of the Ghost Bat or Spectacled Flying-fox, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an **impact trigger** between sunset and sunrise each day; and/or b) If the additional mitigation measures are required in respect of any nocturnal **EPBC Act listed migratory species**, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an	Open	N/A	No impact trigger was reached or exceeded.

No.	Condition	Active	Compliance	Evidence
	impact trigger between sunset and sunrise each day during the **migratory period** of any **EPBC Act listed migratory species** for which an **impact trigger** has been reached or exceeded; and/or c) If the additional mitigation measures are required in respect of any diurnal **EPBC Act listed migratory species**, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an **impact trigger** between sunrise and sunset each day during the **migratory period** of any **EPBC Act listed migratory species** for which an **impact trigger** has been reached or exceeded; and/or d) If the additional mitigation measures are required in respect of any cathemeral **EPBC Act listed migratory species** or any **EPBC Act listed migratory species** for which diel activity is unknown, the approval holder must cease to operate any wind turbine that contributed to reaching or exceeding an **impact trigger** the **migratory period** of any **EPBC Act listed migratory species** for which an **impact trigger** has been reached or exceeded.			
17	Any request by the approval holder to cease or reduce the curtailment required under condition 16 must demonstrate how the ceasing or reducing of the curtailment will not result in any additional **impact** on **EPBC Act listed bird and bat species**.	N/A	N/A	This condition was not triggered during this compliance reporting period.
	Environmental offsets			
18	To compensate for the **clearance** of **Magnificent Brood Frog habitat** and **Greater Glider habitat** as specified in condition 1(b)-(c), the approval holder must legally secure all environmental offsets proposed in the **Offset Area Management Plan** (OAMP) within 18 months of the **commencement of the action**. The **Offset Area Management Plan** must be attached to the legal mechanism used to **legally secure** the offset areas.	Closed	N/A	Condition criteria was assessed in the 2023 Annual Compliance Report (E2M Pty Ltd, 2023) and no further assessment is required.

No.	Condition	Active	Compliance	Evidence
19	The approval holder must notify the Department within five **business days** of the legal security mechanism for each offset area being executed.	Closed	N/A	Condition criteria were assessed in the 2023 Annual Compliance Report (E2M Pty Ltd, 2023) and no further assessment is required.
20	The legal mechanism used to **legally secure** the offset areas must remain in force for at least the duration of this approval.	Open	C	Offset remains in force.
21	To ensure that the offsets required under condition 18 provide a conservation gain in accordance with the **EPBC Act Environmental Offsets Policy**, the **completion criteria** must be achieved within 20 years of the **commencement of the action** and then be maintained or improved for the duration of the approval.	N/A	N/A	This condition has not been activated. The following management activities occurred during this audit period: • Ongoing habitat quality monitoring; • Weed monitoring and treatment; and • Controlled ecological burns (last conducted August/September 2024).
22	To ensure that the offsets required under condition 18 provide ongoing habitat for the Magnificent Brood Frog and Greater Glider, the key habitat features identified in the **Offset Area Management Plan** must be maintained or improved for the duration of the approval.	Open	NC	The Offset Area Management Plan was finalised on the 10/05/2021, and mandates offset areas to undergo annual reporting and biennial habitat quality assessments. The annual OAMP report (1 June 2023 to 31 May 2024) summarised management strategies and recommendations, as outlined in Appendix J. Monitoring is scheduled to be completed 30 May 2025, outside of this reporting period. A biennial Offset Area Habitat Quality Assessment (HQA) was completed throughout this reporting period (wet season of April-May 2025) following the previous HQA conducted in 2023. Draft data results identified that overall, both MBF and greater glider habitat scores have improved since the baseline assessment, and some monitoring

No.	Condition	Active	Compliance	Evidence
				sites are on track to meet staged targets identified in the OAMP. However, increases in weed cover and decreases in species diversity were recorded, which are defined as key habitat criterions (trigger events) in the OAMP. The HQA identified that some sites require ongoing management to decrease weed abundance and to increase native grass, forbs and shrub diversity and cover. This report was not finalised during this reporting period and will be provided in the next ACR. **Opportunity for Improvement**: Update the OAMP to remove 'trigger' wording to prevent confusion around what constitutes a notifiable event, and updating the OAMP to align with approval conditions wording i.e., changing "habitat quality features" to explicitly state "key habitat features" to remove any ambiguity.
23	To ensure that the completion criteria will be achieved, performance against performance targets must be reported in each annual compliance report required under condition 35.	Open	C	Refer to Appendix G for a report against each performance criterion included within the OAMP as an assessment of effectiveness of these measures.
24	If a **performance target** is not met at the completion of each five year period, the approval holder must, on each occasion that a **performance target** is not met, report on the corrective action/s that will be implemented and an assessment of their likely effectiveness in the first annual compliance **report** required under condition 35 following a **performance target** not being met and all subsequent **compliance reports** required under condition 35 for the life of the approval.	N/A	N/A	Not required until May 2026.
25	If any of the **completion criteria** are not met within 20 years of the **commencement of the action**, the approval holder must, within 10 **business days** of the 20th	N/A	N/A	Not required until May 2042.

No.	Condition	Active	Compliance	Evidence
	anniversary of the **commencement of the action**, notify the **Department** of the **completion criteria** that have not been met. Within 6 months of the 20th anniversary of the **commencement of the action**, if the approval holder has not met all of the **completion criteria**, the approval holder must submit a supplementary Offset Area Management Plan that details the additional and/or revised management measures that will be implemented and/or alternative offset or offsets that will be provided to compensate for the failed offset and submit it to the **Department** to be approved in writing by the **Minister**. If approved in writing by the **Minister**, the approval holder must implement the approved supplementary Offset Area Management Plan.			
26	At least 12 months and no more than 24 months following **commissioning**, the approval holder must submit a Residual Impacts Report which details the actual residual **impact** of the action on Magnificent **Brood Frog habitat** and **Greater Glider habitat** to the Department. The Residual Impacts Report must be informed by a scientifically robust program of monitoring that has been endorsed by an **independent suitably qualified amphibian expert** and conducted by a **suitably qualified ecologist**. The Residual Impacts Report must be prepared by an **independent suitably qualified ecologist**.	Open	C	The Residual Impacts Report (refer to Appendix H) was informed by the Magnificent Brood Frog (MBF) Monitoring Program, endorsed by Edward Meyer, an independent amphibian expert and principal ecologist. The Residual Impacts Report was completed in July 2024 by Dean Jones, a Principal ecologist with over 25 years of experience.
27	If the actual residual **impact** of the action on **Magnificent Brood Frog habitat** or **Greater Glider habitat** is greater than the **impact** of the action on Magnificent **Brood Frog habitat** or **Greater Glider habitat** already offset, the approval holder must provide an environmental offset to compensate for the additional residual **impact** consistent with the **EPBC Act Environmental Offsets Policy**. The approval holder must, within 60 **business days** of submitting the Residual Impacts Report required	Open	C	The Residual Impacts Report determined that there were no residual impacts from project activities on either species. Offset provisions are above adequate due to significantly reduced clearing values from what was approved.

No.	Condition	Active	Compliance	Evidence
	under condition 26, submit a supplementary Offset Area Management Plan to the **Department** to be approved in writing by the **Minister**. If approved in writing by the **Minister**, the approval holder must implement the approved supplementary **Offset Area Management Plan**.			
28	The supplementary Offset Area Management Plan, whether submitted under the requirements of condition 23 or condition 25, must include: a) Details to demonstrate how the offset compensates for the residual **impact** on **Magnificent Brood Frog habitat** and **Greater Glider habitat** in accordance with the principles of the **EPBC Act Environmental Offsets Policy**; b) A description of the offset, including location, size, condition, environmental values present and surrounding land uses; c) Baseline data and other supporting evidence that documents the presence of each **listed threatened species** and the quality of each **listed threatened species** habitat within the offset area; d) An assessment of **site habitat quality** using a method agreed to in writing by the **Department**; e) Details of how the offset area will provide connectivity with other habitats and biodiversity corridors and/or will contribute to a larger strategic offset for each **listed threatened species**; f) Maps and **shapefiles** to clearly define the location and boundaries of the offset area, accompanied by **offset attributes**; g) Specific offset completion criteria derived from the **site habitat quality** to demonstrate the improvement in the quality of each **listed threatened species** habitat in the offset area over the duration of this approval; h) Details of the management actions, and timeframes for implementation, to be carried out to meet the offset completion criteria;	N/A	N/A	N/A

No.	Condition	Active	Compliance	Evidence
	i) Interim performance targets that set targets at appropriate intervals for progress towards achieving the offset completion criteria; j) Details of the nature, timing and frequency of monitoring to inform progress against achieving the interim performance targets (the frequency of monitoring must be sufficient to track progress towards each set of interim performance targets, and sufficient to determine whether the offset area is likely to achieve those interim performance targets in adequate time to implement all necessary corrective actions); k) Proposed timing for the submission of monitoring reports which provide evidence demonstrating whether the interim performance targets have been achieved; l) Timing for the implementation of corrective actions if monitoring activities indicate the interim performance targets will not or have not been achieved; m) Evidence of how the management actions and corrective actions take into account relevant **approved conservation advices** and are consistent with relevant **recovery plans** and **threat abatement plans**; and n) Details of the legal mechanism for **legally securing** the offset area, such that legal security remains in force over the offset area for at least the duration of this approval.			
	Notification of date of commencement of the action			
29	The approval holder must notify the Department in writing of the date of **commencement of the action** and the date of **commissioning** within 10 **business days** after the date of **commencement of the action**. The approval holder must notify the **Department** in writing of the date of **commissioning** within 10 **business days** after the date of **commissioning**.	Closed	N/A	Condition criteria was assessed in the 2023 Annual Compliance Report (E2M Pty Ltd, 2023) and no further assessment is required.

No.	Condition	Active	Compliance	Evidence
30	If the **commencement of the action** does not occur within 5 years from the date of this approval, then the approval holder must not **commence the action** without the prior written agreement of the **Minister**.	Closed	N/A	The action has commenced.
	Compliance records			
31	The approval holder must maintain accurate and complete **compliance records**.	Open	C	All compliance records have been maintained and stored across E2M Pty Ltd, Neoen Australia Pty Ltd and responsible Contractor's systems.
32	If the Department makes a request in writing, the approval holder must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request. Note: **Compliance records** may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department**'s website or through the general media.	N/A	N/A	No requests for compliance records were made during this compliance period.
	Preparation and publication of plans			
33	The approval holder must: a) submit **plans** electronically to the **Department**; b) publish each **plan** on the website within 20 **business days** of the date of this approval, unless otherwise agreed to in writing by the **Minister** or, if a **plan** requires the approval of the **Minister**, within 20 **business days** of the date of the **Minister** approving the **plan**; c) exclude or redact **sensitive ecological data** from **plans** published on the website or provided to a member of the public; and d) keep **plans** published on the **website** until the end date of this approval.	Open	C	All plans have been submitted to the Department. All plans have been submitted electronically. Sensitive data has been redacted. Plans are available on the website: https://kabangreenpowerhub.com.au/documents/

No.	Condition	Active	Compliance	Evidence
34	The approval holder must ensure that any **monitoring** data (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under a **plan** and conditions of this approval, is prepared in accordance with the **Department's** *Guidelines for biological survey and mapped data* (2018) and submitted electronically to the **Department** in accordance with the requirements of the **plan** and conditions.	Open	C	Monitoring reports prepared during this reporting period have been submitted to the Department as required and included in this Annual Compliance Report.
	Annual compliance reporting			
35	The approval holder must prepare a compliance **report** for each 12-month period following the date of **commencement of** the **action**, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must: a) publish each **compliance report** on the **website** within 60 **business days** following the relevant 12-month period; b) notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within five **business days** of the date of publication; c) keep all **compliance reports** publicly available on the **website** until this approval expires; d) exclude or redact **sensitive ecological data** from **compliance reports** published on the website; and e) where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within five **business days** of publication. **Note**: **Compliance reports** may be published on the **Department**'s website.	Open	C	Previous report documentation is available on the Kaban Green Power Hub website and is publicly available at the time of this audit. The publicly available reports include redacted sensitive ecological data, with the last full compliance report provided to the Department on 06 August 2024. This report was supplied to the Department and published on the Kaban Green Power Hub website within sixty business days following 19th of May annual period.
	Reporting non-compliance			

No.	Condition	Active	Compliance	Evidence
36	The approval holder must notify the **Department** in writing of any: **incident;** non-compliance with the conditions; or non-compliance with the commitments made in **plans**. The notification must be given as soon as practicable, and no later than two **business days** after becoming aware of the **incident** or non-compliance. The notification must specify: a) any condition which is or may be in breach; b) a short description of the **incident** and/or non-compliance; and c) the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.	Open	C	The Department was notified of a potential trigger event for the WTNT on the 24th of July 2024 in regard to the trigger against Condition 15, in accordance with Condition 36 and 37. An investigation was completed and provided to the Department. A request for information was made from the Department and Neoen responded to all questions within the request. The Department concluded there to be no contravention of s142 of the EPBC Act and the case was closed with no further action required. **Opportunity for Improvement**: Amendments to the BBAMP are currently being addressed to improve trigger event wording, procedures and updating trigger values to reflect currently accepted listed migratory bird and threatened species population estimates. It should be noted that the previous Annual Compliance Report identified an impact trigger for MBF abundance occurring in August 2023. This was reported to the Department on 13 February 2024 and closed out on 7 November 2024. The outcomes of this included review of fire management measures to protect known MBF habitat when undertaking controlled burns.

No.	Condition	Active	Compliance	Evidence
37	The approval holder must provide to the Department the details of any **incident** or non-compliance with the conditions or commitments made in **plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying: a) any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future; b) the potential impacts of the **incident** or non-compliance; and c) the method and timing of any remedial action that will be undertaken by the approval holder	Open	C	As above.
	Independent audit			
38	The approval holder must ensure that independent **audits** of compliance with the conditions are conducted as requested in writing by the Minister.	N/A	N/A	No audits have been requested.
39	For each **independent audit**, the approval holder must: a) provide the name and qualifications of the independent auditor and the draft audit criteria to the **Department**; b) only commence the **independent audit** once the audit criteria have been approved in writing by the **Department**; and c) submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.	N/A	N/A	N/A

No.	Condition	Active	Compliance	Evidence
40	The approval holder must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.	N/A	N/A	N/A
	Completion of the action			
41	Within 30 days after the **completion of the** action, the approval holder must notify the **Department** in writing and provide **completion data**.	N/A	N/A	N/A

3 Conclusion and Recommendations

E2M has prepared this Annual Compliance Report for the Kaban Green Power Hub (the Project), in accordance with the requirements outlined in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) conditions of approval (EPBC 2018/8289). The compliance assessment was conducted based on information provided by the Proponent and the on-site operations manager, along with information captured by E2M as part of compliance monitoring activities.

From a total of 42 conditions within the EPBC Approval 18 conditions were not applicable. 23 of the 24 remaining conditions were determined to be compliant. Condition 22 was found to be non-compliant with an insignificant decrease in native species diversity compared to the previous assessment. Continued utilisation of offset area management procedures should see an improvement in species diversity throughout the duration of offset management.

An assessment of the effectiveness of performance criteria for the Vegetation Management Plan, Fauna Management Plan, Bird and Bat Adaptive Management Plan and Offset Area Management Plan was conducted to determine if mitigation measures have been effective in avoiding and minimising impacts of the Project upon Matters of National Environmental Significance. Some items within the management plans have been identified to improve mitigation measures. These are discussed in further detail within Section 2.2.

One potential trigger incident was notified to the Department concerning mortality estimates for the white-throated needletail. This incident was investigated according to project management procedures and details of the investigation provided to the Department. The Department determined that there was no contravention of the conditions and no mitigation measures, nor further actions, were required, and this item was officially closed out.

Following the completion of this Annual Compliance Report, the following recommendations have been identified:

- Review all bird and bat monitoring data collected from January 2017 to January 2025 to inform the revision of the current BBAMP. BBAMP review should include a revised monitoring program adapted to assess potential impacts on those listed migratory and threatened species most at-risk.
- Continue weed vigilance and treatments within offset and disturbance footprint. Follow the current Weed Management Plan and review, amend and adapt the plan to be most appropriate and relevant to the observed weed infestations across the Project Area.
- Continue vigilance for those disturbance areas not fulfilling rehabilitation criteria. Remedial activities for areas with erosion to be conducted within six (6) months of this report being published.
- Inclusion of changed drainage design to help return waterflows into MBF habitat back to those water volumes, similar to those, prior to construction.
- In conjunction with the fire management plan, amend the magnificent brood frog management plan to help mitigate the impacts of fires on known MBF populations.
- Revise the OAMP to clarify notifiable event benchmarks and better define key criteria to align with condition wording, as per Table 3.
- Complete an annual review of, and revise, the Fauna Management Plan and the Vegetation Management Plan to capture currency and relevancy of monitoring and management strategies and to help improve management efficiencies for the purpose of achieving environmental objectives set within the approval and plans.

4 References

DCCEEW (2023) *Annual Compliance Report Guidelines*. Available at: https://www.dcceew.gov.au/sites/default/files/documents/annual-compliance-report-guidelines-2023.pdf.

E2M (2020a) *Kaban Green Power Hub – Fauna Management Plan*.

E2M (2020b) *Kaban Green Power Hub – Vegetation Management Plan*.

E2M Pty Ltd (2021) 'Kaban Green Power Hub - Offset Area Management Plan'.

E2M Pty Ltd (2022) *Kaban Green Power Hub - Annual Compliance Report*.

E2M Pty Ltd (2023) *Kaban Green Power Hub - Second Annual Compliance Report*.

E2M Pty Ltd (2024) *Kaban Green Power Hub - 2024 Annual Compliance Report*.

E2M Pty Ltd (2025) *Kaban Green Power Hub - Bird and Bat Adaptive Management Plan, REVISION 11*.

Appendix A: Vegetation, Fauna, and Offset Area Management Plan Assessment of Effectiveness

Table 4: Assessment of Effectiveness of Vegetation Management Plan Performance Criteria

Performance Criteria	Comment	Review of Effectiveness
Micro-siting does not result in additional disturbance to threatened flora or communities above what is approved.	Micro-siting has not resulted in additional disturbance to threatened flora or communities.	The VMP has been effective to date.
No exceedance of approved clearing limits.	Approved clearing limits have not been exceeded.	The VMP has been effective to date.
No introduction or spread of priority weed species within the site and successful removal of priority weed species within the disturbance footprint.	A Weed Management Plan (see Appendix F) has been implemented to prevent the introduction and spread of priority weed species. Weed treatment controls and weed surveys have been conducted throughout this reporting period.	The execution of the Weed Management Plan has helped reduce weed abundance within the disturbance area from 5.55 percent to 2.75 percent over a 12-month period. See weed monitoring report in Appendix G
No loss or decline in threatened flora population sizes resulting from indirect impacts associated with construction and operation.	There has been no loss of threatened flora populations resulting from indirect impacts from project activities. Suitable controls have been implemented to manage indirect impacts, including dust suppression and erosion and sediment control measures.	There was no known loss of threatened flora due to project activities.
Progressive stabilisation of disturbed areas and rehabilitation of the disturbance footprint following construction.	Stabilisation and rehabilitation has been successful in most areas.	Some disturbed areas have had unsuccessful rehabilitation leading to minor to moderate erosion. These areas were identified in the February 2025 rehabilitation survey (Appendix G) and have been flagged for remedial works.

Table 5: Assessment of Effectiveness of Fauna Management Plan Performance Criteria

Performance Criteria	Comment	Review of Effectiveness
Micro-siting does not result in additional disturbance to magnificent brood frog and greater glider habitat above what is approved	Micro-siting has not resulted in additional disturbance to threatened fauna habitat.	The FMP and VMP has been effective to date.
Post-construction: No injury to native fauna	No fauna were reported injured during this reporting period. Any incidental bird and bat carcass finds were reported and registered under the provisions of the Bird and Bat Adaptive Management Plan.	The FMP has been effective to date.
No exceedance of approved clearing limits	Approved clearing limits have not been exceeded.	The FMP has been effective to date.
An Erosion and Sediment Control Plan (ESCP) is prepared and implemented to limit potential impacts on threatened fauna, specifically magnificent brood frog	An ESCP was implemented throughout this reporting period.	Some areas have been identified with changes to hydrological flows resulting in increased waterflows discharged into magnificent brood frog habitat, resulting in some erosion within the creek. Further remedial activities are needed to return waterflows to levels similar to those observed pre-construction.
Disturbance is limited to the disturbance footprint	No clearing has occurred outside the disturbance footprint.	No additional clearing has occurred post-construction.

Performance Criteria	Comment	Review of Effectiveness
No loss or decline in threatened fauna population sizes resulting from indirect impacts associated with construction and operation	MBF and Greater Glider monitoring was conducted throughout this reporting period, as required by the FMP. No loss or decline of either species was identified throughout this reporting period.	The FMP has been effective to date. To date there have been no detectable losses to MBF or greater glider populations related to indirect project activities. Relative abundance monitoring reports are provided in Appendix K and Appendix M.
No increase in hydrocarbon abundance within magnificent brood frog habitat	No signs of hydrocarbons or residues were noted during the MBF microhabitat assessment. No vehicle events involving hydrocarbon spillages were recorded.	The FMP has been effective to date.
No increase in sedimentation of magnificent brood frog habitat	An ESCP was implemented throughout this reporting period. MBF monitoring has occurred to determine the effectiveness of the FMP in limiting sedimentation within MBF habitat.	There has been minimal sedimentation detected within impacted MBF habitat. However, some erosion was noted and reported during annual microhabitat assessment, see Appendix L.

Table 6: Assessment of Effectiveness with Offset Area Management Plan Performance Criteria

Performance Criteria	Comment	Review of Effectiveness
No clearing occurs within the offset area	No clearing has occurred within the offset area.	The OAMP has been effective to date.
Magnificent brood frog abundance remains stable or increases within the offset area	Annual MBF relative abundance monitoring was conducted, refer to Appendix K.	The OAMP has been effective to date.
Greater glider abundance remains stable or increases within the offset area	Annual greater glider relative abundance monitoring was conducted, refer to Appendix M.	The OAMP has been effective to date.
No new weeds are introduced to the offset area	Weed surveys and weed treatments, including controlled burns, were conducted throughout this reporting period, see Appendix N. No additional priority weeds were identified within the offset site.	The OAMP and WMP has been effective to date.
Existing weed invasion within the offset area decreases	Weed surveys and weed treatments, including controlled burns, were conducted throughout this reporting period. Weed biomass was found to have significantly declined within the offset area.	The OAMP and WMP has been effective to date.
Greater glider friendly cattle fencing is erected and maintained	All fencing is in line with requirements, including fence repair and inspection and replacement of barbed wire strands in greater glider habitat.	The OAMP has been effective to date.

Performance Criteria	Comment	Review of Effectiveness
Offset area Habitat Quality score improves by a minimum of 1 point within 10 years	This is ongoing. Results of the 2025 habitat quality assessment survey reported an overall increase in habitat quality; however, some triggers against the OAMP were observed in the assessment (refer to Condition 22). The HQA will be presented in the next ACR as the report was not finalized during this reporting period.	Ongoing monitoring will be conducted to determine the effectiveness of offset activities.
Fuel loads are managed to limit potential of high intensity bush fires	Ecological burns took place during this reporting period, with the most recent undertaken in August/September 2024, (see Appendix O). Controlled burns are scheduled in July/August during the 2025 burn season.	Ongoing monitoring will be conducted to determine the effectiveness of offset activities. The 2025 habitat quality assessment report will be presented in the next Annual Compliance Report (2025 - 2026).

Appendix B: ACR period 2024-2025: Post-commissioning Bird and Bat Utilisation Survey

Kaban Green Power Hub Post-commissioning Bird and Bat Utilisation Monitoring Report

Survey: October 2024

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust

Level 21, 570 Geroge Street, Sydney NSW 2000

Document Management

Rev.	Internal Review	Author	Approved By	Signature	Issued for External Review	External Reviewer
A	30/01/2025	Laura Dee	Dean Jones		03/02/2025	Paul Suter
0	25/02/2025	Dean Jones	Dean Jones			

Document Reference: X:\JOBS\~2021\QEJ21046\DELIVERABLES\4. FY25 Jul-Dec\4. BBUS - Post Commissioning - BBAMP_OCT24\1. Dry Season OCT2024\RevA\KABAN_Oct2024_Dry_Season_BBUS_RevA.docx

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Definitions

Term	Definition
EPBC Approval	EPBC Approval 2018/8289, issued by the DCCEEW.
Kaban Wind Farm Pty Ltd	Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust
The Project	The Kaban Green Power Hub
The survey	Post-commissioning Wet Dry Season Bird and Bat Utilisation Survey (BBUS)
Rotor Sweep Area (RSA)	The maximum height and width range in which bird and bat species may be susceptible to turbine strike.
Suitable habitat	A species' preferred environment required to sustain a viable population. Suitable habitat may include breeding, foraging and shelter resources.
Site	The areas of Lot 1 on RP735194, Lot 33 on CWL374, Lot 35 on CWL391, Lot 2 on RP735194 and Lot 34 on CWL374 which contain proposed turbines.
Threatened species	Extinct (EX), extinct in the wild (XW), critically endangered (CE), endangered (E), vulnerable (V) or conservation dependent (CD) under the *Environment Protection and Biodiversity Conservation Act 1999* or extinct in the wild (PE), Endangered, Vulnerable or Near Threatened (EVNT) under the *Nature Conservation Act 1992*.

Abbreviations

Term	Definition
BBAMP	Bird and Bat Adaptive Management Plan
BBUS	Bird and Bat Utilisation Survey
DAWE	Commonwealth Government Department of Agriculture, Water and the Environment
DES	Department of Environment and Science
E2M	E2M Consulting Pty Ltd
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
NC Act	*Nature Conservation Act 1992*
RSA	Rotor Sweep Area
sp.	Singular species. For example, *Eucalyptus* sp. refers to a single species of *Eucalyptus*
spp.	Multiple species. For example, *Eucalyptus* spp. refers to multiple species of *Eucalyptus*
WTG	Wind turbine generator

1 Introduction

1.1 Project background

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust (Kaban Wind Farm) have entered the commissioning stage of the Kaban Green Power Hub wind farm (the Project) in north Queensland. The wind farm is located near the township of Tumoulin, Queensland, within the Tablelands Regional Council Local Government Area. The wind farm contains 28 wind turbine generators (WTGs) located across the following land parcels, herein collectively referred to as the 'Site' (Figure 1):

- Lot 1 on Plan RP735194
- Lot 33 on Plan CWL374
- Lot 35 on Plan CWL391
- Lot 2 on Plan RP735194
- Lot 34 on Plan CWL374 and a section of local road reserve.

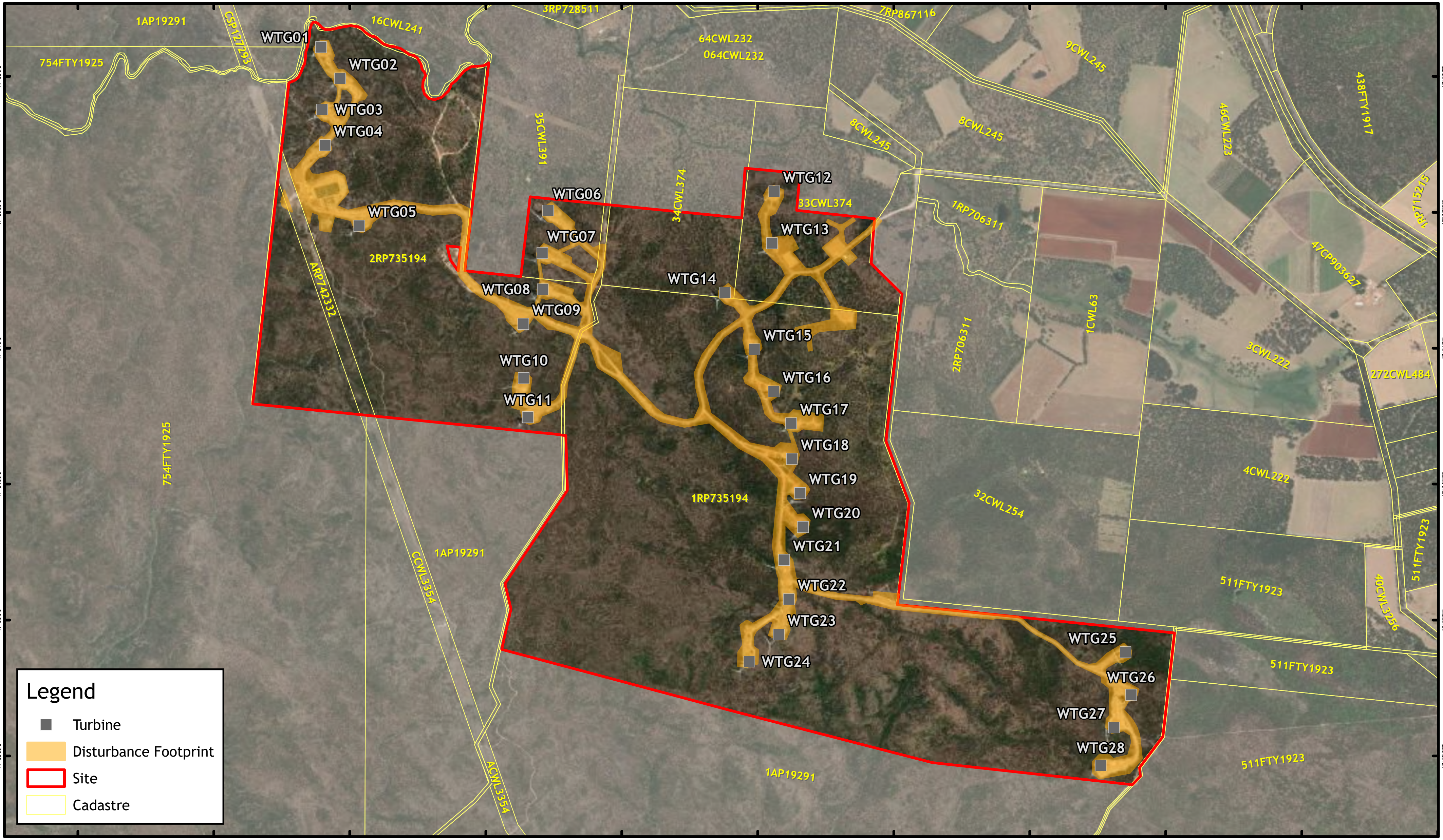
1.2 Scope and objectives

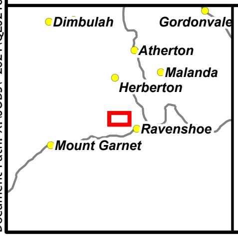
Kaban Wind Farm has engaged E2M Consulting Pty Ltd (E2M) to undertake a post-commissioning 2024 Dry Season Bird and Bat Utilisation Survey (BBUS) (herein referred to as 'the survey') at the Kaban Green Power Hub. The survey was undertaken to meet the requirements of Conditions 5A, 6, 7, 9 and 11 of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Variation of Conditions attached to approval EPBC 2018/8289 received from the (former) Department of Agriculture, Water and the Environment (DAWE) on 10 August 2022.

Specifically, the survey aimed to assess bird and bat utilisation of the Site during the 2024 dry season with the following objectives:

- Gathering dry season bird and bat utilisation survey data
- Ascertaining the risk of WTG collision with threatened and migratory bird and bat species
- Ensure survey timing is seasonally appropriate and is completed within the migratory periods of each EPBC Act listed migratory species as defined in the EPBC approval; and
- Determining a 'risk profile' for each WTG based on the results of the survey.

Bird and bat utilisation surveys have informed development of the Bird and Bat Adaptive Management Plan required per Conditions 5 and 10 of the EPBC approval.





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Scale 1:35,000 (A4)

0 0.5 1 1.5

Kilometres

Coordinate System: GCS GDA 1994

Notes:
Aerial Imagery: © ESRI 2024
Cadastre: © DoR 2023

Rev	Description	Drawn	Approved	Date
A	Issued for Review	GO	LD	09/12/2024

e2m

FIGURE 1: PROJECT LOCATION

BIRD AND BAT UTILISATION
2024 DRY SEASON MONITORING REPORT
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
1 of 1	QEJ21046	A

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2 Methods

2.1 Desktop assessment

Prior to construction, a desktop assessment was undertaken to identify species potentially occurring on site. This included a review of previous ecological reports for the Site, including:

- Kaban Green Power Hub: Post-commissioning Bird and Bat Utilisation 2023 Dry Season Monitoring Report (E2M Pty Ltd., 2023)
- Kaban Green Power Hub: Pre-commissioning Bird and Bat Utilisation 2022 Wet Season Monitoring Report (E2M Pty Ltd, 2022)
- Kaban Green Power Hub: Bird and Bat Utilisation Survey, Pre-commissioning 2020 Dry Season (E2M Pty Ltd, 2021)
- Kaban Green Power Hub: RFI - Ecological Assessment Report (E2M, 2019b)
- Kaban Green Power Hub: Ecological Gap Analysis (E2M, 2019a)
- Kaban Green Power Hub: Bird and Bat Adaptive Management Plan (E2M, 2020)
- Kaban Green Power Hub: Fauna Technical Report (AECOM, 2017); and
- Kaban Green Power Hub: Bird and Bat Pre-construction Utilisation Survey (Brett Lane & Associates Pty Ltd, 2017a).

2.2 Field Survey

2.2.1 Survey timing and conditions

Field survey timing was conducted at the most appropriate time with respect to migratory bird species known and likely to occupy airspace within the site, during the commencement of the southern passage of migratory birds such the white-throated needletail and the fork-tailed swift. The survey has a requirement under the EPBC approval, to be conducted during the dry-season.

2.2.2 Survey locations

Utilisation surveys were conducted at all 28 WTGs (WTG01 – WTG28). The coordinates and habitat descriptions for each survey location are detailed in Table 1, with their location present in Figure 1.

Table 1: Survey locations

WTG number / location	Ground-truthed Regional Ecosystem/habitat description	Coordinates
WTG01	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.548210 145.381571
WTG02	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.550126 145.38274
WTG03	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.552032 145.38164

WTG number / location	Ground-truthed Regional Ecosystem/habitat description	Coordinates
WTG04	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.55423 145.381818
WTG05	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland to low woodland on igneous hills and rocks	-17.559162 145.383913
WTG06	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.558235 145.395489
WTG07	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland on igneous hills and rocks	-17.560835 145.395136
WTG08	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland on igneous hills and rocks	-17.563049 145.395164
WTG09	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland on igneous hills and rocks	17.565181 145.393968
WTG10	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland on igneous hills and rocks	-17.568497 145.393995
WTG11	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland on igneous hills and rocks	-17.570903 145.394247
WTG12	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.557055 145.409347
WTG13	Non-remnant / Non remnant vegetation, including artificial wetlands (dams)	-17.560235 145.409206
WTG14	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.56333 145.40633
WTG15	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.563257 145.406316
WTG16	Remnant 7.8.8b: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.566732 145.408132
WTG17	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.569326 145.409315
WTG18	Non-remnant / Non remnant vegetation, including artificial wetlands (dams)	-17.571277 145.410381
WTG19	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.573464 145.410428
WTG20	Remnant 7.12.27a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.575547 145.410928
WTG21	Remnant 7.12.27a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.577627 145.411108
WTG22	Remnant 7.12.27a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.579659 145.40995

WTG number / location	Ground-truthed Regional Ecosystem/habitat description	Coordinates
WTG23	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.582056 145.41024
WTG24	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland on igneous hills and rocks	-17.584229 145.409627
WTG25	Remnant 9.12.30a: *Corymbia* and *Eucalypt* mixed woodland on igneous hills and rocks	-17.585886 145.407813
WTG26	Remnant 7.12.27c: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.585312 145.430873
WTG27	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.587917 145.431218
WTG28	Remnant 7.12.30a: *Corymbia citriodora* and mixed *Eucalypt* open woodland	-17.589915 145.430164

2.2.3 Bird utilisation survey

2.2.3.1 Fixed-point bird counts

Fixed-point bird counts were used to determine bird utilisation at each survey location. This involved an ecologist recording the presence and abundance of all bird species observed (heard and/or seen) within a 350 m radius of the survey point during a 20-minute survey period. Information collected during each survey included:

- Bird species
- Number of birds
- Observation type (seen or heard)
- Bird behaviour (flying or perched)
- Birds observed within the rotor sweep area (RSA)
- Height[1] at which bird was first observed, recorded in the following heigh categories:
  - Below RSA:
    - 0-10 m
    - 10-20 m
    - 20-30 m
    - 30-40 m
    - 40-50 m
    - 50-60 m
    - 60-80 m
  - RSA Height (80 – 255 m); and
  - Above RSA (>225 m).

[1] Heights were estimated using landscape features such as trees and referencing against the WTG structure components.

Additionally, for threatened species and bird groups at greatest risk of WTG interaction (i.e. raptors and waterbirds) the maximum and minimum heights at which the birds were observed were recorded.

Note: Due to difficulty in determining the number of birds from calls, a number greater than 1 was only recorded if calls were clearly distinguishable as two or more birds calling.

2.2.3.2 Survey schedule

To identify variations in bird utilisation across different periods of the day, each survey location was assessed a minimum of 6 times throughout three different periods of the day (morning, mid-day and afternoon). Two surveys at each turbine were conducted during the morning, mid-day and afternoon sessions. A total of 171 surveys were conducted across the Site. Dates and time periods that each WTG location was surveyed during the February 2024 survey, is listed in Table 2.

2.2.3.3 Incidental observations

While traversing the Site, incidental observations of threatened species, bird groups at greater risk of WTG interaction (i.e., raptors and waterfowl) and species not previously recorded during fixed-point bird counts were also included.

Table 2: Fixed-point bird count survey schedule

	28/10/2024			29/10/2024			30/10/2024			31/10/2024			1/11/2024			Total
Site	Morning	Midday	After-noon	Morning	Midday	After-noon	Morning	Midday	After-noon	Morning	Midday	After-noon	Morning	Midday	After-noon	
WTG01			1				1	1		1				1	1	6
WTG02			1				1	1		1				1	1	6
WTG03			1	1				2		1				1	1	7
WTG04			1	1				1		1				1	1	6
WTG05			1	1				1	1	1				1		6
WTG06		1	1					1	1	1				1		6
WTG07			1	1				1	1	1				1		6
WTG08			1	1				1	1	1					1	6
WTG09			1	1	1			1	1	1					1	7
WTG10			1	1	1			1	1	1						6
WTG11				1	1	1		1	1	1						6
WTG12		1		1	1	1	1		1							6
WTG13		1		1	1	1	1		1							6
WTG14		1		1	1	1	1					1				6
WTG15		1		1	1		1					1			1	6
WTG16		1		1	1		1					1			1	6
WTG17	1				1		1				1	1			1	6
WTG18	1				1		1	1	1						1	6
WTG19	1				1	1	1				1				1	6

	28/10/2024			29/10/2024			30/10/2024			31/10/2024			1/11/2024			Total
WTG20	1				1	1	1				1				1	6
WTG21	1	1				1	1				1	1				6
WTG22	1	1				1	1				2	1				7
WTG23	1	1				1	1				1	1				6
WTG24	1	1				1	1				1	1				6
WTG25	1	1				1				1	2					6
WTG26	1	1				1				1	1	1				6
WTG27	1	1				1				1	1	1				6
WTG28		2				1				1	1	1				6

2.2.4 Bat utilisation survey

2.2.4.1 Passive echolocation detection for microbats

Bat utilisation was determined through deployment of automated bat detection devices (Anabat Swift Detectors) that record species-specific echolocation call signatures of nearby microchiropteran bats (microbats). Detectors were fitted with an upward-facing, omnidirectional microphone and deployed approximately 2 m above ground at each of the WTG survey sites. All detectors were programmed to operate from dusk to dawn over two nights, yielding a total survey effort of 56 recorder-nights across the Site (see Table 3).

Following the field survey, all recordings were sent to a suitably qualified specialist (Greg Ford of Balance! Environmental) for analysis. Where possible, calls were identified to species level; however, where overlap exists between species' calls, these were identified as belonging to a species complex.

Table 3: Echolocation detector survey schedule

WTG number / location	Date set	Date retrieved	Survey nights
WTG01	30/10/2024	1/11/2024	2
WTG02	30/10/2024	1/11/2024	2
WTG03	30/10/2024	1/11/2024	2
WTG04	30/10/2024	1/11/2024	2
WTG05	30/10/2024	1/11/2024	2
WTG06	30/10/2024	1/11/2024	2
WTG07	30/10/2024	1/11/2024	2
WTG08	30/10/2024	1/11/2024	2
WTG09	1/11/2024	3/11/2024	2
WTG10	1/11/2024	3/11/2024	2
WTG11	1/11/2024	3/11/2024	2
WTG12	1/11/2024	3/11/2024	2
WTG13	1/11/2024	3/11/2024	2
WTG14	28/10/2024	30/10/2024	2
WTG15	28/10/2024	30/10/2024	2
WTG16	28/10/2024	30/10/2024	2
WTG17	28/10/2024	30/10/2024	2
WTG18	28/10/2024	30/10/2024	2
WTG19	28/10/2024	30/10/2024	2
WTG20	28/10/2024	30/10/2024	2
WTG21	28/10/2024	30/10/2024	2
WTG22	1/11/2024	3/11/2024	2
WTG23	5/11/2024	7/11/2024	2

WTG number / location	Date set	Date retrieved	Survey nights
WTG24	1/11/2024	3/11/2024	2
WTG25	1/11/2024	3/11/2024	2
WTG26	1/11/2024	3/11/2024	2
WTG27	1/11/2024	3/11/2024	2
WTG28	1/11/2024	3/11/2024	2

2.2.4.2 Megachiropteran bat (flying-fox) nocturnal surveys

Two, 20-minute fixed-point surveys for megachiropteran bat (flying-fox) species were conducted at each WTG survey site, yielding a total of 56 surveys. Flying-fox surveys commenced at dusk, the time at which species become active and leave their roost sites to forage. Observers conducting surveys recorded any observation of flying fox, noting species and numbers. The surveys were completed over four nights with the sessions organised to capture an early evening and later survey period, between 6:30 and 9:30 pm. The flying-fox survey timetable can be viewed below (Table 4).

Table 4: Flying-fox nocturnal survey schedule

Start time	Date			
	3/11/2024	4/11/2024	5/11/2024	6/11/2024
18:30	WTG05	WTG12 WTG16 WTG24	WTG11 WTG13	WTG22 WTG15
19:00	WTG08 WTG04	WTG17 WTG23 WTG22	WTG06 WTG12	WTG23 WTG20 WTG21
19:30	WTG09 WTG11 WTG03	WTG18 WTG26	WTG05 WTG04 WTG07	WTG24 WTG25 WTG18
20:00	WTG10 WTG02 WTG01	WTG19 WTG27	WTG03 WTG10 WTG08	WTG26 WTG19
20:30	WTG14 WTG15	WTG20 WTG21	WTG01 WTG02 WTG09	WTG27 WTG28 WTG16
21:00	WTG13 WTG06 WTG07	WTG28 WTG25	WTG14	WTG17

Note: Survey times are rounded to the nearest half hour.

2.2.4.3 Incidental observations

Incidental observations of any flying-foxes or threatened microbats throughout the Site were also recorded, along with information on behaviour (i.e. weather roosting or flying), height observed and number of individuals observed.

2.2.5 Survey limitations

- Bird abundance: birds observed during a survey were included in counts only if observers were confident the same individual hadn't been counted earlier during the same survey event based on appearance (e.g., differences in plumage), behaviour (including movement/direction of travel when sighted), temporal overlap/separation of observations. Repeat observation of the same bird were not recorded unless the individual was observed within the RSA.
- Microbats: Data from bat echolocation detectors does not allow for the assessment of bat numbers, only relative activity (based on the number of calls detected per unit time). Data from bat detectors cannot be used to determine the flight height of bats recorded either. Due to the limited reach of bat detector microphones, the echolocation calls of microbats active within the RSA are unlikely to be captured on detectors deployed near ground level.
- Flying-foxes: The presence/abundance of flying-foxes during surveys is likely dependent on the availability/abundance of flowering canopy trees on site, with flying-foxes more likely to occur on site when canopy trees are in flower. During the current survey period, flowering eucalypt and grevilleas were present at just 3 out of the 28 WTG sites surveyed and, as such, the paucity of flying-foxes during surveys may be attributed to the scarcity of flowering canopy trees.

2.3 Collision risk assessment and 'High Risk' allocation

Prior to construction, a desktop collision risk assessment was performed to identify threatened and migratory bird species potentially at risk of interacting with WTGs on Site (see Table 13 in 'Results' section).

Together with the result of the BBUS utilisation survey, the results of the desktop collision risk assessment were used to develop a 'risk profile' for each WTG. As per Condition 10 of the EPBC Act approval, WTGs have been assigned a 'low' or 'high' risk rating, as detailed below:

- **Low-risk**: A WTG that has not had an EPBC Act and/or *Nature Conservation Act 1992* (NC Act) listed threatened or migratory bird or bat species detected within a 350 m radius; and
- **High-risk**: A WTG that has had an EPBC Act and/or NC Act listed threatened or migratory bird or bat species detected within a 350 m radius.

The purpose of determining WTG risk profiles is to guide WTG monitoring during the operational phase of the Project, with all high-risk WTG requiring ongoing monitoring.

3 Results

3.1 Desktop results

Desktop assessment results identified eight bird species and two bat species listed as threatened of migratory under either the EPBC Act and/or NC Act as likely or known to occur on site.

Table 5: Known and likely to occur bird and bat species

Fauna species	EPBC Act status[1]	NC Act status[1]	Likelihood of occurrence
Birds			
fork-tailed swift *(Apus pacificus)*	M	SLC	[5]**Known to occur:** Detected on site during incidental carcass searches
Latham's snipe (*Gallinago hardwickii*)	M	SLC	**Likely to occur:** Suitable habitat occurs on site and the species has been previously recorded within 10km of the Site
masked owl - northern (*Tyto novaehollandiae kimberli*)	V	V	**Likely to occur:** Suitable habitat occurs on site and the species has been previously recorded within 5km of the Site
oriental cuckoo *(Cuculus optatus)*	M	LC	**Likely to occur:** Suitable habitat occurs on site and the species has been previously recorded within 12km of the Site
black-faced monarch[2] *(Monarcha melanopsis)*	NA[2]	LC	NA: These have been removed from the EPBC migratory species list.
satin flycatcher *(Myiagra cyanoleuca)*	NA[2]	LC	**Likely to occur:** Suitable habitat occurs on site and the species has been previously recorded within 12km of the Site
rufous fantail[2] *(Rhipidura rufifrons)*	NA[2]	LC	NA: These have been removed from the EPBC migratory species list.
white-throated needletail *(Hirundapus caudacutus)*	V/M[3]	V[3]	[5]**Known to occur:** Detected on site during incidental and monthly carcass searches and seen utilising air space during BBUS survey
Bats			
ghost bat *Macroderma gigas*	V	E	**Known to occur:** A single individual has been recorded previously on site.
spectacled flying-fox *Pteropus conspicillatus*	V[4]	V[4]	**Known to occur:** Three individuals have been recorded previously on site.

[1] E = Endangered, V = Vulnerable, M = Migratory, SLC = Special Least Concern, LC = Least Concern
[2] Species has been delisted from migratory status under the EPBC Act as of January 2025. and SLC under the NC Act as of 2024. However, assessment is based on the species status when the Project's EPBC Act referral was submitted.
[3] Species is listed as Vulnerable under the EPBC Act as of the 4th July 2019, and NC Act as of 19th September 2019. However, assessment is based on the species status when the Project's EPBC Act referral was submitted. As such, the species has been assessed as a migratory species (EPBC Act) and SLC (NC Act).
[4] Species is listed as Endangered under the EPBC Act as of the 22nd February 2019, and NC Act as of 19th September 2019. However, assessment is based on the species status when the Project's EPBC Act referral was submitted. As such, the species has been assessed as Vulnerable (EPBC Act/ NC Act).
[5] These species have been detected on site during carcass surveys or utilising the air space above the Site.

3.2 Field results

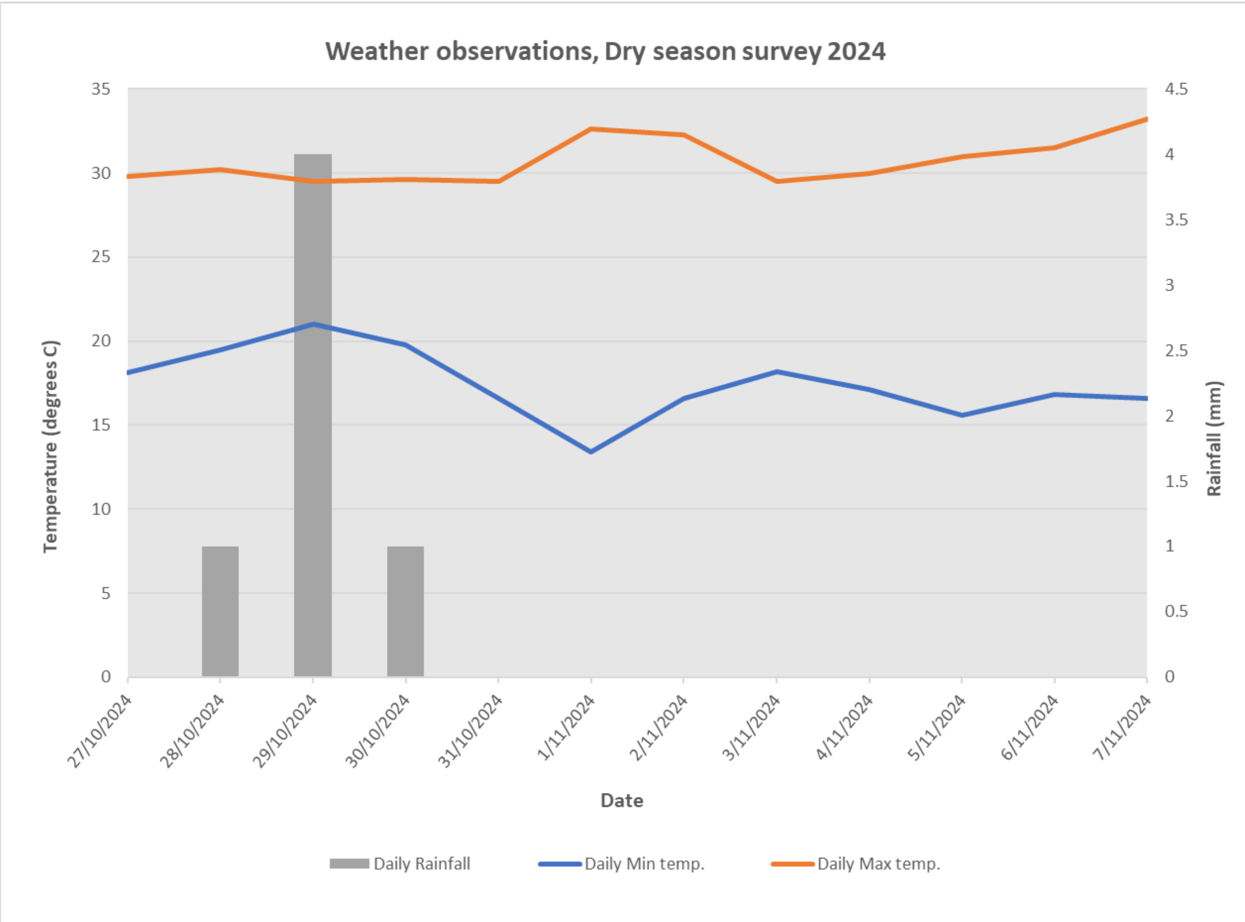
3.2.1 Survey Timing

The field survey was undertaken by two suitably qualified ecologists, Dean Jones and Laura Dee, between 27 October and 7 November 2024.

3.2.2 Survey Conditions

Weather conditions in the region during the survey were warm with average daily temperatures ranging between 25˚C to 27˚C (Walkamin research station ID: 031108). During the survey period, daily rainfall totals at the closest Bureau of Meteorology weather station (Ravenshoe alert station ID: 31200) ranged from 1 to 4 mm. Calm south-easterly winds were present during most of survey.

Figure 2. Weather observations recorded from the BoM weather station (031200) closest to Site during the October-November 2024 survey period

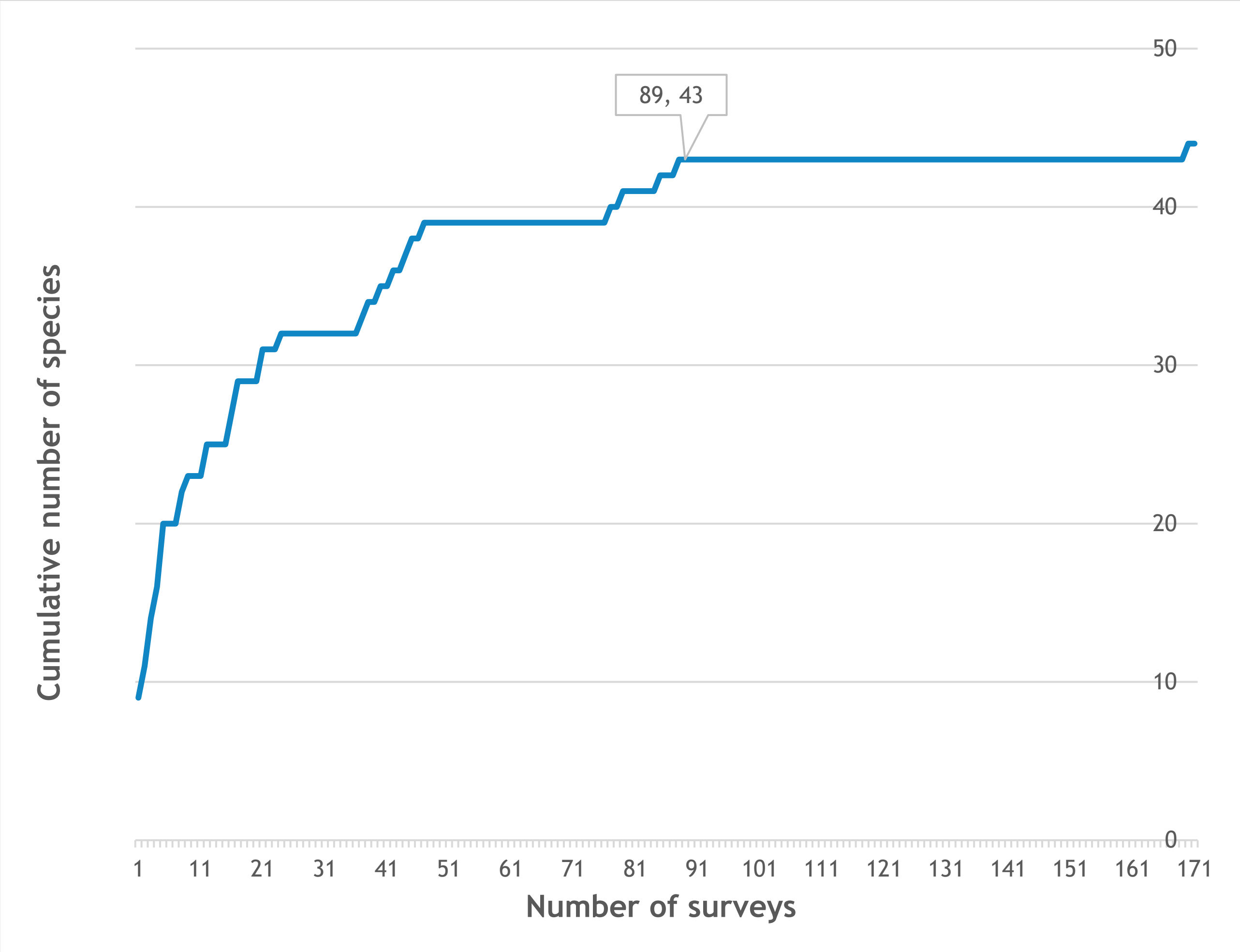


3.2.3 Bird utilisation

3.2.3.1 Survey effort

Survey effort during the current survey period is considered adequate to account for the majority of bird species utilising the Site. The species accumulation curve (Figure 3) indicates that after 89 of the 171 surveys, 43 of the 44 bird species (97.7%) were detected.

Figure 3. Bird species accumulation curve



3.2.3.2 Bird diversity, abundance and distribution

3.2.3.2.1 Bird diversity

A total of 47 bird species were observed during the field survey, 44 from fixed-point surveys and 3 incidental observations. A representation of the historical site bird diversity can be viewed in Figure 4.

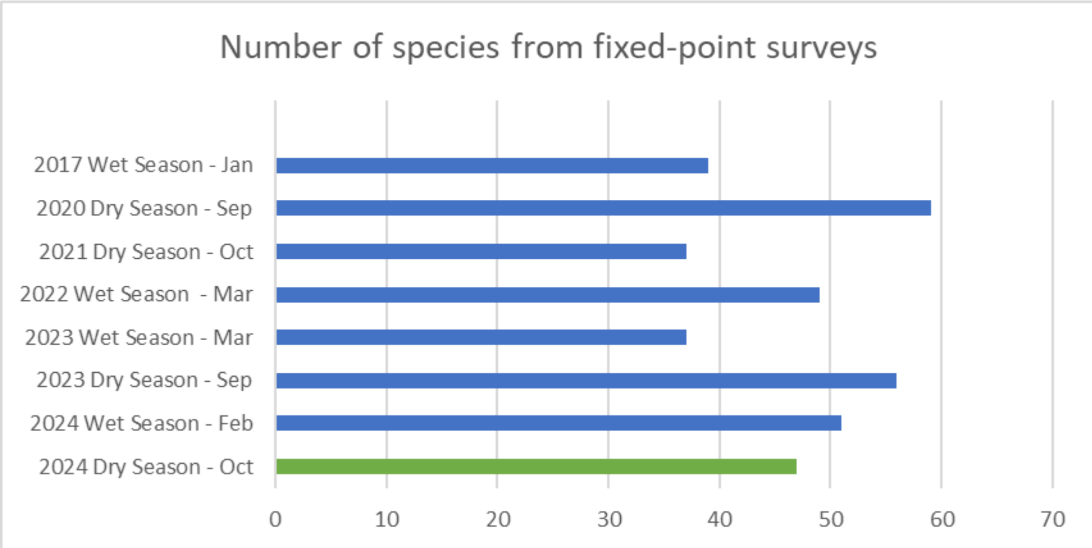
Bird and bat utilisation surveys undertaken on site since 2017 include the following:

1. January 2017 wet season survey
2. September 2020 dry season survey
3. October 2021 dry season survey
4. March 2022 wet season survey

5. March 2023 wet season survey
6. September 2023 dry season survey
7. February 2024 wet season survey; and
8. October 2024 dry season survey (current reporting).

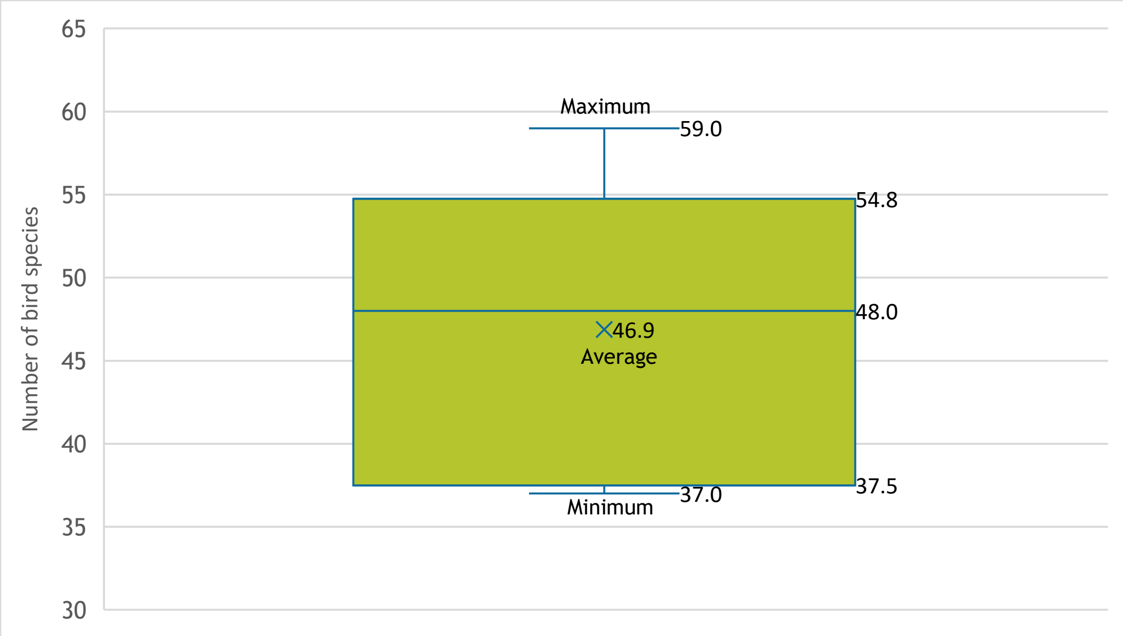
Bird species diversity has fluctuated overtime.

Figure 4. Number of bird species observed for all eight BBUS surveys during fixed point surveys



The box-plot in Figure 5 shows the minimum and maximum bird species from all eight surveys is 37 and 59 respectively. The total of forty-seven bird species, from the current BBUS, is just above the average of 46.9, calculated from all BBUS completed to date. The upper quartile 54.8, indicates that 25% of results are higher than this and the lower quartile 37.5, indicates that 25% of results are lower. The median line 48.0, is the point where 50% values will be greater and 50% will be lower than this value.

Figure 5: Box-plot representation of number of bird species observed from all eight BBUS.



3.2.3.2.2 Detection frequencies

Of the 44 species observed during fixed-point surveys, 10 species were recorded within 10% or more of all surveys as detailed in Table 7. Amongst the more frequently detected species during surveys were yellow-faced honeyeater and rufous whistler, both of which were recorded on >25% of all surveys.

Table 6: Bird species recorded at highest frequencies across fixed point surveys

Common name	Scientific name	Number of surveys recorded	Percent of surveys recorded
yellow-faced honeyeater	*Lichenostomus chrysops*	54	32
rufous whistler	*Pachycephala rufiventris*	52	30
noisy friarbird	*Philemon corniculatus*	37	22
red-backed fair-wren	*Malurus melanocephalus*	32	19
cicadabird	*Coracina tenuirostris*	29	17
Australian magpie	*Gymnorhina tibicen*	19	11
pied butcherbird	*Cracticus nigrogularis*	19	11
Scarlet honeyeater	*Myzomela sanguinolenta*	19	11
white-throated honeyeater	*Melithreptus albogularis*	19	11

Common name	Scientific name	Number of surveys recorded	Percent of surveys recorded
black-faced cuckoo-shrike	*Coracina novaehollandiae*	18	11

3.2.3.2.3 Bird species distribution throughout site

Seven of the 44 bird species detected were recorded at more than 50% of survey sites, with the rufous whistler recorded at 21 of the 28 WTGs or 75% of the survey sites (detailed in Table 7).

Table 7: Most widely distributed birds across the Site

Common name	Scientific name	Observations at different turbine locations	Percent (%) of total turbine locations
rufous whistler	*Pachycephala rufiventris*	21	75
yellow-faced honeyeater	*Lichenostomus chrysops*	19	68
red-backed fairy-wren	*Malurus melanocephalus*	17	61
noisy friarbird	*Manorina melanocephala*	17	61
cicadabird	*Edolisoma tenuirostre*	15	54
white-throated honeyeater	*Melithreptus albogularis*	14	50
black-faced cuckoo-shrike	*Coracina novaehollandiae*	14	50

3.2.3.2.4 Threatened and migratory species

There were no migratory or threatened species recorded during fixed-point surveys.

3.2.3.3 Flight heights

Approximately 99% of bird observations during surveys were of birds perching or flying outside of the RSA (Table 8 and Figure 6). Only one species, the wedge-tailed eagle was observed flying within the RSA, between 80 to 255 metres (see Figure 6. Observed bird heights for all fixed-point surveys

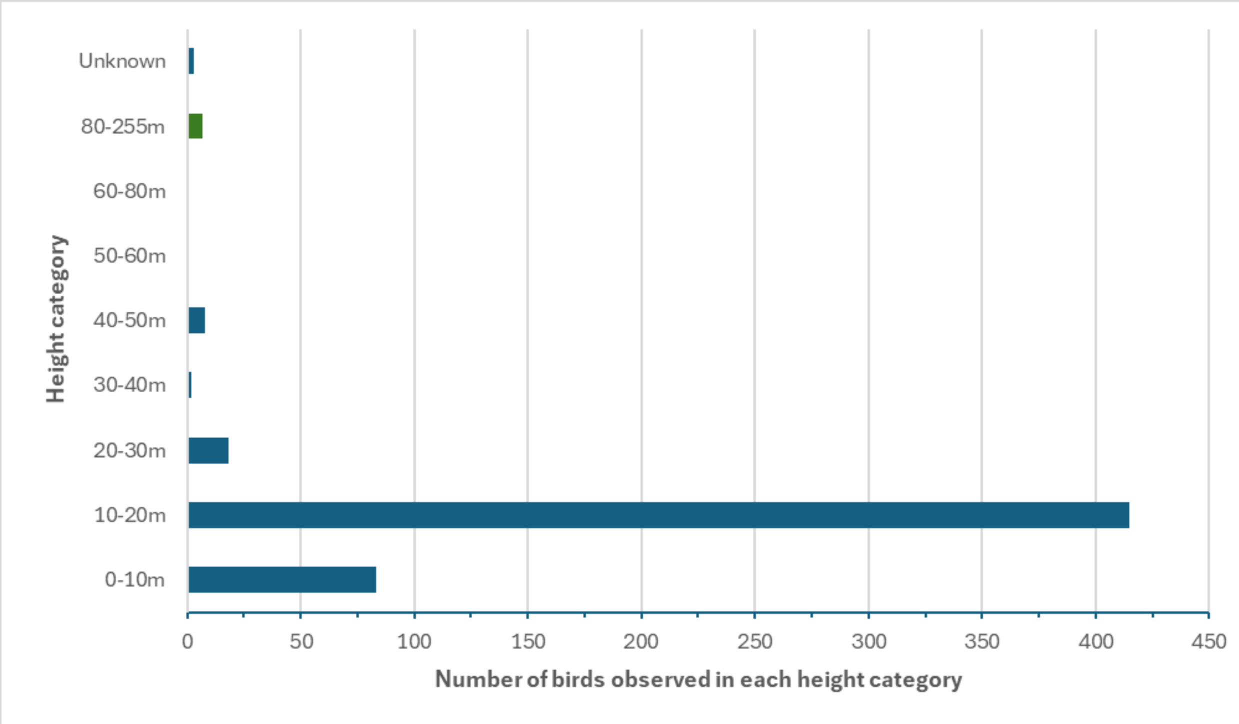


Table 9 The wedge-tailed eagle was observed on seven occasions, flying within the RSA, from a total of the 536 bird records. There was one observation of 6 sarus cranes flying above the RSA. A full summary of the number and height of the birds recorded during the October 2024 survey is provided in Table 8 and the observations of birds flying within or above the RSA provided in Table 9.

Table 8: Height of all bird observations

Height observed	Number of observations	Percent (%) of total observations
0-10 m	83	15
10-20 m	415	77
20-30 m	18	3
30-40 m	2	0
40-50 m	8	1
50-60 m	0	0
60-80 m	0	0
80-255 m (RSA height)	7	1.3
>255 m	7	1.3
Unknown	3	1
TOTAL	536	100

Figure 6. Observed bird heights for all fixed-point surveys

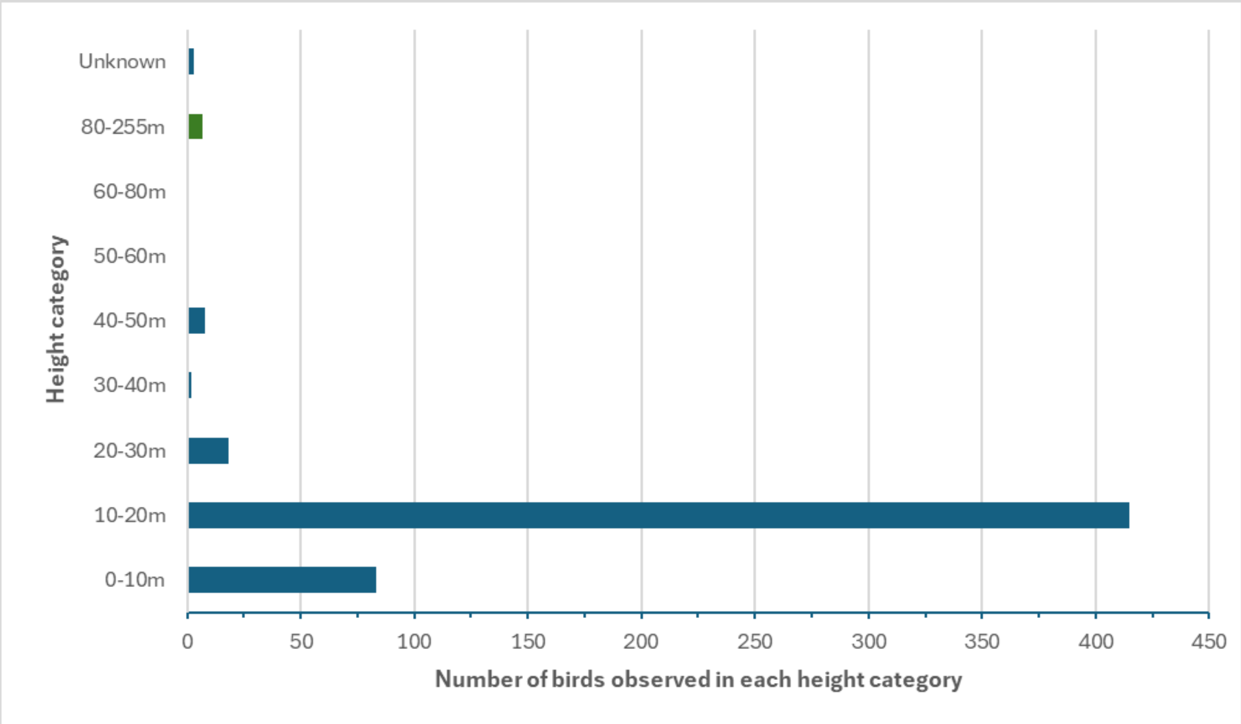


Table 9: Species observed within or above Rotor Sweep Area (RSA)

Common name	Scientific name	# of Survey Periods Observed	Number of birds observed within RSA	# birds above RSA
wedge-tailed eagle	*Aquila audax*	6	7	1
Sarus crane	*Grus antigone*	1	0	6

3.2.3.4 Historical observations

The number of bird species recorded during fixed-point surveys for each BBUS is detailed in Table 10. The number of bird species recorded during the 2024 dry season survey is lower than the preceding 2024 wet season survey.

Table 10: Total bird species recorded during each BBUS

BBUS	2020 Dry Season	2021 Dry Season	2022 Wet Season	2023 Wet Season	2023 Dry Season	2024 Wet Season	2024 Dry Season
# of species	58	38	49	39	57	51	47

3.2.4 Bat utilisation

3.2.4.1 Microbats

The microbat utilisation survey identified a total of 13,885 individual bat calls, from at least 18 distinct taxa and six "unresolved" call groups. Sixty-three percent of calls (8748) recorded during the current surveys were positively identified (Balance! Environmental, 2024) (see Appendix C for details). The majority (72%) of unresolved calls were attributed to *C. nigrogriseus/Scotorepens sp*. (Appendix C), (Balance! Environmental, 2024).

The frequency of calls and number of resolved species varied greatly between turbine locations. WTG11 had 24 calls and 5 species, whereas WTG 20 had 1940 calls from at least 10 species. The highest number of confirmed microbat species was recorded at WTG's 9, 16, 26 and 28 with 12 species (Appendix C).

Overall, the most frequently-detected, positively identified microbat species during surveys was *Saccolaimus flaviventris*, comprising up to 32% of calls recorded (i.e., 2,790 calls). This species was recorded at 26 out of 28 WTG sites. The two bat species detected at every site were *Miniopterus australis* and *Miniopterus orianae oceanensis*.

3.2.4.2 Threatened microbat observations

The Anabat analysis reported that there were no threatened microbat species detected at any WTG site during this survey period.

3.2.4.3 Flying-foxes

Over 186 hours nocturnal survey effort was conducted during this survey period. Fifty six, 20-minute surveys were conducted throughout the entire site. No flying-foxes were seen or heard during these surveys.

Table 11: Species call records by turbine number / location (WTG01 - WTG14)

Species	Turbine number / location													
	WTG01	WTG02	WTG03	WTG04	WTG05	WTG06	WTG07	WTG08	WTG09	WTG10	WTG11	WTG12	WTG13	WTG14
Positively identified calls														
eastern horseshoe bat (*Rhinolophus megaphyllus*)		6							1					
Gould's wattled bat (*Chalinolobus gouldii*)	44	7	1	10	3	4	72	2	5			18	11	7
chocolate wattled bat (*Chalinolobus morio*)	8			7	1									
hoary wattled bat (*Chalinolobus nigrogriseus*)	64	1		1	1	4	12	2	1			1		2
Nyctophilus sp.		1	3			1			1			2	1	
Cape York Pipistrelle (*Pipstrelle adamsi*)	4	3	1	3	1	1	1	1	1					
greater broad-nosed bat (*Scoteanax rueppellii*)							1					1	1	17
Inland broad-nosed bat (*Scotorepens balstoni / S. orion)*														1
little broad-nosed bat (*Scotorepens greyii*)	1	2			7	7	3	1	1					
Eastern forest bat (*Vespadelus pumilus)*									9					
Eastern cave bat (*Vespadelus troughtoni*)			2	1	6									
little bentwing bat (*Miniopterus australis*)	34	99	1	20	62	10	12	3	292	8	1	27	7	10

Species	Turbine number / location													
	WTG01	WTG02	WTG03	WTG04	WTG05	WTG06	WTG07	WTG08	WTG09	WTG10	WTG11	WTG12	WTG13	WTG14
eastern bentwing bat (*Miniopterus orianae oceanensis*)	39	7	9	7	17	15	28	1	10	9	6	28	7	39
white-striped freetail bat (*Austronomus australis*)	11	7	6	5	9	1	22	10	11	8	13	6	1	10
greater northern freetail bat (*Chaerephon jobensis*)							1							
northern free-tailed bat (*Ozimops lumsdenae*)														
eastern freetail bat (*Ozimops ridei*)	36	1	6		11	1	9	1	23			15	102	73
yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)	121	28	14	11	217		9	3	31	1	2	526	973	120
Unresolved calls														
C. gouldii or *O. ridei*	20						1							
C. nigrogriseus or *Scotorepens* sp.	91	5	9	22	36	12	64	1	8	1		44	3	21
M. australis or *V. pumilus*	4					1			13					
M. o. oceanensis or *P. adamsi*				1		1		1		1	2	2		
S. rueppellii or *Scotorepens* sp.	400	1	1			1	5					2	9	5
Scotorepens greyii or *S. sanborni*					6							3		
Turbine Site Total	877	168	53	88	377	59	240	26	407	28	24	675	1115	305

Table 12: Species call records by turbine number / location (WTG15-WTG28)

Species	Turbine number / location													
	WTG15	WTG16	WTG17	WTG18	WTG19	WTG20	WTG21	WTG22	WTG23	WTG24	WTG25	WTG26	WTG27	WTG28
Positively identified calls														
eastern horseshoe bat (*Rhinolophus megaphyllus*)						1						1		
Gould's wattled bat (*Chalinolobus gouldii*)		2				4	27	4	8	3				
chocolate wattled bat (*Chalinolobus morio*)														
hoary wattled bat (*Chalinolobus nigrogriseus*)	2	12	12	3	20	18	5	1	118	1	34	3	17	19
Nyctophilus sp.	1	2	1		1			1			2		3	
Cape York Pipistrelle (*Pipstrelle adamsi*)					2			1				2		2
greater broad-nosed bat (*Scoteanax rueppellii*)		22					1	1			1			
Inland broad-nosed bat (*Scotorepens balstoni / S. orion)*		1			1				443			1		1
little broad-nosed bat (*Scotorepens greyii*)	1	4		1		2			9		18	55	13	27
Eastern forest bat (*Vespadelus pumilus)*		1			2	3								1
Eastern cave bat (*Vespadelus troughtoni*)														
little bentwing bat (*Miniopterus australis*)	9	193	71	5	109	34	201	82	1	3	68	158	9	172

Species	Turbine number / location													
	WTG15	WTG16	WTG17	WTG18	WTG19	WTG20	WTG21	WTG22	WTG23	WTG24	WTG25	WTG26	WTG27	WTG28
eastern bentwing bat (*Miniopterus orianae oceanensis*)	34	71	54	5	8	9	67	66	16	7	37	68	10	72
white-striped freetail bat (*Austronomus australis*)	27	10	1		9	1	4	1	1	12	9	19	13	13
greater northern freetail bat (*Chaerephon jobensis*)									1			1		5
northern free-tailed bat (*Ozimops lumsdenae*)								1		12	1	1	1	2
eastern freetail bat (*Ozimops ridei*)	58	87	109	5	24	738	39	78	1	17	139	105	225	18
yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)	326	196	26	18	44	7	13	2		2	59	16	18	7
Unresolved calls														
C. gouldii or *O. ridei*									1					
C. nigrogriseus or *Scotorepens* sp.	45	513	92	117	18	1050	389	25	407	52	204	424	54	5
M. australis or *V. pumilus*		6			3	6	6							
M. o. oceanensis or *P. adamsi*		1	1	3	1	1	1					3	1	
S. rueppellii or *Scotorepens* sp.	3	9	3	1	4	66	154	5	558		3	66	5	
Scotorepens greyii or *S. sanborni*				1	5				16	2	2		6	2
Turbine Site Total	506	1130	370	159	251	1940	907	268	1580	111	577	923	375	346

3.3 Turbine collision risk assessment

3.3.1 Bird survey

3.3.1.1 Threatened species

No threatened bird species were observed on site during the October 2024 dry season bird and bat utilisation survey.

3.3.1.2 Migratory species

No migratory bird species were recorded on site, of the 171 fixed-point surveys conducted during the October 2024 dry season bird and bat utilisation survey.

3.3.2 Bat survey

3.3.2.1 Threatened microbats

No threatened micorbats were detected during this survey period.

3.3.2.2 Threatened Flying-foxes

No threatened flying-fox species were recorded during the 2024 dry season survey.

Table 13: Turbine collision risk assessment for known and likely occurring threatened and migratory species

Species	Conservation status[1]		Habitat and occurrence	Flight behaviour	Risk of collision
	EPBC Act	NC Act			
Threatened species					
masked owl (*Tyto novaehollandiae kimberli*)	V	V	The species is known to occur in riparian forest, rainforest, open forest and Melaleuca swamps and the edges of mangroves, as well as along margins of sugar cane fields (DAWE, 2021). While the species has previously recorded within 10km of the Site, records of the species across the Atherton Tablelands are scattered, infrequent and at low densities, reducing the risk of collision.	The species occupies permanent large home ranges and hunts primarily on the ground or within the canopy, taking small mammals (Curtis & Dennis 2012, DAWE, 2021). It typically glides from perches in trees when foraging (Brett Lane & Associates Pty Ltd, 2017b). As such, the species is unlikely to occur within the RSA, and has a low risk of turbine collision.	**Low risk:** While the species is considered likely to occur on site, the risk of turbine collision is low because of the species' flight behaviour.
red goshawk (*Erythrotriorchis radiatus*)	V	V	The species is known to have a large home range covering between 50 and 220 square kilometres. The species prefers a mix of vegetation types including tall open forest, woodland, lightly treed savannah and the edge of rainforest (DES 2021). While the species has previously been recorded within 10km of the Site, records of the species across the Atherton Tablelands are scattered, infrequent and at low densities, reducing the risk of collision.	Typically the species perches in and hunts from canopy trees but it is known to undertake fast agile flights 10-50m above the tree canopy and soar 200-300 m above its territory (Brett Lane & Associates Pty Ltd, 2017b). These flight behaviours place the species at risk of turbine collision.	**Low risk:** While the species' flight behaviour makes the species susceptible to turbine collision, the overall risk of collision is considered low because of the species' large home range and paucity of records near to the site.
Migratory species					

Species	Conservation status[1]		Habitat and occurrence	Flight behaviour	Risk of collision
	EPBC Act	NC Act			
fork-tailed swift (*Apus pacificus*)	M	SLC	In Australia, this species mostly occurs over inland plains but sometimes above foothills or in coastal areas. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh (DAWE, 2021). The species also occurs over treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (DAWE, 2021). On occasion, birds have also been sighted above rainforests, wet sclerophyll forest or plantations of pines (DAWE, 2021). The species has been previously recorded within 10 km of the Site and is predicted to intermittently forage within the airspace above the Site.	The fork-tailed swift is an aerial forager spending large periods of within RSA heights foraging on insect prey (Higgins, 1999).	**High risk:** The species flight behaviour makes it highly susceptible to collision, however the frequency of collision is likely to be low given the species' highly dispersive, vagile nature.
Latham's snipe (Gallinago hardwickii)	M	SLC	Latham's snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia (DAWE, 2021). In Australia, Latham's snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) (DAWE, 2021). Historical records show the species has previously recorded on site.	While the species primarily forages on the ground, it is possible that the species may occur within the RSA during migration and dispersal. However, the species is unlikely to frequent the Site in large numbers given the lack of extensive wetland habitat.	**Moderate risk:** The species may occur within the RSA during migration and dispersal. However, it is only likely to occur infrequently and in low numbers due to the limited extent of wetland habitat on site.

Species	Conservation status[1]		Habitat and occurrence	Flight behaviour	Risk of collision
	EPBC Act	NC Act			
oriental cuckoo (*Cuculus optatus*)	M	SLC	In Australia this species is found in monsoon forest, rainforest edges, leafy trees in paddocks, river flats, roadsides, mangroves and islands (Pizzey & Knight, 2007). Important habitat for this species is identified as monsoonal rainforest, vine thickets, wet sclerophyll forest or open *Casuarina*, *Acacia* or *Eucalyptus* woodlands. The species has been previously recorded within 12 km of the Site and may utilise the Site for foraging when present in Australia (November to May).	The species is primarily restricted to the canopy layer where it forages on a variety of small invertebrates (Brett Lane & Associates Pty Ltd, 2017b). It is therefore unlikely to occur at RSA height.	**Low risk:** While the species is considered likely to occur within the Site, the risk of turbine collision is low owing to the species' flight behaviour.
white-throated needletail (*Hirundapus caudacutus*)	M	SLC	In Australia, the white-throated needletail is almost exclusively aerial (DAWE, 2021). Because they are aerial, it is suggested that conventional habitat descriptions are inapplicable (DAWE, 2021). However, DAWE (2021) identifies the species is most commonly recorded over wooded areas, including open forest, rainforest, heathland, plantations, the edge of paddocks and less often over treeless areas such as grassland or swamps (DAWE, 2021). The species was recorded on two separate occasions during the 2021 survey, including one observation of 13 individuals at turbine WTG08 and one observation of three individuals at turbine WTG19. It has been detected at WTG's 1, 4, 7, 16, 18, and 20 during carcass surveys or incidental finds.	The white-throated needletail is an aerial forager which hunts insect prey at various heights above the canopy of woodland and forest habitats (Higgins, 1999). It is likely to forage at heights within the RSA.	**High risk:** The species flight behaviour makes it highly susceptible to collision, however the frequency of collision is likely to be low given the species' highly dispersive, vagile nature.
Microbats					

Species	Conservation status[1]		Habitat and occurrence	Flight behaviour	Risk of collision
	EPBC Act	NC Act			
ghost bat (*Macroderma gigas*)	V	E	In Queensland the species occurs along the central and northern coast, from Rockhampton to Cape York (DES 2021). The species occurs in a wide range of habitats from rainforest, monsoon and vine scrub, to open woodlands in arid areas. These habitats are used for foraging while roost habitat is more specific and includes undisturbed caves or mineshafts which have several openings (DES 2021). A single individual has been recorded on site during previous surveys.	The species roosts in caves or undisturbed mineshafts, of which non are known to occur on site. Foraging typically occurs within 2km of the roost and consist of flying within the lower half of the canopy, between 1-8m. This behaviour makes it unlikely the species would occur within the RSA.	**Low risk:** While the species is known to occur on site, the species' flight behaviour puts it at low risk of collision.
Flying-foxes					
spectacled flying-fox (*Pteropus conspicillatus*)	V	V	The species is known to occur in north-eastern Queensland, between Ingham and Cooktown, and between the McIlwraith and Iron Ranges on Cape York (DAWE, 2021). Spectacled flying foxes have long been considered to be primarily frugivorous and dependent on rainforest for foraging resources (DERM 2010). However, recent research suggests that this is not the case with satellite telemetry studies showing some individuals spend a significant proportion of the time in non-rainforest habitats. Many of these records were obtained from locations tens of kilometres from rainforest and included a range of wet and dry Eucalyptus, and Melaleuca vegetation types (DERM 2010). The species has been recorded on site on multiple occasions, though only ever in low numbers (1-2 individuals). The nearest known roost is approximately 25km from the Site.	While the species forages primarily within the canopy, the species would only be susceptible to turbine collision during dispersal. However, given the Site is 25km from the nearest known roost it is considered unlikely that the Site would be utilised frequently and by large numbers of individuals.	**Moderate risk:** The species flight behaviour makes it a high risk of turbine collision; however, the distance to the nearest roosts makes it unlikely that the site would be utilised frequently or by large numbers of individuals.

[1]: E= Endangered, M = Migratory, SLC = Special Least Concern, V = Vulnerable

3.3.3 Post-operation: Incidental bird and bat observations

Turbines first became operational at Kaban in late September 2022. Since this time, several migratory bird and spectacle flying-fox deaths potentially attributable to turbine collision have been recorded on site. The records of these observations are detail in Table 14.

Table 14: Incidental finds of migratory/threatened bird and bat species during operational phase

Common name	Scientific name	Date found	# individuals found	Location of record
Fork-tailed swift	*Apus pacificus*	January 2023	2	WTG2 & WTG11
White-throated needletail	*Hirundapus caudacutus*	March 2023	1	Between WTG16 & 17
Spectacled flying-fox	*Pteropus conspicullatus*	January 2023 February 2023	1	WTG16 & 01

Note: rufous fantail, satin flycatcher and black-faced monarch are no longer listed as migratory species under the EPBC Act nor the NC Act. As such, they have been removed from the significant species list for the determination of High-Risk turbines allocation. Henceforth, all turbines previously designated as High-Risk turbines with respect to rufous fantail, satin flycatcher and black-faced monarch will now be downgraded to Low-Risk.

3.3.4 Turbine risk profiles

As per Condition 10 of the EPBC Act approval (Department of Climate Change, Energy, the Environment and Water (DDEEW), 2022), individual WTGs were assessed as 'high' or 'low' risk as described in section 2.3. WTG04 was re-assigned as low risk because the black-faced monarch previously identified at this site has been delisted from the EPBC migratory bird list.

3.3.4.1 Downgrading High-Risk to Low-Risk

As per the EPBC Approval definitions, a high-risk turbine may be downgraded to a low-risk turbine if no EPBC listed threatened species or EPBC listed migratory species that are bird or bat species are detected within the vicinity of the turbine for a minimum of two years. As such, Table 15 provides details of observations when listed migratory or threatened birds and bats were detected on-site, and the dates of high-risk turbine assignment, along with the scheduled downgrade date to a low-risk turbine. Any re-assigned turbine to low-risk would not qualify for carcass search monitoring, unless it was previously assigned for carcass monitoring prior to the assignment of a high-risk turbine. The details of the current risk profiles for each turbines are provided in Table 16.

3.3.4.2 Current high-risk turbines

Of the 28 WTGs, 6 turbines are classed as high-risk, based on records of threatened and migratory species observed during scheduled bird and bat utilisation surveys, through monthly carcass search observations or through incidental finds, and through the re-assignment of some high-risk to low-risk, (Table 16).

All 'high risk' turbines have been added to the monthly carcass monitoring program, bringing the total number of turbine monitoring sites to 18, (Table 16).

Table 15: Observations of listed migratory birds and threatened bats within 350 m of turbines during BBUS, monthly and incidental carcass monitoring.

Common Name	Detection Type	EPBC Threatened or Migratory Listing	Date Detected	Profile Re-set Date	Turbine Location	Carcass Found	Observed _Flying	Turbine Listing Pre Operation	Comments
White-throated needletail	*BBUS*	*YES*	Oct-21	Oct-23	7	0	0	NO	Within 350m of WTG08 record
White-throated needletail	*BBUS*	*YES*	Oct-21	Oct-23	8	0	13	Yes	
White-throated needletail	*BBUS*	*YES*	Oct-21	Oct-23	9	0	0	NO	Within 350m of WTG08 record
White-throated needletail	*BBUS*	*YES*	Oct-21	Oct-23	18	0	0	Yes	Within 350m of WTG19 record
White-throated needletail	*BBUS*	*YES*	Oct-21	Oct-23	19	0	3	Yes	
White-throated needletail	*BBUS*	*YES*	Oct-21	Oct-23	20	0	0	NO	Within 350m of WTG19 record
Spectacled flying-fox	*BBUS-Incidental*	*YES*	Oct-21	Oct-23	13	0	1	NO	
Fork-tailed swift	*Incidental*	*YES*	Jan-23	Jan-25	2	2	0	NO	
Fork-tailed swift	*Incidental*	*YES*	Jan-23	Jan-25	5	1	0	Yes	
Fork-tailed swift	*Carcass Search*	*YES*	Jan-23	Jan-25	5	1	0	Yes	
Fork-tailed swift	*Incidental*	*YES*	Jan-23	Jan-25	11	2	0	NO	
Spectacled flying-fox	*Incidental*	*YES*	Jan-23	Jan-25	15	0	0	NO	Within 350m of WTG16 record
Spectacled flying-fox	*Incidental*	*YES*	Jan-23	Jan-25	16	1	0	Yes	Found at 16
Spectacled flying-fox	*Incidental*	*YES*	Jan-23	Jan-25	17	0	0	NO	Within 350m of WTG16 record
Black-faced monarch	*Incidental*	*De-listed*	Feb-23	Feb-25	4	1	0	No	
Spectacled flying-fox	*Incidental*	*YES*	Feb-23	Feb-25	1	1	0	NO	
Fork-tailed swift	*Carcass Search*	*YES*	Feb-23	Feb-25	9	1	0	NO	
White-throated needletail	*Carcass Search*	*YES*	Mar-23	Mar-25	4	1	0	NO	
Rufous fantail	*Incidental*	*De-listed*	Mar-23	Mar-25	17	1	0	No	
White-throated needletail	*Incidental*	*YES*	Mar-23	Mar-25	16	1	0	Yes	

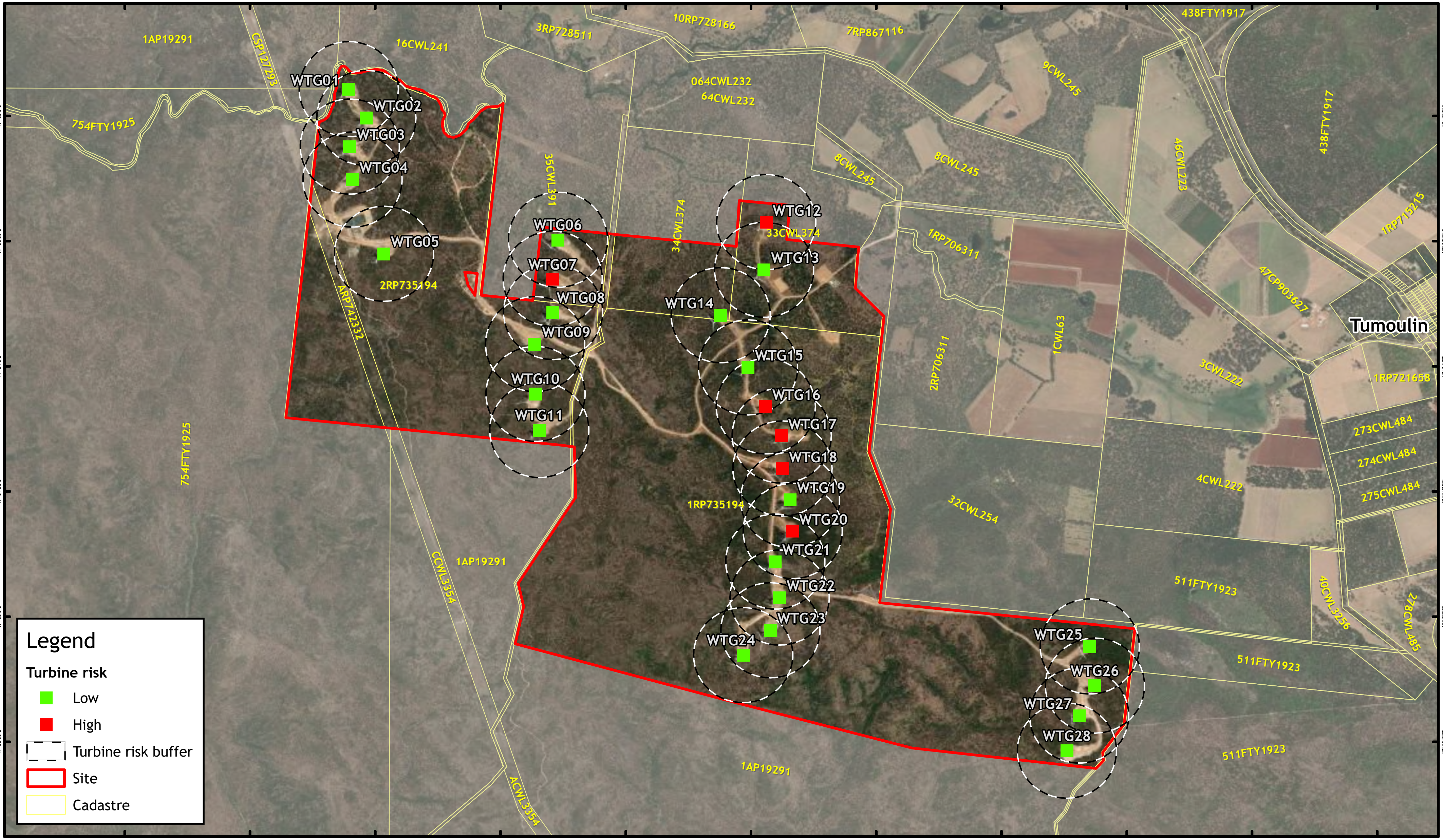
White-throated needletail	*Incidental*	*YES*	Mar-23	Mar-25	17	0	0	NO	<350m
White-throated needletail	*Carcass Search*	*YES*	Nov-23	Nov-25	1	1	0	NO	
White-throated needletail	*Carcass Search*	*YES*	Nov-23	Nov-25	18	1	0	Yes	
Fork-tailed swift	*Carcass Search*	*YES*	Jan-24	Jan-26	12	1	0	Yes	
Black-faced monarch	*Incidental*	*De-listed*	Mar-24	Mar-26	21	1	0	Yes	
Black-faced monarch	*Incidental*	*De-listed*	Mar-24	Mar-26	24	1	0	Yes	
White-throated needletail	*Carcass Search*	*YES*	Oct-24	Oct-26	20	1	0	NO	
White-throated needletail	*Carcass Search*	*YES*	Dec-24	Dec-26	7	1	0	NO	

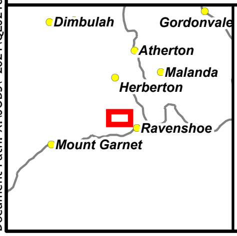
Table 16: Turbine risk profiles. Pending no additional observation of significant species these are the forecasted turbines to monitor from February to April 2025. Turbine carcass monitoring subject to changes of risk profiles.

WTG	Initial Monitoring Requisite	Current Risk Profile Feb 25	Carcass Monitoring Update Feb 2025	Carcass Monitoring Update March 2025	Carcass Monitoring Update April 2025
1	YES	Low	YES[D]	YES[D]	YES[D]
2		Low	NO	NO	NO
3	YES	Low	YES[D]	YES[D]	YES[D]
4		Low	YES	NO[F]	NO[F]
5	YES	Low	YES[D]	YES[D]	YES[D]
6	YES	Low	YES[D]	YES[D]	YES[D]
7		High[B]	YES[B]	YES[B]	YES[B]
8	YES	Low	YES	YES	YES
9		Low	NO	NO	NO
10	YES	Low	YES[D]	YES[D]	YES[D]
11		Low	NO	NO	NO
12	YES	High[A]	YES[D]	YES[D]	YES[D]
13		Low	NO	NO	NO
14	YES	Low	YES[D]	YES[D]	YES[D]
15		Low	NO	NO	NO
16	YES	High[A]	YES[A]	YES[A]	YES[A]
17		High[A]	YES[A]	YES[A]	YES[A]
18	YES	High[B]	YES[B]	YES[B]	YES[B]
19	YES	Low	YES[D]	YES[D]	YES[D]
20		High[B]	YES[B]	YES[B]	YES[B]
21	YES	Low[E]	YES[D]	YES[D]	YES[D]
22		Low	NO	NO	NO
23		Low	NO	NO	NO
24	YES	Low[E]	YES[D]	YES[D]	YES[D]
25	YES	Low	YES[D]	YES[D]	YES[D]
26		Low	NO	NO	NO
27		Low	NO	NO	NO
28	YES	Low	YES[D]	YES[D]	YES[D]

[A] Significant species carcass found at this location during incidental searches since WTGs became operational (see Table 15).
[B] White-throated needletail carcass detected, December 2024.

[C] Spectacled flying-fox observed at turbine site during the 2020 dry season BBUS
[D] 'Low risk' turbines nominated within the BBAMP for monitoring effort prior to commissioning.
[E] Previously high-risk but downgraded to low risk because black-faced monarch removed from EPBC listing.
[F] Two-years since significant species detected, downgraded to low-risk.





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Kilometres

Coordinate System: GCS GDA 1994

Notes:
Aerial Imagery: © ESRI 2023
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Rev	Description	Drawn	Approved	Date
A	Issued for Use	GO	DJ	28/02/2025

e2m

FIGURE 7: TURBINE RISK PROFILES

BIRD AND BAT UTILISATION
2024 DRY SEASON MONITORING REPORT
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
1 of 1	QEJ21046	A

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4 Conclusion

Kaban Wind Farm engaged E2M to conduct post-commissioning bird and bat utilisation surveys at the Kaban Green Power Hub during the 2024 dry season. These surveys were undertaken to meet the requirements of Conditions 5A, 6, 7, 9 and 11 of the EPBC Act. Variation of Conditions attached to the approval EPBC 2018/8289 received from DAWE on 10 August 2022. The October 2024 dry season survey is the final survey of four scheduled post-commissioning surveys required under the conditions of approval for the Project.

Specifically, the survey aimed to evaluate bird and bat utilisation of turbine sites during the dry-season to:

- Assess the turbine collision risk for potentially occurring threatened and migratory bird and bat species; and
- Develop a turbine collision 'risk profile' for each turbine based on the results of the bird and bat utilisation surveys.

Key findings from the current assessment are summarised below:

- Bird utilisation:
  - No threatened bird species or migratory bird species were observed during the 2024 dry season survey.
  - A total of 47 bird species were recorded across the Site (44 during fixed-point surveys).
  - As with previous surveys, most bird species observed were woodland species,
  - 97.4% of birds observed occurred below the RSA height. Seven observations from one species (wedge-tailed eagle) recorded at the RSA height and one observation of the wedge-tailed eagle above the RSA along with one record of 6 sarus crane also above RSA.
  - Previous BBUS has identified the white-throated needletail utilising the airspace at RSA height.
  - Incidental observation of migratory bird carcasses, post operation, have identified that the white-throated needletail and fork-tailed swift are using the airspace above the Project
  - Rufous fantail, black-faced monarch and the satin flycatcher have been delisted from the EPBC migratory bird list, and the turbine profiling has been adjusted accordingly, with WTG04 downgraded from high-risk to low-risk.
  - There were several high-risk turbines downgraded to low-risk as per the risk profile definition within the EPBC approval.
- Bat utilisation:
  - There were no threatened microbats or threatened flying-fox detected during this BBUS.

5 Recommendations

This was the last scheduled BBUS under the current Bird and Bat Adaptive Management Plan. (E2M, 2021). As such, it is recommended that all BBUS data be consolidated and reviewed, along with monthly carcass search and incidental carcass finds, to inform the BBAMP revision. The revised monitoring schedule and design should be supported by a statistically robust process and take the following items into consideration:

- If, and when further BBUS are necessary
- What monthly carcass search effort is needed and timing
- Update trigger values from current population estimates, for each threatened and migratory species, including spectacled flying-fox
- Ensure revised trigger values and trigger value assessment timing are clear and site appropriate, to ensure the protection of threatened species but are relevant and are practicable and based on trends not assumptions.
- Ensure revised monitoring and design considers the importance of capturing appropriate monitoring for those species known to exist on-site, with a special consideration for migratory species such as the white-throated needletail.

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Appendix A Species list

Table 17: Bird species

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
Australian king-parrot	*Alisterus scapularis*		✓						
Australian magpie	*Cracticus tibicen*	✓	✓	✓	✓	✓	✓	✓	✓
Australian owlet-nightjar	*Aegotheles cristatus*				✓				
Australian swiftlets	*Aerodramus terraereginae*							✓	
Australian pelican	*Pelecanus conspicillatus*		✓						
Australian raven								✓	
Australian wood duck	*Chenonetta jubata*		✓						
banded honeyeater	*Certhionyx pectoralis*	✓							
barking owl	*Ninox connivens*			✓					
bar-shouldered dove	*Geopelia humeralis*		✓						
barn owl	*Tyto alba*		✓	✓			✓		✓
black kite	*Milvus migrans*		✓	✓				✓	
black-chinned honeyeater	*Melithreptus gularis*			✓					
black-faced cuckoo-shrike	*Coracina novaehollandiae*		✓	✓	✓	✓	✓	✓	✓
black-faced monarch	*Monarcha melanopsis*		✓						
blue-faced honeyeater	*Entomyzon cyanotis*		✓						
blue-winged kookaburra	*Dacelo leachii*		✓	✓					

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
brolga	*Grus rubicunda*		✓	✓				✓	
brown falcon	*Falco berigora*		✓						
brown goshawk	*Accipiter fasciatus*			✓			✓	✓	
brown honeyeater	*Lichmera indistincta*	✓	✓	✓	✓	✓	✓	✓	✓
brown quail	*Coturnix ypsilophora*		✓	✓	✓		✓	✓	
brown treecreeper	*Climacteris picumnus*						✓		
brush cuckoo	*Cacomantis variolosus*				✓			✓	✓
buff-rumped thornbill	*Acanthiza reguloides*		✓	✓	✓	✓	✓	✓	✓
bush stone-curlew	*Burhinus grallarius*		✓	✓	✓		✓		✓
cicadabird	*Coracina tenuirostris*	✓		✓	✓			✓	✓
Channel-billed cuckoo	*Scythrops novaehollandiae*								✓
collared sparrowhawk	*Accipiter cirrocephalus*		✓						
common bronzewing	*Phaps chalcoptera*		✓				✓		
Eastern koel	*Eudynamys orientalis*								✓
eastern spinebill	*Acanthorhynchus tenuirostris*	✓					✓		
eastern whipbird	*Psophodes olivaceus*		✓	✓					
eastern yellow robin	*Eopsaltria australis*	✓	✓	✓			✓	✓	✓
fantail cuckoo	*Rhipidura rufifrons*						✓	✓	

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
forest kingfisher	*Todiramphus macleayii*		✓	✓			✓		
fuscous honeyeater	*Lichenostomus fuscus*				✓				
golden whistler	*Pachycephala pectoralis*	✓							
great cormorant	*Phalacrocorax carbo*				✓				
grey butcherbird	*Cracticus torquatus*		✓	✓	✓		✓	✓	✓
grey fantail	*Rhipidura albiscapa*		✓	✓	✓	✓	✓	✓	✓
grey shrike-thrush	*Colluricincla harmonica*	✓	✓	✓	✓	✓	✓	✓	✓
hardhead	*Aythya australis*		✓						
Horsfield's bronze-cuckoo	*Chrysococcyx basalis*		✓						
jacky winter	*Microeca fascinans*		✓						
laughing kookaburra	*Dacelo novaeguineae*	✓	✓	✓	✓	✓	✓	✓	✓
leaden flycatcher	*Myiagra rubecula*	✓		✓	✓	✓	✓	✓	✓
Lewin's honeyeater	*Meliphaga lewinii*	✓	✓			✓	✓	✓	✓
little bronze-cuckoo	*Chrysococcyx minutillus*			✓			✓		
little friarbird	*Philemon citreogularis*		✓	✓			✓	✓	
little kingfisher	*Alcedo pusilla*	✓							
little lorikeet	*Parvipsitta pusilla*		✓	✓	✓		✓	✓	✓
little pied cormorant	*Microcarbo melanoleucos*		✓						
magpie-lark	*Grallina cyanoleuca*	✓	✓		✓	✓	✓	✓	

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
mistletoebird	*Dicaeum hirundinaceum*		✓	✓	✓		✓	✓	
nankeen kestrel	*Falco cenchroides*			✓	✓		✓		
noisy friarbird	*Philemon corniculatus*	✓	✓	✓	✓	✓	✓	✓	✓
noisy miner	*Manorina melanocephala*	✓	✓	✓	✓	✓	✓	✓	✓
olive-backed oriole	*Oriolus sagittatus*	✓	✓		✓			✓	✓
Pacific black duck	*Anas superciliosa*		✓		✓				
pale-headed rosella	*Platycercus adscitus*	✓	✓	✓	✓	✓	✓	✓	✓
pallid cuckoo	*Cacomantis pallidus*	✓							
peaceful dove	*Geopelia striata*		✓	✓	✓	✓	✓	✓	✓
pheasant coucal	*Centropus phasianinus*	✓	✓	✓	✓	✓	✓	✓	
pied butcherbird	*Cracticus nigrogularis*	✓	✓	✓	✓	✓	✓	✓	✓
pied currawong	*Strepera graculina*	✓	✓	✓	✓	✓	✓	✓	✓
rainbow bee-eater	*Merops ornatus*	✓	✓	✓	✓	✓	✓	✓	
rainbow lorikeet	*Trichoglossus haematodus moluccanus*	✓	✓	✓	✓	✓	✓	✓	✓
red-backed button-quail	*Turnix maculosus*		✓		✓				
red-backed fairy-wren	*Malurus melanocephalus*	✓	✓	✓	✓	✓	✓	✓	✓
red-browed finch	*Neochmia temporalis*	✓	✓	✓		✓		✓	✓
red-tailed black-cockatoo	*Calyptorhynchus banksii*		✓	✓			✓		

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
rufous fantail	*Rhipidura rufifrons*								✓
rufous whistler	*Pachycephala rufiventris*		✓	✓	✓	✓	✓	✓	✓
sacred kingfisher	*Todiramphus sanctus*		✓						✓
sarus crane	*Antigone antigone*			✓			✓		✓
satin flycatcher	*Myiagra cyanoleuca*							✓	
scaly-breasted lorikeet	*Trichoglossus chlorolepidotus*	✓	✓	✓	✓	✓	✓	✓	✓
scarlet honeyeater	*Myzomela sanguinolenta*		✓	✓	✓		✓	✓	✓
shining bronze-cuckoo	*Chrysococcyx lucidus*						✓		✓
southern boobook	*Ninox novaeseelandiae*			✓					
spangled drongo	*Dicrurus bracteatus*		✓	✓	✓			✓	✓
spotted pardalote	*Pardalotus punctatus*		✓	✓	✓	✓	✓	✓	✓
squatter pigeon (northern subspecies)	*Geophaps scripta peninsulae*			✓	✓	✓	✓	✓	✓
striated pardalote	*Pardalotus striatus*	✓	✓	✓	✓	✓	✓	✓	
Torresian crow	*Corvus orru*	✓	✓	✓	✓		✓		
varied sittella	*Daphoenositta chrysoptera*	✓		✓	✓	✓	✓	✓	
varied triller	*Lalage leucomela*	✓							
wedge-tailed eagle	*Aquila audax*	✓	✓	✓	✓	✓	✓	✓	✓
weebill	*Smicrornis brevirostris*	✓	✓	✓	✓	✓	✓	✓	

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
whistling kite	*Haliastur sphenurus*		✓	✓	✓				✓
white-bellied cuckoo-shrike	*Coracina papuensis*	✓	✓	✓	✓	✓	✓	✓	✓
white-browed scrubwren	*Sericornis frontalis*	✓							✓
white-cheeked honeyeater	*Philidonyris niger*						✓		
white-faced heron	*Egretta novaehollandiae*		✓	✓					
white-necked heron	*Ardea pacifica*		✓						
white-throated gerygone	*Gerygone olivacea*		✓	✓	✓		✓	✓	✓
white-throated honeyeater	*Melithreptus albogularis*		✓	✓	✓	✓	✓	✓	✓
white-throated needletail	*Hirundapus caudacutus*			✓					
white-throated nightjar	*Eurostopodus mystacalis*				✓		✓		
white-throated treecreeper	*Cormobates leucophaea*	✓	✓			✓			
white-winged triller	*Lalage sueurii*	✓							✓
willie wagtail	*Rhipidura leucophrys*	✓	✓		✓	✓	✓	✓	✓
yellow thornbill	*Acanthiza nana*					✓			
yellow-faced honeyeater	*Caligavis chrysops*	✓	✓	✓	✓	✓	✓	✓	✓
yellow-tinted honeyeater	*Ptilotula flavescens*							✓	

Table 18: Microbat and flying-fox species

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
bare-rumped sheathtail bat	*Saccolaimus saccolaimus*					✓			
Chocolate wattled bat	*Chalinolobus morio*							✓	✓
eastern bentwing bat	*Miniopterus orianae oceanensis*	✓	✓	✓	✓	✓		✓	✓
eastern cave bat	*Vespadelus troughtoni*				✓	✓			✓
eastern forest bat	*Vespadelus pumilus*					✓			✓
eastern freetail bat	*Ozimops ridei*	✓	✓	✓	✓	✓	✓	✓	✓
eastern horseshoe bat	*Rhinolophus megaphyllus*	✓	✓	✓	✓	✓		✓	✓
eastern bentwing bat	*Miniopterus orianae oceanensis*						✓	✓	
eastern forest bat	*Vespadelus pumilus*						✓		✓
eastern horsehoe bat	*Rhinolophus megaphyllus*						✓		
forest pipistrelle	*Pipistrellus adamsi*					✓		✓	✓
ghost bat	*Pteropus conspicillatus*	✓							
Gould's wattled bat	*Chalinolobus gouldii*	✓	✓	✓	✓	✓	✓	✓	✓
greater broad-nosed bat	*Scoteanax rueppellii*			✓	✓	✓	✓	✓	✓
hoary wattled bat	*Chalinolobus nigrogriseus*	✓	✓	✓	✓	✓	✓	✓	✓
inland broad-nosed bat	*Scotorepens balstoni*				✓				✓
little bentwing bat	*Miniopterus australis*	✓	✓	✓	✓	✓	✓	✓	✓

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
little broad-nosed bat	*Scotorepens greyii*				✓	✓	✓	✓	✓
northern broad-nosed bat	*Scotorepens sanborni*				✓			✓	
greater northern freetail bat	*Chaerephon jobensis*		✓	✓	✓	✓	✓	✓	✓
northern free-tailed bat	*Ozimops lumsdenae*			✓	✓				✓
south-eastern broad-nosed bat	*Scotorepens orion*				✓				
Troughton's sheathtail bat	*Taphozous troughtoni*				✓	✓	✓	✓	
white-striped freetail bat	*Austronomus australis*	✓	✓	✓	✓	✓	✓	✓	✓
yellow-bellied sheathtail-bat	*Saccolaimus flaviventris*		✓	✓	✓	✓	✓	✓	✓
	Austronomus australis / Chaerephon jobensis				✓	✓			
	Chalinolobus gouldii/ Ozimops ridei			✓		✓		✓	✓
	Chalinolobus gouldii / Scotorepens balstoni				✓				
	Chalinolobus nigrogriseus / Scotorepens greyii				✓	✓	✓		
	Chalinolobus nigrogriseus / Scotorepens spp.		✓	✓		✓		✓	✓
	Miniopterus australis / Vespadelus pumilus				✓		✓		✓
	M. o. oceanensis / P. adamsi					✓			✓

Common name	Scientific name	BLA 2017	E2M 2020	E2M 2021	E2M 2022	E2M 2023 Wet	E2M 2023 Dry	E2M 2024 Wet	E2M 2024 Dry
	Nyctophilus sp.		✓	✓					
	Nyctophilus sp. / Myotis macropus	✓	✓			✓			
	Ozimops lumsdenae / Taphozous troughtoni					✓			
	Ozimops ridei and Chalinolobus nigrogriseus			✓			✓		
	Ozimops ridei / Scoteanax rueppellii				✓				
	P. adamsi or Vespadelus troughtoni						✓		
	Scotorepens greyii / Scotorepens sanborni	✓	✓	✓	✓	✓	✓	✓	✓
	S. sanborni / M. o. oceanensis						✓		
	Scotorepens orion / Scoteanax rueppellii	✓							
	S. rueppellii or S. orion						✓		✓
	V. pumilus / M. australis					✓			
	Vespadelus troughtoni / Chalinolobus morio		✓						
spectacled flying-fox	*Pteropus conspicillatus*	✓							

Appendix B Fixed-point survey results

Table 19: Fixed-point survey results

	Turbine number									
Species	WTG01	WTG02	WTG03	WTG04	WTG05	WTG06	WTG07	WTG08	WTG09	WTG10
Australian magpie	2		2		1	2	1			
black-faced cuckoo-shrike	1		1			1		1	1	
brown honeyeater										
brush cuckoo										
buff-rumped thornbill								1	1	
Channel-billed Cuckoo						1				
cicada bird	1					1				1
eastern koel						1				
eastern yellow robin										
grey butcherbird						1				
grey fantail										
grey shrike-thrush	1									1
laughing kookaburra										
leaden flycatcher		1		1						
Lewin's honeyeater		1								
little lorikeet										
noisy friarbird	1		1				1	1		
noisy miner					1	3				
olive-backed oriole										
pale-headed rosella	2									

	Turbine number									
Species	WTG01	WTG02	WTG03	WTG04	WTG05	WTG06	WTG07	WTG08	WTG09	WTG10
peaceful dove										
pied butcherbird	1		3		1	1	1	1	1	1
pied currawong	1									
rainbow lorikeet			2			1				1
red-backed fairy-wren	3		1	3					1	1
red-browed finch										
rufous fantail										
rufous whistler	1		1	2			4	5	1	1
sacred kingfisher										
sarus crane										
scaly-breasted lorikeet										
scarlet honeyeater	1									
shining-bronze cuckoo										
spangled drongo										
spotted pardalote										
wedge-tailed eagle				1						
whistling kite							1	1		
white-bellied cuckoo-shrike		1			1					1
white-browed scrubwren										
white-throated gerygone										
white-throated honeyeater							1	2	2	1

Turbine number										
Species	WTG01	WTG02	WTG03	WTG04	WTG05	WTG06	WTG07	WTG08	WTG09	WTG10
white-winged triller			1							
willie wagtail										
yellow-faced honeyeater	1							1		2
Grand Total	**16**	**3**	**12**	**7**	**4**	**12**	**9**	**13**	**7**	**11**

Turbine number										
Species	WTG11	WTG12	WTG13	WTG14	WTG15	WTG16	WTG17	WTG18	WTG19	WTG20
Australian magpie			4	1		2				
black-faced cuckoo-shrike	3		2	1	1			1		1
brown honeyeater						2	2			1
brush cuckoo		1		2		1				
buff-rumped thornbill										
Channel-billed Cuckoo				1						
cicada bird		1	5		1	3		1	1	3
eastern koel			1		2		1			
eastern yellow robin			1		4		1			
grey butcherbird						1				
grey fantail	1	2					1	1	1	2
grey shrike-thrush	1					1				1
laughing kookaburra	1								2	3
leaden flycatcher		2	1	1	1	2	1			1

Turbine number										
Species	WTG11	WTG12	WTG13	WTG14	WTG15	WTG16	WTG17	WTG18	WTG19	WTG20
Lewin's honeyeater					1	1	1			
little lorikeet					2					
noisy friarbird		5	4	1	1	1	1	2		1
noisy miner		1	4		2	1				
olive-backed oriole					1					
pale-headed rosella			2						1	
peaceful dove			1	1						
pied butcherbird	3		1		1			1		
pied currawong	1		1			2	1		2	4
rainbow lorikeet	1			1			2			
red-backed fairy-wren	2	2	1			4		4		1
red-browed finch		3	1	2		2			1	1
rufous fantail					1					
rufous whistler	1	3	4	2	5	4	4	2		3
sacred kingfisher		2	1							
sarus crane										6
scaly-breasted lorikeet		4								
scarlet honeyeater		2	4	1	2		1	1		
shining-bronze cuckoo			1	1						
spangled drongo								1		
spotted pardalote			1		1					

Species	Turbine number									
Species	WTG11	WTG12	WTG13	WTG14	WTG15	WTG16	WTG17	WTG18	WTG19	WTG20
wedge-tailed eagle		1	1							1
whistling kite		1								
white-bellied cuckoo-shrike	1		1			1			2	1
white-browed scrubwren										1
white-throated gerygone					1	2	1		1	1
white-throated honeyeater	2	3		1		1	1			
white-winged triller										
willie wagtail					2					
yellow-faced honeyeater	4	2	2	1	4		1	2		6
Grand Total	**21**	**35**	**43**	**17**	**29**	**32**	**19**	**16**	**11**	**37**

Species	Turbine number							
Species	WTG21	WTG22	WTG23	WTG24	WTG25	WTG26	WTG27	WTG28
Australian magpie	2	2						
black-faced cuckoo-shrike				1			2	1
brown honeyeater	1			1				
brush cuckoo	1							
buff-rumped thornbill								
Channel-billed Cuckoo								
cicada bird	4	3	2	1			1	
eastern koel								

	Turbine number							
Species	WTG21	WTG22	WTG23	WTG24	WTG25	WTG26	WTG27	WTG28
eastern yellow robin								
grey butcherbird								
grey fantail	2	1			4			1
grey shrike-thrush	1	1	2					
laughing kookaburra	1	1					2	
leaden flycatcher		2				1		
Lewin's honeyeater							1	
little lorikeet	3				1			
noisy friarbird	1	6	6	3			1	
noisy miner	1							1
olive-backed oriole								
pale-headed rosella		1						
peaceful dove					2			
pied butcherbird		3						
pied currawong	2	1						
rainbow lorikeet		1	2	2		2		1
red-backed fairy-wren	1	1	1	3		1		2
red-browed finch				1	1	1		
rufous fantail								
rufous whistler	2	3			2		1	1
sacred kingfisher								

Species	Turbine number							
	WTG21	WTG22	WTG23	WTG24	WTG25	WTG26	WTG27	WTG28
sarus crane								
scaly-breasted lorikeet	1							
scarlet honeyeater		1			2			
shining-bronze cuckoo		1	1					
spangled drongo		1						
spotted pardalote								
wedge-tailed eagle	1			2				
whistling kite							1	
white-bellied cuckoo-shrike						2	1	2
white-browed scrubwren								
white-throated gerygone	1							1
white-throated honeyeater		1	1	1	1		1	
white-winged triller								
willie wagtail	1							
yellow-faced honeyeater	4	2	3	1	6	3	3	6
Grand Total	30	32	18	16	18	10	14	16

Appendix C Bat call analysis

Microbat Call Identification Report

Prepared for ("Client"):	E2M Pty Ltd
Survey location/project name:	Kaban BUS, late dry season 2024
Survey dates:	28th October – 6th November 2024
Client project reference:	
Job no.:	E2M-2409
Report date:	4 January 2025

Methods

Data received

Balance! Environmental received 33,185 full-spectrum ultrasonic acoustic files (WAV files), which were recorded at 28 sites using Anabat Swift detectors (Titley Scientific, Brisbane). Each site was sampled for two consecutive nights between 28th October and 6th November 2024.

Bat-call analysis

Analyses were performed with *Anabat Insight* (Version 2.1.2; Titley Scientific).

All WAV files were first processed with a generic noise filter to exclude files containing only non-bat noise. Files that passed the filter (i.e., contained bat calls) were then processed as follows:

- A Decision Tree Analysis was used to group and label files according to the average zero-crossing metrics of calls within each file. Separation was based primarily on the characteristic frequency (Fc) metric, but metrics such as pulse duration (Dur), slope of characteristic section (Sc) and time between pulses (TBC) were included to further refine call recognition by the Decision Tree.
- Species present within each Decision Tree group were then confirmed using a combination of further species-specific metric-based filters and manual review of the call spectrograms.
- Where a Decision Tree group included a large number of files, the species verification process continued only until all potential species within the group were identified for each site. The remaining files retained the group label.

Manual species confirmation was based on comparing visual properties of call spectrograms and derived metrics with those of regionally relevant reference calls and/or with published call descriptions (e.g., Reinhold et al. 2001, Milne 2002). The likelihood of species' occurrence on site was confirmed by referring to published distributional information (e.g., Australasian Bat Society 2021, Churchill 2008; Baker & Gynther 2023).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/.

Species nomenclature follows Armstrong *et al.* (2020).

Results & Discussion

The noise filter excluded 20,053 WAV files from further analysis. A total of 13,885 individual bat call passes were identified in the remaining 13,132 files. Some 63% (8748) of those calls were reliably attributed to 18 distinct taxa, while the remainder were assigned to six "unresolved" call groups.

The positively identified calls were attributed to 16 distinct species plus two undifferentiated congeneric species groups (see **Table 1**). *Nyctophilus* species' calls cannot be reliably differentiated and three species – *N. bifax, N. geoffroyi, N. gouldi* - potentially occur in the study area. Similarly, several low-frequency (~35-36 kHz) *Scotorepens* calls represented *S. balstoni* and/or *S. orion*.

Most unresolved calls belonged to species that were positively identified from other calls; however, nine calls potentially represent one additional species (*Scotorepens sanborni*) that was not otherwise identified.

Sample call spectrograms for each identified species are presented in **Appendix 1**.

References

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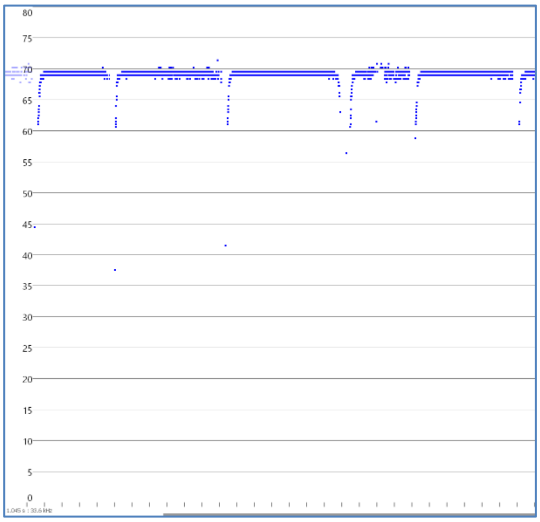
Table 1A Microbat species recorded during the Kaban BUS 2024 late dry season survey, October-November 2024; **Sites WTG01-WTG14**. Number of calls identified per species and unresolved species group per site.

Site:	WTG 01	WTG 02	WTG 03	WTG 04	WTG 05	WTG 06	WTG 07	WTG 08	WTG 09	WTG 10	WTG 11	WTG 12	WTG 13	WTG 14	Species Total
Positively identified calls															
Rhinolophus megaphyllus		6							1						7
Chalinolobus gouldii	44	7	1	10	3	4	72	2	5			18	11	7	184
Chalinolobus morio	8			7	1										16
Chalinolobus nigrogriseus	64	1		1	1	4	12	2	1			1		2	89
Nyctophilus sp.		1	3			1			1			2	1		9
Pipistrellus adamsi	4	3	1	3	1	1	1	1	1						16
Scoteanax rueppellii							1					1	1	17	20
Scotorepens balstoni / S. orion														1	1
Scotorepens greyii	1	2			7	7	3	1	1						22
Vespadelus pumilus									9						9
Vespadelus troughtoni			2	1	6										9
Miniopterus australis	34	99	1	20	62	10	12	3	292	8	1	27	7	10	586
Miniopterus orianae oceanensis	39	7	9	7	17	15	28	1	10	9	6	28	7	39	222
Austronomus australis	11	7	6	5	9	1	22	10	11	8	13	6	1	10	120
Chaerephon jobensis							1								1
Ozimops lumsdenae															
Ozimops ridei	36	1	6		11	1	9	1	23			15	102	73	278
Saccolaimus flaviventris	121	28	14	11	217		9	3	31	1	2	526	973	120	2056
Unresolved calls															0
C. gouldii / O. ridei	20						1								21
C. nigrogriseus / Scotorepens sp.	91	5	9	22	36	12	64	1	8	1		44	3	21	317
M. australis / V. pumilus	4					1			13						18
M. o. oceanensis / P. adamsi				1		1		1		1	2	2			8
S. rueppellii / Scotorepens sp.	400	1	1			1	5					2	9	5	424
S. greyii / S. sanborni					6							3			9
Site Total	877	168	53	88	377	59	240	26	407	28	24	675	1115	305	4442

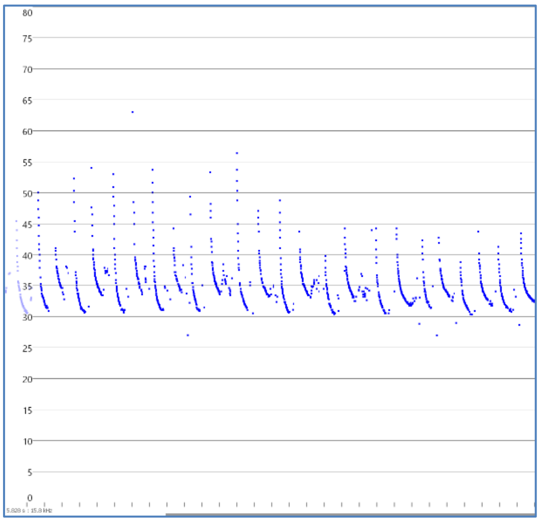
Table 1B Microbat species recorded during the Kaban BUS 2024 late dry season survey, October-November 2024; **Sites WTG15-WTG28**
Number of calls identified per species and unresolved species group per site.

Site:	WTG 15	WTG 16	WTG 17	WTG 18	WTG 19	WTG 20	WTG 21	WTG 22	WTG 23	WTG 24	WTG 25	WTG 26	WTG 27	WTG 28	Species Total
Positively identified calls															
Rhinolophus megaphyllus						1						1			2
Chalinolobus gouldii		2				4	27	4	8	3					48
Chalinolobus morio															0
Chalinolobus nigrogriseus	2	12	12	3	20	18	5	1	118	1	34	3	17	19	265
Nyctophilus sp.	1	2	1		1			1			2		3		11
Pipistrellus adamsi					2			1				2		2	7
Scoteanax rueppellii		22					1	1			1				25
Scotorepens balstoni / S. orion		1			1				443			1		1	447
Scotorepens greyii	1	4		1		2			9		18	55	13	27	130
Vespadelus pumilus		1			2	3								1	7
Vespadelus troughtoni															0
Miniopterus australis	9	193	71	5	109	34	201	82	1	3	68	158	9	172	1115
Miniopterus orianae oceanensis	34	71	54	5	8	9	67	66	16	7	37	68	10	72	524
Austronomus australis	27	10	1		9	1	4	1	1	12	9	19	13	13	120
Chaerephon jobensis									1			1		5	7
Ozimops lumsdenae								1		12	1	1	1	2	18
Ozimops ridei	58	87	109	5	24	738	39	78	1	17	139	105	225	18	1643
Saccolaimus flaviventris	326	196	26	18	44	7	13	2		2	59	16	18	7	734
Unresolved calls															
C. gouldii / O. ridei									1						1
C. nigrogriseus / Scotorepens sp.	45	513	92	117	18	1050	389	25	407	52	204	424	54	5	3395
M. australis / V. pumilus		6			3	6	6								21
M. o. oceanensis / P. adamsi		1	1	3	1	1	1					3	1		12
S. rueppellii / Scotorepens sp.	3	9	3	1	4	66	154	5	558		3	66	5		877
S. greyii / S. sanborni				1	5				16	2	2		6	2	34
Site Total	506	1130	370	159	251	1940	907	268	1580	111	577	923	375	346	9443

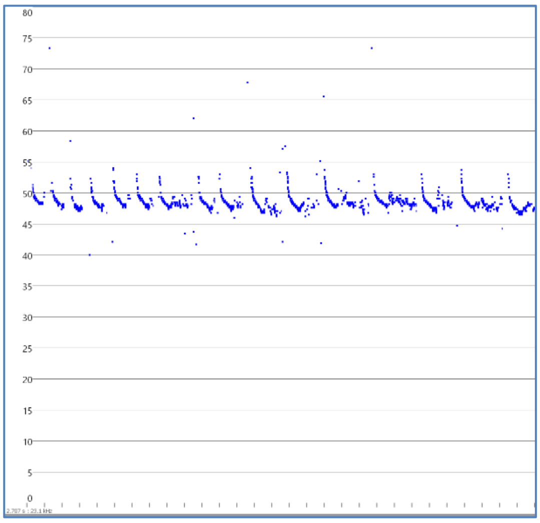
Appendix 1 Representative call sequences from the Kaban BUS, October-November 2024.
x-axis = 10 ms per tick-mark; time between pulses removed (“compressed”)



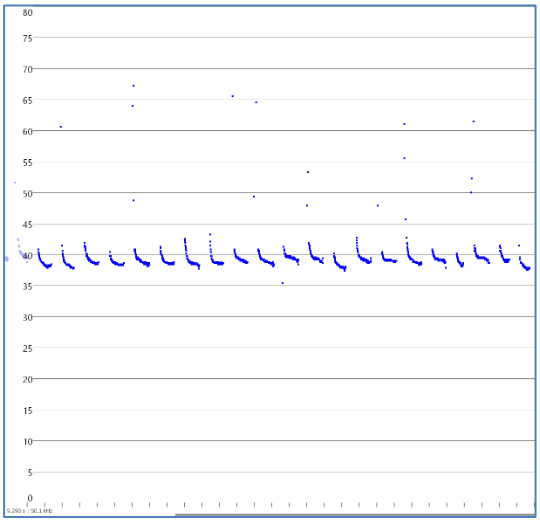
Rhinolophus megaphyllus



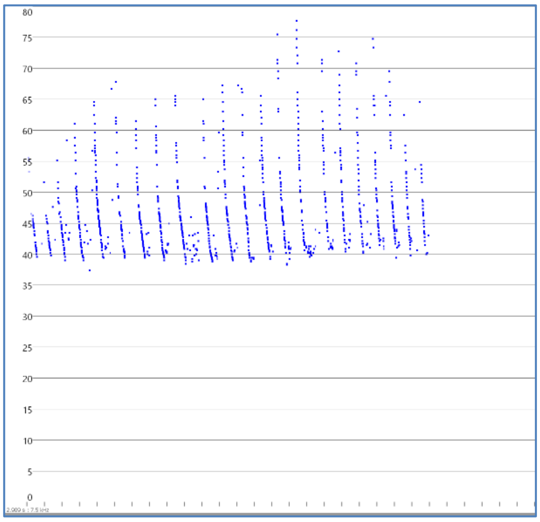
Chalinolobus gouldii



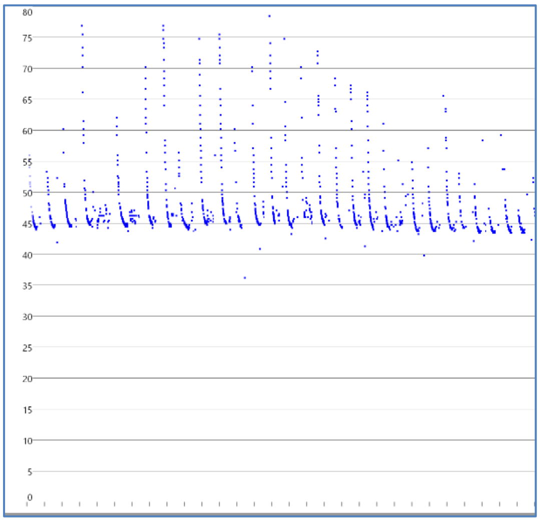
Chalinolobus morio



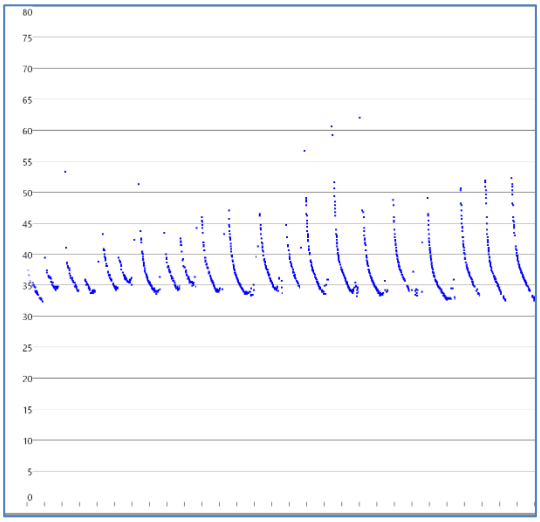
Chalinolobus nigrogriseus



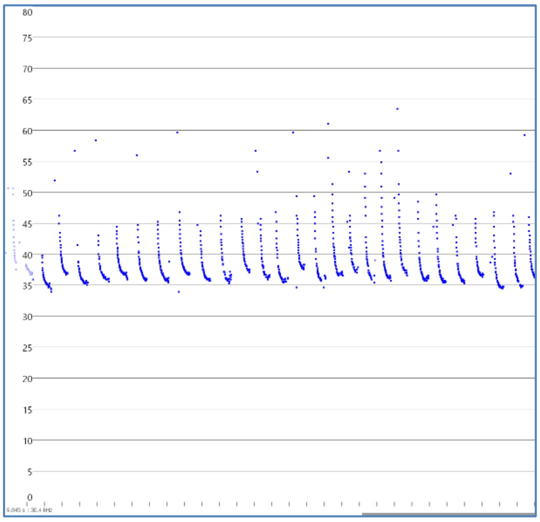
Nyctophilus sp.



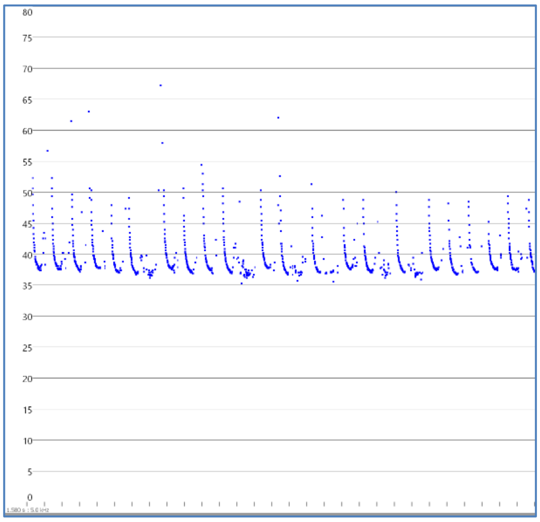
Pipistrellus adamsi



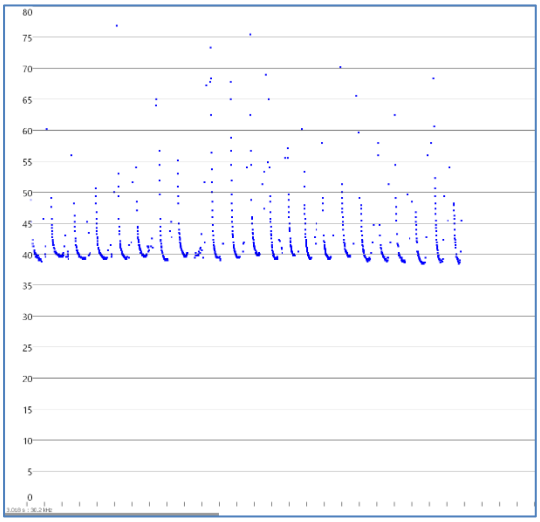
Scoteanax rueppellii



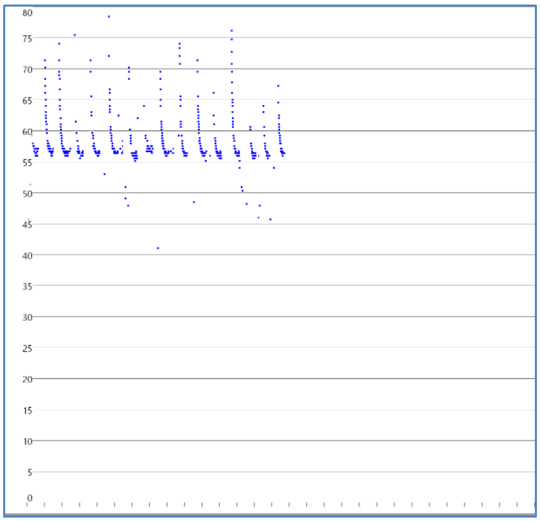
S. balstoni or *S. orion*



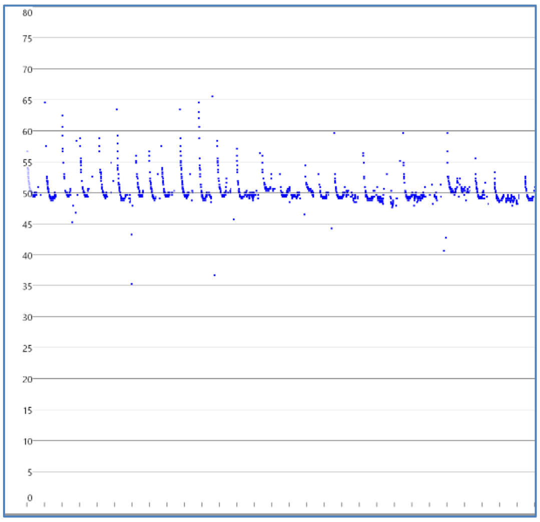
Scotorepens greyii



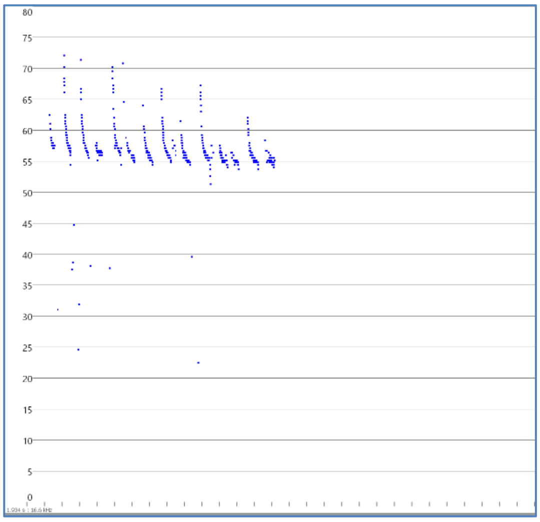
S. greyii or *S. sanborni*



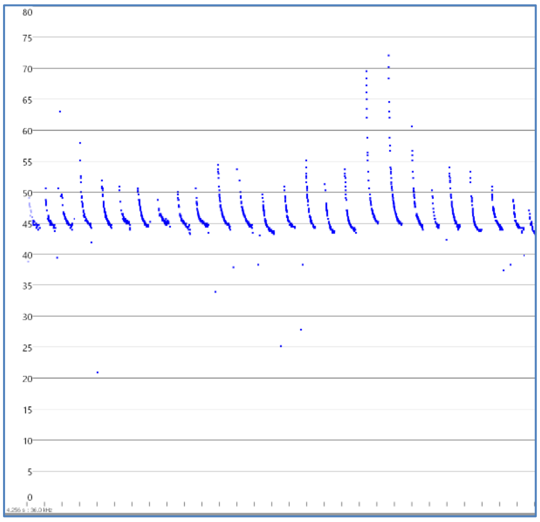
Vespadelus pumilus



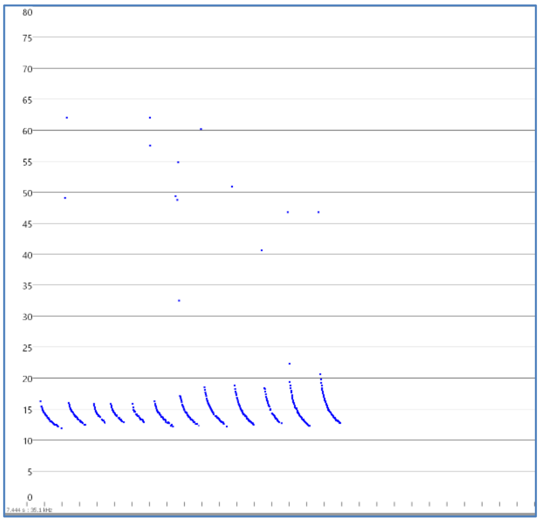
Vespadelus troughtoni



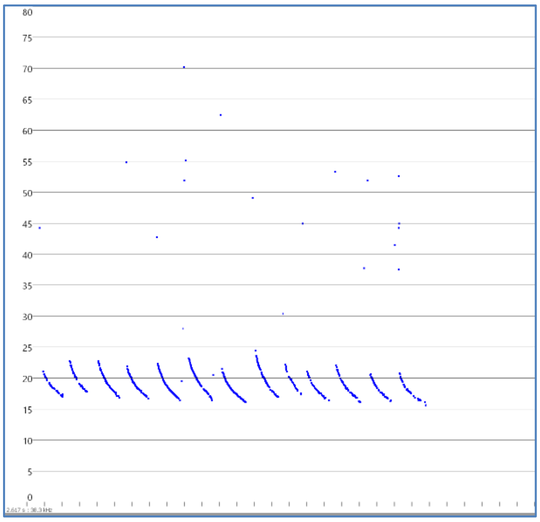
Miniopterus australis



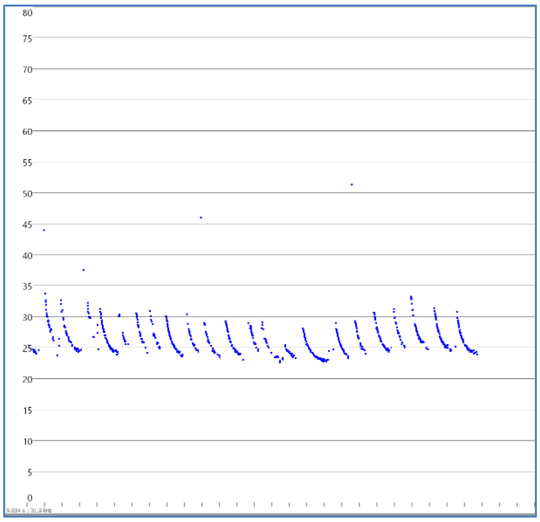
Miniopterus orianae oceanensis



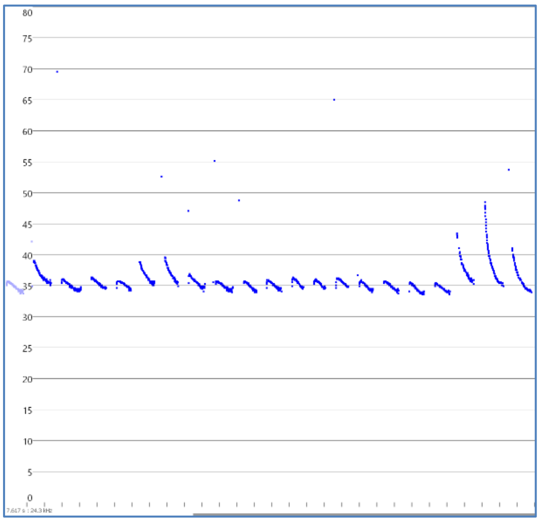
Austronomus australis



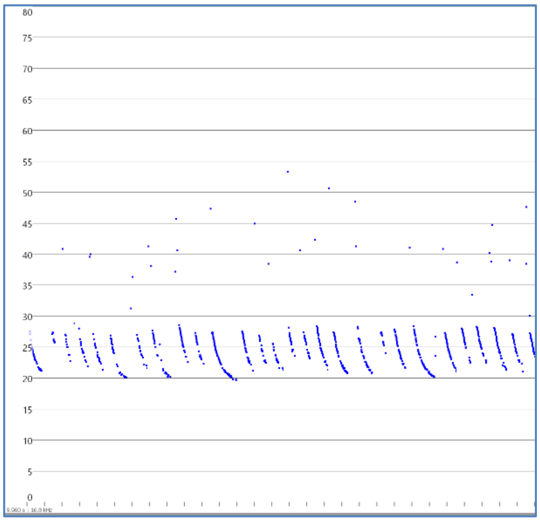
Chaerephon jobensis



Ozimops lumsdenae

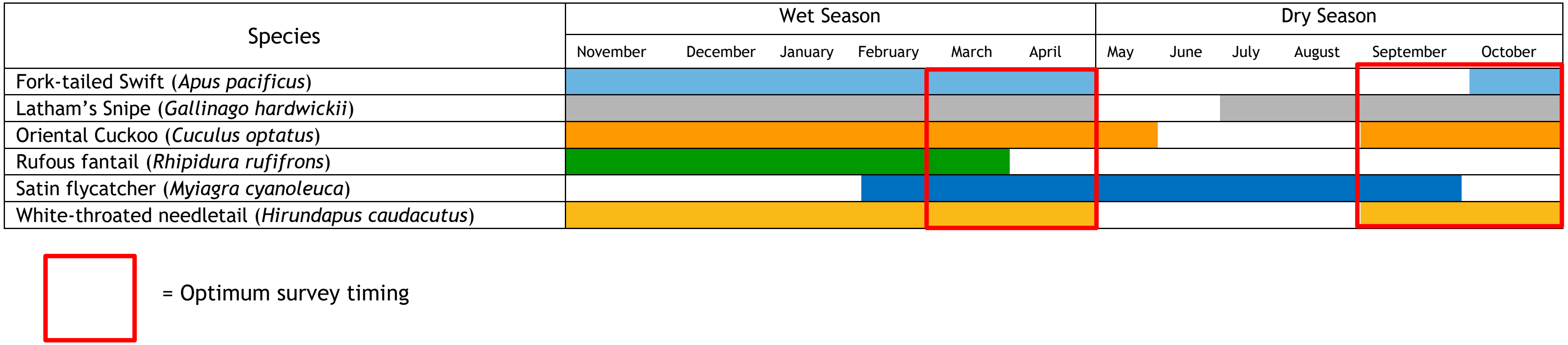


Ozimops ridei



Saccolaimus flaviventris

Appendix D Migratory species predicted time of occurrence within site



Data sources:

- Species Profile and Threats Database (DAWE 2020).
- The Field Guide to the Birds of Australia (Pizzey & Knight 2007).
- Handbook of Australian, New Zealand and Antarctic Birds (Higgins 1999).

Appendix C: BBAMP: Turbine Risk Profiles

Table 1: Threatened species observations within 350m of wind turbine generator (WTG), as of May 2025.

WTG	Risk Profiles	Threatened Species Observed	Date Observed
1	LOW		
2	LOW		
3	HIGH	White-throated needletail	Apr-25
4	LOW		
5	LOW		
6	LOW		
7	HIGH	White-throated needletail	Dec-24
8	LOW		
9	LOW		
10	LOW		
11	LOW		
12	HIGH	Fork-tailed swift	Jan-24
13	LOW		
14	LOW		
15	LOW		
16	LOW		
17	LOW		
18	HIGH	White-throated needletail	Nov-23
19	LOW		
20	HIGH	White-throated needletail	Oct-24
21	LOW		
22	LOW		
23	LOW		
24	LOW		
25	LOW		
26	LOW		
27	LOW		
28	LOW		

Appendix D: BBAMP: Annual Mortality Assessment, 2023 to 2024

Kaban Wind Farm Mortality Estimate - Year 2

Prepared for E2M, 20 November 2024, Ver. 1.0

This report outlines an analysis of bird and bat mortality at Kaban Wind Farm from 2023-09-01 to 2024-09-30, the "second year period" of operation. The analysis is broken into the three related components below:

- Searcher efficiency / detectability – estimated from trials in October 2023 and March 2024
- Scavenger loss rates – estimated from trials in October 2023 and March 2024
- Mortality estimates - based on surveys at 24 turbines, from 2023-09-22 to 2024-09-24

We estimate overall bird and bat mortality, and mortality for the following species of interest:

- Black-faced Monarch
- Fork-tailed Swift
- White-throated Needletail

We note that the following migratory and threatened species are also of interest; however, we have not included them in a mortality analysis as there is no evidence of their mortality in this period. These species are:

- Ghost Bat
- Spectacled Flying Fox
- Latham's Snipe
- Oriental Cuckoo
- Rufous Fantail
- Satin Flycatcher

1 Available data

Turbine data, mortality survey data, and adjunct survey data was provided by E2M.

Species archetype data was taken from Hull and Muir (2010) (bat and small/medium bird archetypes).

1.1 Data cleaning

Carcass finds (formal), incidental finds, searcher efficiency, scavenger efficiency data:

- Unidentifiable/unknown birds were recoded to “Unidentified Bird”
- Unidentifiable/unknown bats were recoded to “Unidentified Bat”
- Capitalisation and hyphenation made consistent

Otherwise, data was used as provided by E2M.

2 Statistical methodology overview

Mortality through collision is an ongoing environmental management issue for wind facilities. Different sites present different risk levels; consequently different sites have different monitoring requirements. In order to estimate the mortality loss at a given site (in a way that is comparable with other facilities) we must account for differences in survey effort, searcher and scavenger efficiency. We used a Monte Carlo method to achieve this.

Best practice estimators project the number of found carcasses (C) up the number of actual mortalities (M). They should account for:

- The probability a carcass will be detected by the searcher (p)
- The probability a carcass is not lost to scavenge or decay prior to the search (r)
- The probability a carcass falls within the searched area (a)
- The fraction of turbines searched (f)

Most mortality estimators, e.g. (M. M. Huso 2011), can be conceptualised as a ratio estimator

$$\hat{M} = \frac{C}{\hat{p} \cdot \hat{r} \cdot \hat{a} \cdot f} \tag{1}$$

with the terms in the denominator providing a “boost factor” to the number of carcasses found, C.

However, a limitation of analytical methods is estimating r when the time between surveys is not constant. In Australia, it is common for the time between searches to vary due to seasonal changes in effort or the use of a pulsed design in which the turbine is searched monthly with a return visit a few days later. Additionally, ratio estimators cannot handle the cases when zero carcasses are found, as zero multiplied by any number still gives zero.

To address this, Symbolix have developed a Monte Carlo algorithm. We have used this method for mortality estimates at over forty wind farms in Australia to date.

Monte Carlo methods (Sawilowsky (2003), Ripley (1987)) simulate a large set of possible survey results, by simulating the actual survey protocol, and sampling from empirical distributions for scavenge loss and searcher efficiency. In this way, we directly sample the probability a carcass was lost before the survey, negating the need to calculate r analytically each time.

We then estimate how many carcasses were truly generated, given the range of searcher and scavenger efficiencies, the survey frequency and coverage, and the true “found” details. After many simulations, we can estimate the likely range of mortalities that could have resulted in the recorded survey outcome (number of carcasses found).

This method has been benchmarked against analytical approaches (M. M. Huso (2011), Korner-Nievergelt et al. (2011)). Its outputs are equivalent but it is able to robustly model more complex survey designs (e.g. pulsed surveys, rotating survey list).

Figure 1 provides an overview of the methodology. A detailed explanation can be found in Stark and Muir (2020).

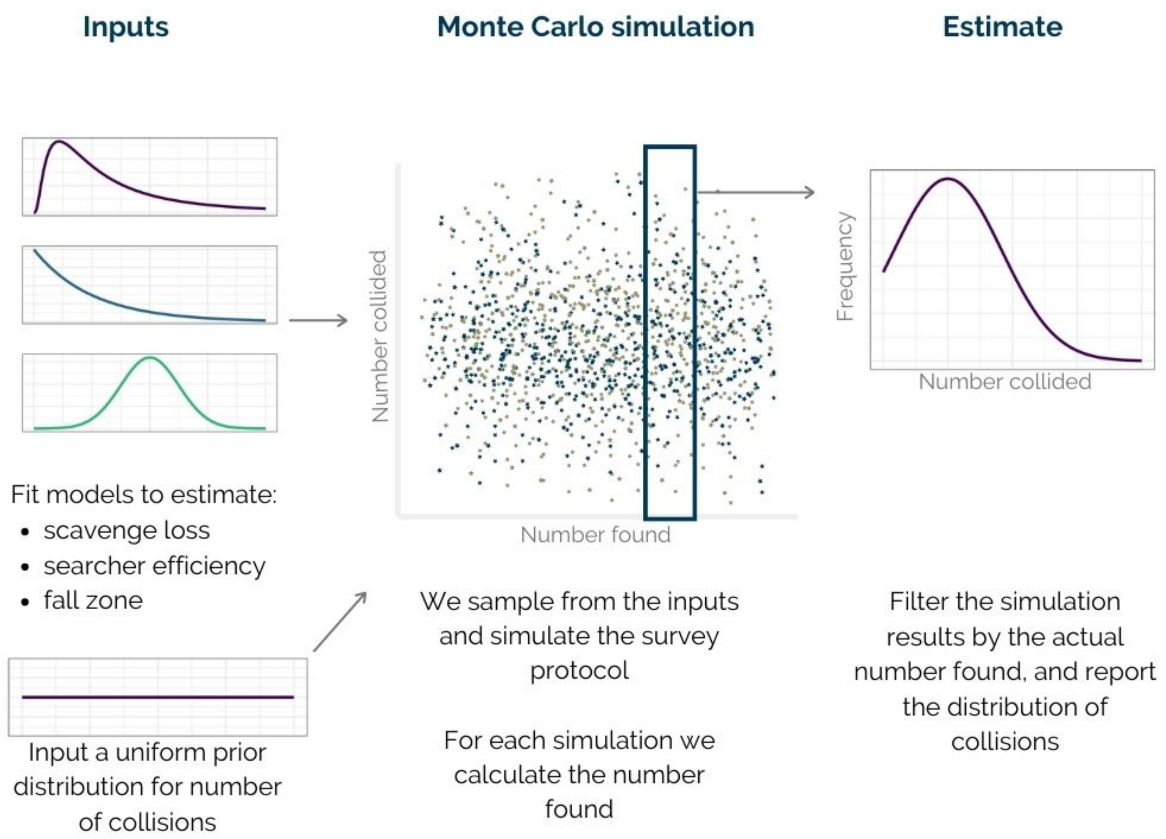


Figure 1: Overview of how the mortality estimation works.

The following sections outline how we estimate p, r and a. C is given by the field observation data, and f is defined by the survey design.

3 Analysis and modelling

The survey program consisted of carcass searches, and adjunct scavenger and detection trials. We summarise the methods, field data and analysis results for each below.

3.1 Carcass search data

In the second year, carcass searches for birds and bats were undertaken by scent dog, with a trained handler.

The carcass searches provide the C and f terms in Section 2.

3.1.1 Survey effort

The original survey was based upon a list of 15 selected turbines. According to the EPBC Approval Conditions 11 and 13 for Kaban Wind Farm (E2M 2021), all “high risk” turbines must be surveyed, and if a EPBC listed bird or bat species is detected in the vicinity of a “low risk” turbine, that turbine is re-classified as “high risk”. Therefore, the number of turbines searched evolved over the first year of surveys. In the second year, the number remained constant at 24 turbines.

Two dog teams specifically trained for the detection of birds and bats, were used throughout the second year of mortality assessment. For consistency, the same two detection dogs and handlers were used for each survey throughout this survey period.

In the second of year of surveying, an irregularly shaped but consistently searched area, per turbine, was surveyed. This is discussed and accounted for in Section 3.5.

The search effort per month is summarised in Table 1. Turbines were searched twice every 28 days, meaning that in some months less surveys appear to have been conducted. These were conducted early the next month within the same 28-day period. Surveys could not be completed in December 2023, due to a cyclone so an extra round of surveys were conducted in September 2024.

Table 1: Number of surveys per month during the second year analysis period.

Date	Surveys
2023 Sep	46
2023 Oct	46
2023 Nov	48
2024 Jan	47
2024 Feb	47
2024 Mar	48
2024 Apr	48
2024 May	13
2024 Jun	59
2024 Jul	71
2024 Aug	48
2024 Sep	48
Total	569

3.1.2 Carcass finds

The breakdown of found carcasses per species are summarised in Table 2.

Table 2: Carcasses found during formal surveys over the second year of survey. Key species highlighted.

Species	Bat	Bird
Australian Swiftlet		2
Black-faced Monarch		**2**
Brown Quail		1
Forest Kingfisher		1
Fork-tailed Swift		**1**
Grey Shrike-thrush		1
Peaceful Dove		3
Rainbow Bee-eater		1
Rainbow Lorikeet		1
Red-legged Crake		1
Sacred Kingfisher		1
Superb Fruit-Dove		1
Unidentified Bird		15
Wedge-tailed Eagle		1
White-throated Needletail		**1**
Eastern Freetail Bat	5	
Hoary Wattled Bat	12	
Northern Freetail Bat	12	
Unidentified Bat	43	
White-striped Freetail Bat	29	
Yellow-bellied Sheathtail Bat	4	

A number of carcasses were also found incidentally. While these can't be included in the formal mortality estimate, we report them for completeness in Table 3.

Table 3: Incidental finds.

Species	Number found
Black-faced Monarch	**1**
Bush Stone-curlew	1
Grey Teal	1
Rainbow Lorikeet	1
Unidentified Bat	1

3.2 Searcher efficiency

The aim of searcher efficiency trials is the quantify the effectiveness of observers, at finding carcasses. They provide the p term in 2.

3.2.1 Field methods

The searcher efficiency data is primarily sourced from trials conducted in 2023 Oct and 2024 Mar. Carcasses were laid out in accordance to the specification in Section 5.2.2.5 of E2M (2021). Trained detection dogs (with a human handler) searched for the carcasses using the same protocol as the main mortality survey. If the carcass was found, “success” was recorded, else “failure” was the dog missing the carcass. For consistency the same two detection dogs and handlers were used in the trials and surveys throughout the second year period.

The detectability trials used bird (26 replicates) and bat (26 replicates) of various size classes.

Table 4: Count of species types and sizes used during the detection trials.

Species	Size	Replicates
Bat	Small	10
Bat	Medium	10
Bat	Large	6
Bird	Small	13
Bird	Medium	7
Bird	Large	6

3.2.2 Statistical methods

We estimated searcher efficiency by fitting binomial generalised linear models (GLMs). The optimal model was determined, guided by the small-sample Akaike Information Criterion (Anderson and Burnham 2004), otherwise known as the AICc.

The theory of AIC is deep and complex, and beyond the scope of this report. However, to summarise, AIC is a method for choosing the best approximating model of the “truth”. For each model we fit to the data, we calculate the AIC. We compare the differences in AIC between models, which in turn informs us of the weight of evidence for that particular model.

AIC is not the same as significance testing. We do not aim to state anything is significant at the 5% level, instead we aim to find a good model fit for the data. Additionally, we also consider two other principles guiding model selection. They are parsimony (a simpler model is preferable to a more complex model), and application (for example, it’s all well and good to find that cloud cover affects detection rates, but it’s not feasible to incorporate cloud cover into a mortality estimate).

AICc is a modification of AIC, which is appropriate for smaller sample sizes.

3.2.3 Results

The most parsimonious model of searcher efficiency models was the “intercept-only” model (i.e. all carcasses have the same expected searcher efficiency). Therefore, bird and bat detection efficiencies are aggregated in the following mortality estimate, for canine-based surveys.

We assume that dogs have a 81% chance of detecting a carcass (birds and bats), with a 95% confidence interval of [67%, 90%].

Table 5 shows the results.

Table 5: Detection efficiencies for canine searchers.

Variable	Dogs (all species)
Number found	42
Number placed	52
Mean detectability proportion	0.81
Detectability lower bound (95% CI)	0.67
Detectability upper bound (95% CI)	0.9

3.3 Scavenger efficiency

In order to accurately estimate mortality, we must account for carcass loss to scavengers. Scavenger trials are performed to quantify the time until a carcass is completely lost as a result of scavenger activity, which is the r term in Section 2.

3.3.1 Field methods

Scavenger efficiency trials were conducted in October 2023 and March 2024. The trials ran over approximately 30 days. In total, 27 bird carcasses and 25 bat carcasses were used. Trials used motion sensitive cameras in order to record exact times of scavenge events, and were held in accordance with Section 5.2.2.4 of E2M (2021).

Table 6: Species types for scavenger trials.

Species	Replicates
Bird	27
Bat	25

3.3.2 Statistical methods

Survival analysis (Kaplan and Meier (1958), Kalbfleisch and Prentice (2011)) was used to determine the distribution of time until complete loss from scavenge (or decay). Survival analysis was required to account for the fact that we do not necessarily know the exact time of scavenge loss, only an interval in which the scavenge event happened. For example, any carcass which is unscavenged at the end of the trial, has its scavenge event in the interval [x, ∞] (where x is the length of the trial). By performing survival analysis we can estimate the time until carcass loss after a given length of time, despite these unknowns.

We fit parameterised models to analyse significant factors influencing time to scavenge (carcass species type etc), and to find the most appropriate distribution to fit the time-to-loss curve (e.g. log-normal, exponential).

Time to carcass loss is influenced by the parameters discussed above and the distribution of the loss curve we fit to the data (M. M. P. Huso, Dalthorp, and Korner-Nievergelt 2015). The choice of loss function is important because it should capture the behaviours and relative time dependence of the various scavengers. Generally, the best distribution is the log-normal distribution (Stark and Muir 2020).

However, at Kaban Wind Farm, the standard log-normal shape did not suit the data. Therefore, we used a custom “hurdle” model. This two-part model accounted both for the rapid scavenge loss rate in the first 5-10 days, and the very slow rate of loss after this time period. This model is technically a weighted mixture/hurdle model between a fitted log-normal distribution, and infinity.

3.3.3 Results

The three Chicken carcasses used in the year 1 scavenger trials were removed from the modelling set. This is because there is a significant body of evidence suggesting Chickens are removed much faster than bats or birds (Stark and Muir 2020). The year 2 trials used only native birds and bats.

AICc and visual analysis of the survival data, showed the most parsimonious model contained no difference between the bat and bird scavenger rates. Therefore, in the following mortality estimations, aggregated survival curves are used.

As mentioned in Section 3.3.2, we used a custom modelling technique. This was because no standard distribution could fit the survival curve shape at Kaban Wind Farm (the black step function in Figure 2). The red smooth curve is the fitted survival curve from the custom model, which we can see accurately models the empiricial behaviour.

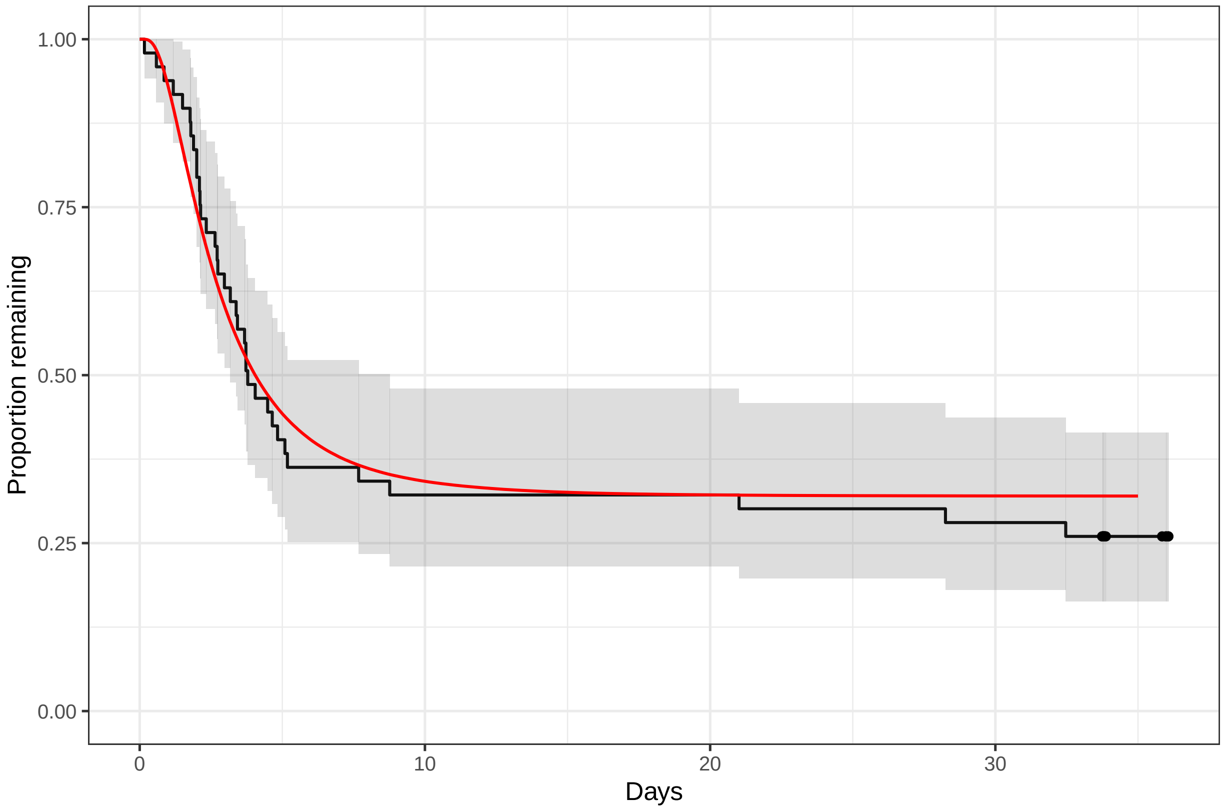


Figure 2: Empirical survival curve (the black step function), with 95% confidence interval shaded. The red smooth curve presents the fitted model.

Under these assumptions, the median time to carcass removal via scavenge is approximately 4 days. In other words, we expect that 50% of carcasses struck by wind turbines at Kaban will be removed by scavengers within 4 days, and 50% to be removed by scavengers after 4 days on the ground.

3.4 Proportion of turbines searched

In the Monte Carlo algorithm, we explicitly simulate the survey design. The proportion of turbines sampled is therefore accounted for in the simulation.

There are 28 total turbines at Kaban Wind Farm. Initially, 15 were selected to be survey, but due to the permit conditions an additional 9 turbines were added within the first year. As such, 24 turbines were surveyed twice every 28 days during the second year period.

3.5 Coverage factor

The coverage factor estimates the probability that, given a carcass falls at a searched turbine, that the carcass falls within the searched area. This contributes to the a term in Section 2.

3.5.1 Fall zone simulation - methods

We generated a carcass fall-zone distribution for the following species classes, given the turbine size at the wind farm:

- Medium birds (used as an archetype for the general bird mortality estimate)
- Microbats (used as an archetype for the general bat mortality estimate)
- Small birds (used as an archetype for the Black-faced Monarch, Fork-tailed Swift, and White-throated Needletail estimates)

The fall-zone distribution is the end result of the simulation method detailed in Hull and Muir (2010). The simulation method is a ballistics model describing avifauna strikes by turbine blades.

3.5.2 Coverage factor calculation - methods

The percentage of the fall zone not covered by the survey area, provides a correction factor in the mortality estimate. Because carcasses that fall outside the searched area have a zero probability of being detected by a survey, the likelihood of landing in this region is essential to understanding the relationship between detections and actual losses.

At Kaban Wind Farm, custom search areas were used. To account for the unique shapes being searched, a technique similar to that in Box 3.4 of International Finance Corporation (2023) is used.

A two-dimensional fall zone distribution is generated from the rotating the one-dimensional output of Hull and Muir (2010). This 2-D distribution is a series of concentric annuli, with the probability density in each annulus, being equal to the density of the corresponding histogram bin in the one-dimensional Hull and Muir (2010) output. The annuli are then spatially intersected with the searched area, and hence the proportion of carcasses falling in searched area (the “coverage factor”) is found.

3.5.3 Simulation inputs

Table 7 displays the dimensions and RPM of the turbines at Kaban Wind Farm while Table 8 shows the bird and bat physical parameters used. These are input into the fall zone simulation.

Turbine specifications were provided by E2M. Bird and bat parameters were sourced from the archetypes in Hull and Muir (2010) (medium and small birds, and bats).

Table 7: Turbine specifications for Kaban Wind Farm.

Rotor diameter (m)	Tower hub height (m)	RPM
162	149	12.1

Table 8: Species size archetype parameters.

Species type	Archetype	Mass (kg)	Min. area (sq m)	Max. area (sq m)
Bat	Gould's Wattled Bat	0.014	0.0028	0.0140
Medium Bird	Raven	0.68	0.0450	0.1000
Small Bird	Silvereye Finch	0.012	0.0013	0.0036

3.5.4 Results

Figure 3 displays the simulation results, given the factors specified above. We display the cumulative density function (CDF) on the y axis versus the distance from turbine (x axis). for each species type. The CDF describes the expected proportion of carcass which fall less than or equal to a certain distance from the turbine. For example, we see that we expect about 78% of microbat carcasses to fall within 60m of the turbine.

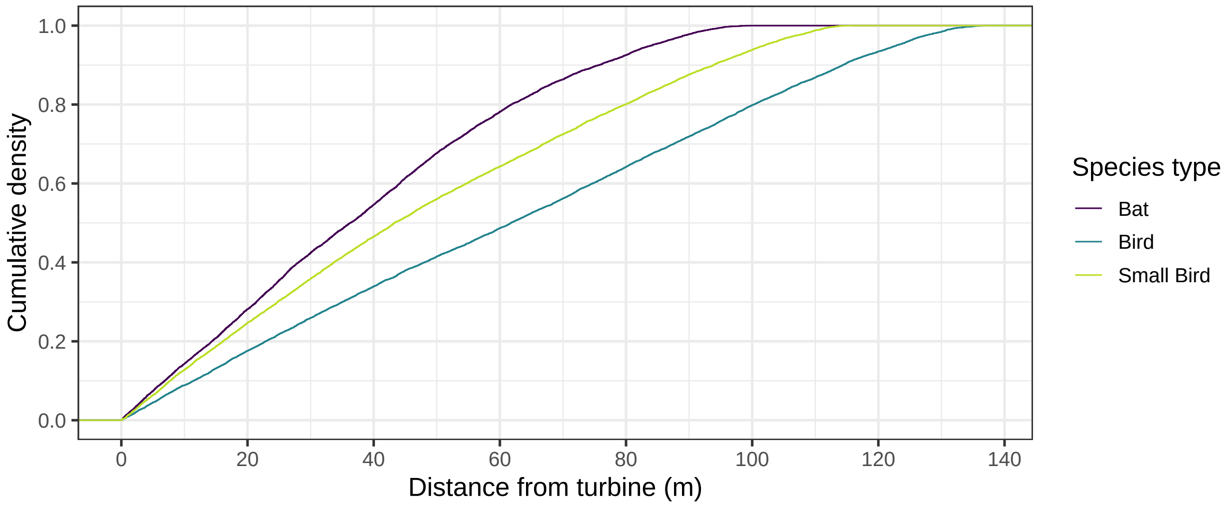


Figure 3: Cumulative distribution function of the fall zone simulation output, for various species classes.

Once the fall zone distribution is calculated, we generate a "coverage factor" for each species type. The coverage factor represents the proportion of carcasses which fall within the searched area.

Figure 4 visualises some of the search areas, and shows the respective coverage factors. For example, when searching for the Small Bird archetype species, turbine 10's search covers 52% of the fall zone. Or, turbine 2's search covers 67% of the fall zone.

Table 9 shows the average coverage factor for each species size class.

Table 9: Average coverage over the survey period, for each species class.

Species type	Average coverage (%)
Bat	74
Medium Bird	53
Small Bird	66

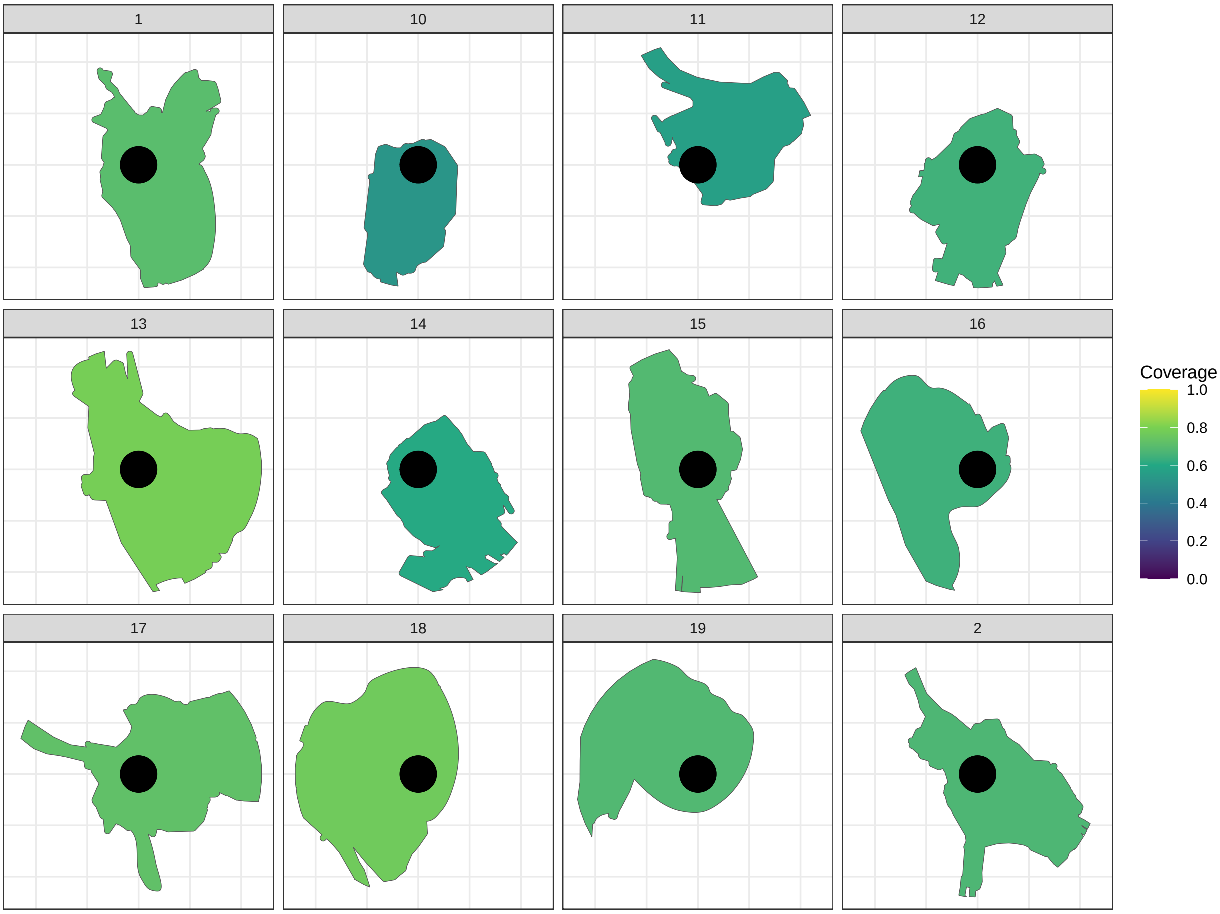


Figure 4: Example - search area shapes and coverage, for various turbines (small birds).

4 Mortality estimate

We undertook general bird and bat estimates, as well as species-specific estimates for Black-faced Monarch, Fork-tailed Swift, and White-throated Needletail. With estimates for scavenge loss, searcher efficiency, and survey coverage, we converted the number of carcasses detected, into an estimate of overall mortality at Kaban Wind Farm from 2023-09-01 to 2024-09-30.

The mortality estimation is done via a Monte Carlo algorithm. We used 15000 simulations, with the survey design simulated each time. Random numbers of virtual mortalities were simulated, along with the scavenge time and searcher efficiency (based on the measured confidence intervals). The proportion of virtual carcasses that were "found" was recorded for each simulation. Finally, those trials that had the same outcome as the reported survey detections were collated, and the initial conditions (i.e. how many true losses there were) reported on.

The model assumptions are listed below:

- There were 28 turbines on site available to strike birds and bats.
- Search frequency for each turbine was taken from a list of actual survey dates (see Table 1 for a summary).
- Mortalities were allowed to occur between 2023-09-01, and 2024-09-30.
- Birds are on-site at all times during this period.
- Bats are on-site at all times during this period.
- Bats and birds that are struck are immediately replaced (i.e. strikes one day do not affect the chance of strikes the next).
- We have used the standard practice of assuming that all carcasses and all feather spots (regardless of size or composition) are attributable to the wind turbines.
- Finds are random and independent, and not clustered with other finds.
- There was equal chance of any turbine being involved in a collision / mortality.
- We took scavenge loss and searcher efficiency rates as outlined above.
- We used the custom model's scavenger shape (Section 3.3.2).
- The coverage factors were taken to be those calculated in Section 3.5.4.

4.1 Bias

The mortality estimation technique gives unbiased estimates for probability-based survey designs. However, the design at Kaban involves progressively adding turbines classed as "high risk" to the survey schedule, if certain key species are detected there. Given this is (potentially) favouring the design towards turbines with higher mortality rates, this may result in a estimate biased high.

4.2 Notes on results

Per turbine per year estimate: Given the progressive commissioning of turbines in the first year of survey, we also present a per turbine per year estimate (along with estimates of total mortality during the analysis period). The per turbine per year estimate is the total mortality, divided by the number of turbine-years at Kaban over that period. Effectively, it can be interpreted as "estimated number of mortalities per turbine, if each turbine was turning for a year". This number is comparable with the per turbine per year estimate in the previous report.

Density: the y-axis of the histograms shows the density. The "density" can be interpreted as the relative likelihood of taking a particular value. For example in Figure 5, a mortality of 250ish is about one-half as likely as a mortality of 350ish.

Percentiles: in tables such as Table 10, we present percentiles of the distribution. A k%-percentile gives the value such that k% of results that have a value less or equal to the k%-percentile. For example, in Table 10, we interpret:

- 50th percentile (325) as "50% of simulations had a value (mortality estimate) of less or equal to 325".
- 90th percentile (360) as "90% of simulations had a value (mortality estimate) of less or equal to 360".

4.3 Bats - overall

During the second year of surveys a total of 105 bats were found during the 569 formal surveys. The resulting (median) estimate of total mortality is 325 bats lost on site over the second year period.

The median mortality per turbine per year, in the second year, is 10.7 bats.

Table 10 and Figure 5 display the percentiles of the distributions, to show the confidence on the mortality estimate.

Based on the detected carcasses, measured detectability, scavenge rate, and survey effort, we expect that there was a total site loss of around 325 bats over the second year period, and are 95% confident that fewer than 367 individuals were lost. We expect the loss per turbine per year is around 10.7 bats, and are 95% confident that fewer than 12.1 bats were lost (on average) per turbine, in this time period.

Table 10: Percentiles of estimated bat losses.

Estimate	0%	50% (median)	90%	95%
Total (second year period)	265.0	325.0	360.0	367.0
Per turbine per year (second year period)	8.8	10.7	11.9	12.1

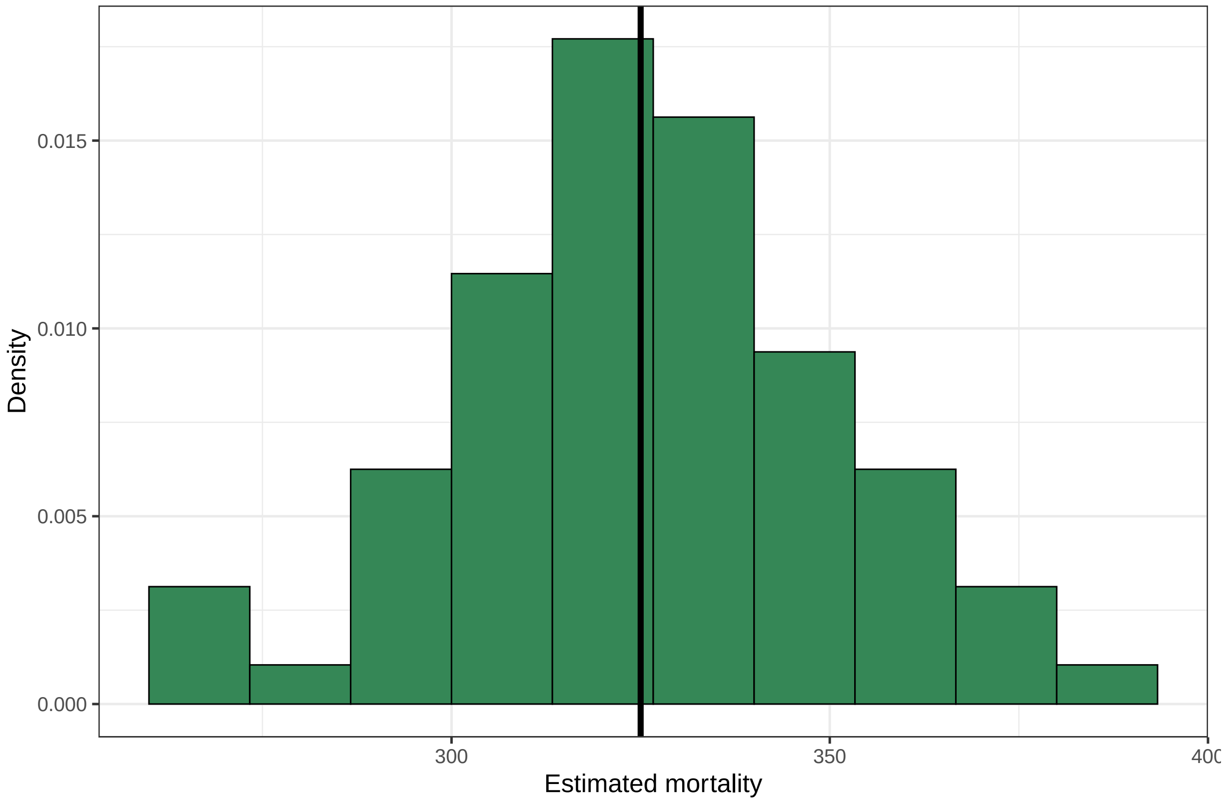


Figure 5: Histogram of the total losses distribution (bats) in the second year period. The black solid line shows the median.

4.4 Birds - overall

During the second year period of surveys a total of 33 birds were found during the 569 formal surveys. The resulting (median) estimate of total mortality is 107 birds lost on site over the second year period.

The median mortality per turbine per year is 3.5, in the second year period.

Table 11 and Figure 6 display the percentiles of the distributions, to show the confidence on the mortality estimate.

Based on the detected carcasses, measured detectability, scavenge rate, and survey effort, we expect that there was a total site loss of around 107 birds over the in the second year period, and are 95% confident that fewer than 136 individuals were lost. We expect the loss per turbine per year is around 3.5 birds, and are 95% confident that fewer than 4.5 birds were lost (on average), per turbine per year, during this time period.

Table 11: Percentiles of estimated bird losses.

Estimate	0%	50% (median)	90%	95%
Total (second year period)	73.0	107.0	126.0	136.0
Per turbine per year	2.4	3.5	4.2	4.5

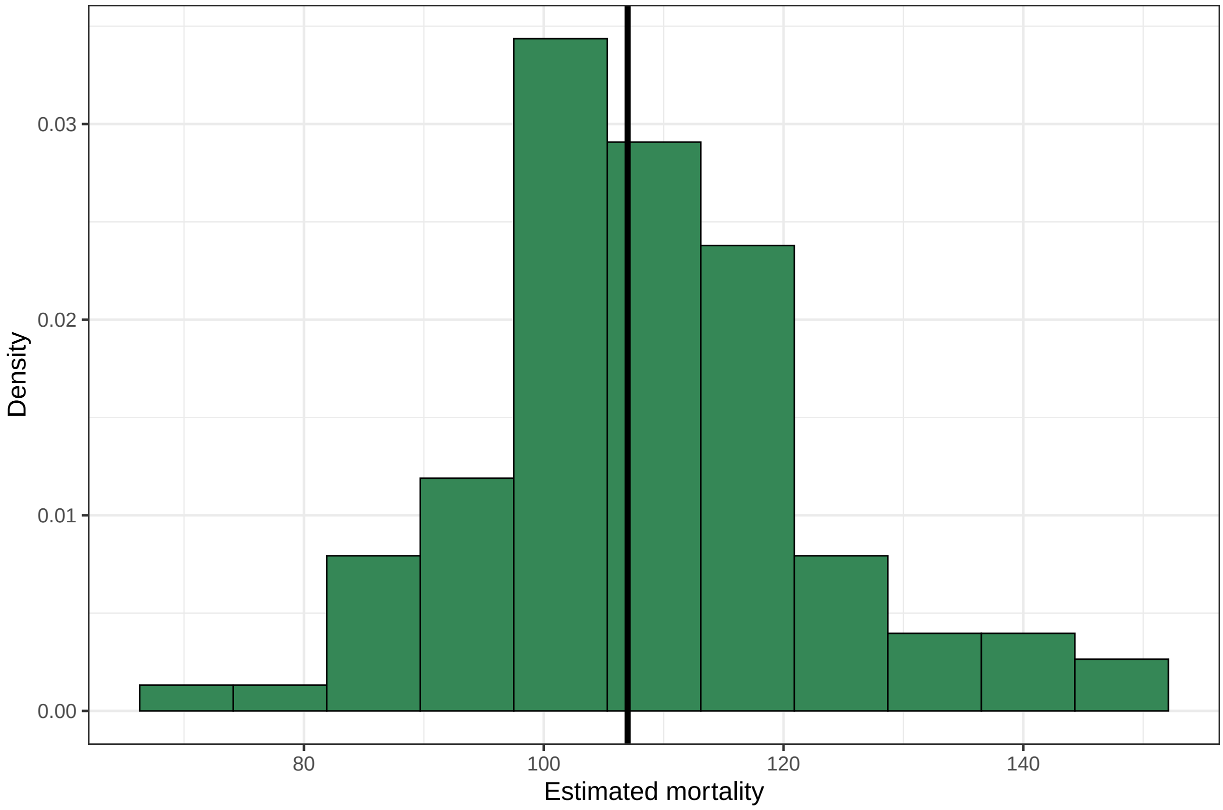


Figure 6: Histogram of the total losses distribution (birds) in the second year period. The black solid line shows the median.

4.5 Single species estimates

We ran species-level estimates on the Black-faced Monarch, Fork-tailed Swift, and White-throated Needletail. Note while these are not the only species of interest at Kaban Wind Farm, these were the only species for which we had tangible evidence of mortality, via either formal or incidental finds (in the second year period).

Again, we provide total (yearly) estimates in Table 12 and Figure 7, and rescaled (per turbine per year) estimates in Table 13.

Table 12: Percentiles of mortalities for species of interest (total losses), in the second year period.

Species	0%	50% (median)	90%	95%
Fork-tailed Swift	1	4	10	12
White-throated Needletail	1	4	10	12
Black-faced Monarch	2	8	15	18

Table 13: Percentiles of mortalities for species of interest (per turbine per year), in the second year period.

Species	0%	50% (median)	90%	95%
Fork-tailed Swift	0.0	0.1	0.3	0.4
White-throated Needletail	0.0	0.1	0.3	0.4
Black-faced Monarch	0.1	0.3	0.5	0.6

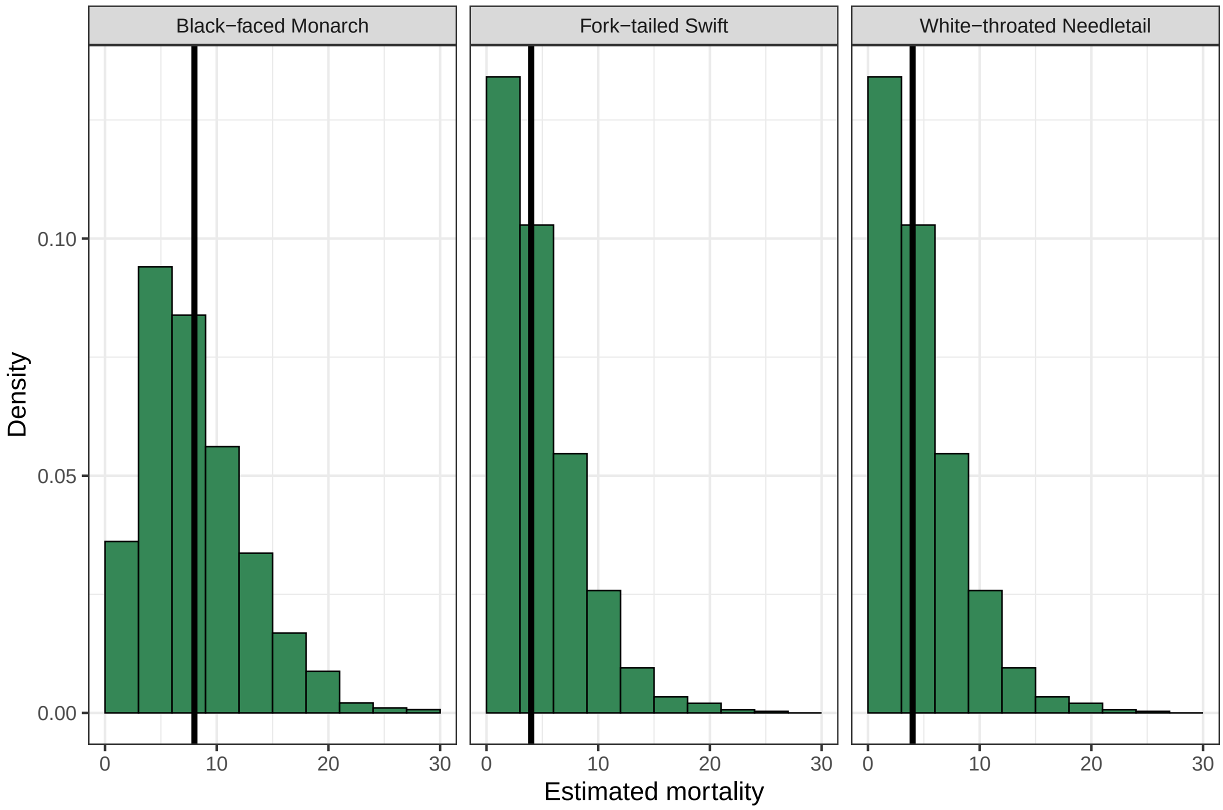


Figure 7: Histogram of the total losses distribution, for species of interest, in the second year period. The black solid line shows the median.

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Appendix E: Bird and Bat Data Analysis Report

Kaban Wind Farm Bird and Bat Data Analysis and Review: January 2017 to January 2025

2 June 2025

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust

Level 21/570 George St, Sydney, NSW 2000

Document Management

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Abbreviations

Abbreviation	Description
AECOM	AECOM Australia Pty Ltd
BBAMP	Bird and Bat Adaptive Management Plan
DAWE	Commonwealth Government Department of Agriculture, Water and the Environment
DCCEEW	Commonwealth Government Department of Climate Change, Energy the Environment and Water
DEE	Commonwealth Government Department of the Environment and Energy
DES	Queensland Department of Environment and Science
DETSI	Queensland Department of the Environment, Tourism, Science and Innovation
E2M	E2M Pty Ltd
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
KGPH	Kaban Green Power Hub
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992* (Qld)
RSA	Rotor Sweep Area
TRC	Tablelands Regional Council
VM Act	*Vegetation Management Act 1999* (Qld)

1 Introduction

1.1 Background

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust have constructed the Kaban Green Power Hub (the Project) in north Queensland to use the available wind resource to supply renewable energy to the national electricity market. The Project is located near the township of Tumoulin, Queensland, within the Tablelands Regional Council (TRC) Local Government Area (LGA). The Project consists of a 28 wind turbines and ancillary infrastructure, located across the following land parcels (Figure 1), herein collectively referred to as ‘the site’:

- Lot 1 on Plan RP735194
- Lot 33 on Plan CWL374
- Lot 35 on Plan CWL391
- Lot 2 on Plan RP735194
- Lot 34 on Plan CWL374; and
- section of local road reserve.

Approval of the Project, EPBC 2018/8289, was granted by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 21 April 2020. The EPBC Approval was subsequently amended and reapprovals granted on 25 August 2020 and 10 August 2022.

1.2 Scope and objectives

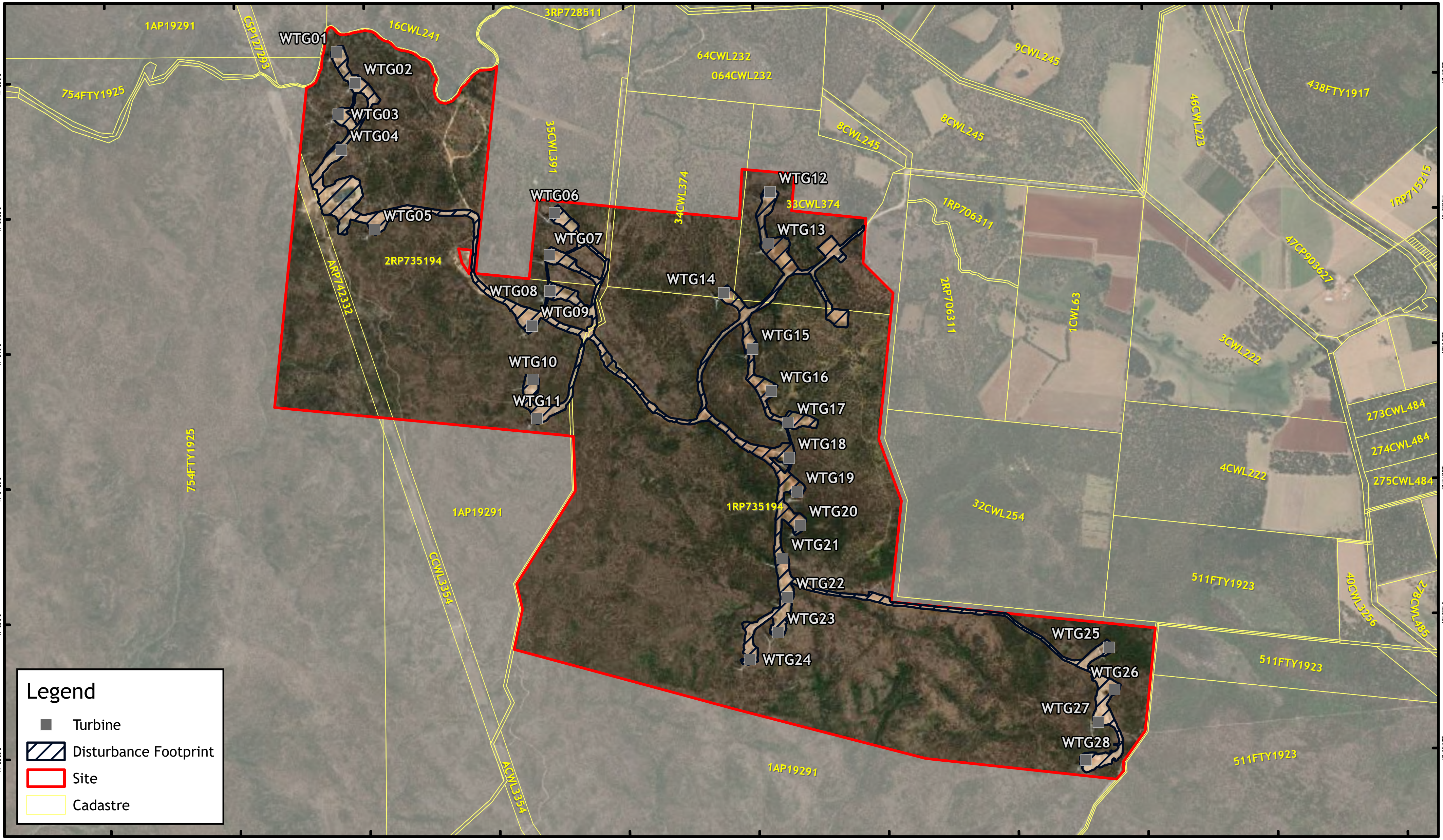
As per conditions within the Bird and Bat Adaptive Management Plan (Rev10) (E2M, 2021a) sections 5.2.1 and 5.2.2.2.3, the objective of this report is to consolidate, analyse and review all bird and bat data collected from January 2017 to January 2025, for the following surveys:

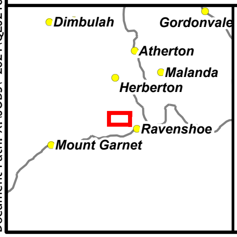
- bird and bat utilisation surveys
- twice monthly carcass search surveys

The analysed data was reviewed and summarised in this report. Outcomes of the review process have been used to inform the revised Bird and Bat Adaptive Management Plan ((E2M Pty Ltd, 2025)) that will:

- Provide a list of listed migratory or threatened species known to occur and are ‘at-risk’[1] of turbine collision
- Allow for early detection of potential impacts to listed migratory and threatened species
- Allow for early implementation of mitigation strategies
- Improve monitoring efficiencies by assigning the best monitoring schedule and techniques for the detection of possible impacts to all bird and bat species

[1] Listed migratory or threatened species at-risk of impacts from interactions with Project turbines. The risk category is assessed from flight behaviours and time spent on-site of each species.





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Kilometers

Coordinate System: GDA2020

Notes:
Aerial Imagery: © ESRI 2025
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0	Issued for Use	HM	DJ	02/06/2025
A	Issued for Review	SOH	DJ	17/04/2025

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FIGURE 1: SITE LOCATION AND LAYOUT

BBAMP BBUS DATA CONSOLIDATION REPORT JAN-FEB25
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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2 Methods

2.1 Data review

E2M conducted a data consolidation, review and analysis of all available bird and bat datasets available from January 2017 through to January 2025 for the project. The following datasets were analysed:

- Four pre-commissioning Bird and Bat Utilisation Surveys (BBUS) including:
  - two baseline (pre-construction) BBUS (Brett Lane & Associates Pty Ltd, 2017; E2M Pty Ltd, 2020); and
  - two (during/post construction) BBUS (E2M Pty Ltd, 2021, 2022)
- Four post-commissioning BBUS, (E2M Pty Ltd, 2023b, 2023a, 2024a, 2024b)
- 29 months of bi-monthly carcass searches
- Incidental observations of listed migratory and threatened bird and bat species
- Two searcher efficiency (detection rate) trials[2]
- Two scavenger rate (persistence) trials[2]; and
- Mortalities and other observations recorded at 'High-Risk' turbines.

The collective survey effort is summarised in Section 3, Table 1.

2.2 Data analysis

Bird and bat data were analysed using the most appropriate methods for the purpose of examining:

- Presence and abundance of listed migratory and threatened bird and bat species
- Species composition distribution between all turbine sites
- Relative abundance of species between all turbine sites
- Species richness between all turbine sites
- Species richness and composition between the different seasons
- The relative abundance of bird bats between the different seasons
- Species richness comparison between the different surface geology. That is, between the different vegetation types located on basalt and igneous soils
- Any relationship or trends from carcass observations for the different listed migratory or threatened species
- Carcass detection rates between each turbine site; and
- Carcass detection rates between the wet and dry seasons.

[2] The data from these trials has been used for annual mortality estimate modelling and to support the revised mortality monitoring program prepared by Symbolix Pty Ltd.

The following methods were used to analyse the different data sets listed above:

- Independent T-test
- Analysis of variance
- Kruskal-Wallis chi squared
- Bray-Curtis
- Box plots; and
- Bar charts.

3 Results

3.1 Survey Effort

There are two main streams from which data has been collected for bird and bat observations. These were the Bird and Bat Utilisation Surveys (BBUS) and twice monthly carcass surveys, and the effort for each is detailed below.

3.1.1 BBUS survey effort

From January 2017 through to January 2025 and pursuant to the EPBC Act Approval (2018/8289), eight BBUS were conducted. This included a total of 1230 twenty-minute bird point surveys, 432 nights of microbat recordings, and 322 twenty-minute point surveys for megabats, see Table 1.

Table 1: Bird and bat survey effort pre-construction, during construction and post commissioning, between January 2017 and January 2025.

BBUS description	Survey date	EPBC condition	# of 20-minute bird surveys	# Nights of anabat recordings	# of 20-minute megabat surveys[1]
Pre-construction Baseline	January 2017	6a	46	36	Site-wide spotlighting
Pre-construction Baseline	September 2020	6a	168	56	0
Construction, Dry season	October 2021	6a	168	56	56
Construction, Wet season	March 2022	6a	168	60	42[2]
Post-commissioning , Wet season	March 2023	6b	171	56	56
Post-commissioning, Dry season	September 2023	6b	170	56	56
Post-commissioning, Wet season	February 2024	6b	168	56	56
Post-commissioning, Dry season	October/ November 2024	6b	171	56	56
		TOTAL SURVEYS	**1230**	**432**	**322**

1. These surveys are not in the approval or BBAMP scope but were completed to provide important information for the occurrence of the spectacled flying-fox and ghost bat.
2. Some sites were not monitored due to severe electrical storms.

3.1.2 Carcass search survey effort

As per EPBC conditions 13 and 14, post-commissioning carcass search surveys were completed. This involved surveys on all fifteen nominated turbines plus any additional turbines listed as ‘high-risk’[3]. From September 2023 to January 2025 there were 58 monthly carcass search survey sessions completed totalling 1018 unique turbine carcass searches, as summarised in Table 2.

Table 2: Operational phase, monthly carcass search effort.

Monthly Carcass Searches	Survey Dates	EPBC Condition	# of Turbine Carcass Searches
Twice monthly carcass searches	September 2022 to August 2023	13 and 14	260
Twice monthly carcass searches	September 2023 to January 2025	13 and 14	758
		TOTAL SURVEYS	**1018**

[3] A ‘high-risk’ turbine is defined as any turbine that any EPBC listed migratory or threatened bird or bat species has been systematically or opportunistically detected within a 350 metres radius of a turbine. A ‘high-risk’ turbine may be downgraded to a ‘low-risk’ turbine, if listed migratory or threatened species have not been detected for two-years.

3.2 Records of migratory and threatened bird and bat species

Systematic monitoring was performed via BBUS and carcass monitoring to gain insight of the presence and collision risk of listed migratory and threatened birds and bats. Any incidental observations of listed and threatened species were also recorded. All observations of birds and bats have been recorded during the eight years of monitoring from January 2017 through to January 2025. A summary of all migratory and threatened bird and bat species observations from BBUS, carcass monitoring and incidental observations is detailed in Table 3. A total of seven (7) audio recordings of the bare-rumped sheath-tailed bat (*Saccolaimus saccolaimus*) were identified during the March 2023 BBUS across three different sites. These have been the first and only recordings of this EPBC Act and NCA listed microbat species.

Table 3: Listed migratory and threatened birds and bats detected on-site from January 2017 to January 2025 and method of detection.

Fork-tailed swift	(*Apus pacificus*)			
Detection type	**Date found**	**Location**	**No. of carcasses**	**No. flying**
Incidental	Jan-23	WTG05	1	-
Carcass Search	Jan-23	WTG05	1	-
Incidental	Jan-23	WTG11	2	-
Incidental	Jan-23	WTG02	2	-
Carcass Search	Feb-23	WTG09	1	-
Carcass Search	Jan-24	WTG12	1	-
		Sub-	**8**	**0**

White-throated needletail	*(Hirundupus caudacutus)*			
Detection type	**Date found**	**Location**	**No. of carcasses**	**No. flying**
BBUS	Oct-21	WTG08	-	13
Carcass Search	Mar-23	WTG04	1	-
Incidental	Mar-23	WTG16	1	-
Carcass Search	Nov-23	WTG01	1	-
Carcass Search	Oct-24	WTG20	1	-
Carcass Search	Dec-24	WTG07	1	-
Carcass Search	Dec-24	WTG01	1	-
		Sub-total	**6**	**13**

Spectacled flying-fox	(*Pteropus conspicullatus*)			
Detection type	**Date found**	**Location**	**No. of carcasses**	**No. flying**
Incidental	Jan-23	WTG16	1	-
Incidental	Feb-23	WTG01	1	-
BBUS - Incidental	Oct-21	WTG13	-	1
		Sub-total	**2**	**1**

Bare-rumped sheath-tailed bat	*Saccolaimus saccolaimus*			
Detection type	**Date found**	**Location**	**No. of carcasses**	**Call recordings**
Anabat	Mar-23	WTG06	0	3
Anabat	Mar-23	WTG13	0	3
Anabat	Mar-23	WTG25	0	1
		Sub-total	**0**	**7**

3.3 Data analysis and interpretation

3.3.1 Data review objectives

The primary objective of the data review is to analyse all Project bird and bat data to evaluate species composition and richness, relative abundance and distribution across the site. The results will then inform future strategic bird and bat monitoring and reporting during the operational phase relating to Project activities. Results from the data analysis and review relevant to the current BBAMP (Revision 10) (E2M, 2021b) monitoring commitments are provided in the following sections.

Additionally, any observations of listed migratory and threatened species have been used to help with collision risk modelling for the listed migratory and threatened species. The details of which are provided in the revised BBAMP (Revision 11) (E2M Pty Ltd, 2025).

3.3.2 BBUS data analysis

Bird and bat data collected from BBUS were analysed and presented separately in the following sections. The results of such are key in the interpretation of population findings for both bird and bats to inform future monitoring effort and scheduling. The different population ecology attributes assessed were:

- species composition between turbines
- species richness between turbines
- change in species richness overtime
- relative abundance between turbines

- comparison of species richness between the different site soil surface geology
- comparison of species richness between the different seasons; and
- comparison of species relative abundance between the different seasons.

3.3.2.1 Bird data analysis

The results of the bird data analysis have been used for providing critical information for, the timing, frequency and effort for ongoing bird monitoring programs detailed within the revised BBAMP (Revision 11) (E2M Pty Ltd, 2025, p. 11). A summary of the bird data analysis is provided in the following sections.

3.3.2.1.1 Bird species list

There was a total of 94 unique bird species identified from all BBUS. The list of bird species and their *Queensland Nature Conservation Act* 1999 (NC Act) and EPBC Act listing status is provided in Table 4.

Table 4: Bird species identified from all BBUS, with EPBC Act and NC Act listing status.

Common Name	Scientific Name	Nature Conservation Act status	Environment Protection and Biodiversity Conservation Act status
Australian kestrel	*Falco cenchroides*	Least concern	-
Australian king-parrot	*Alisterus scapularis*	Least concern	-
Australian magpie	*Gymnorhina tibicen*	Least concern	-
Australian owlet-nightjar	*Aegotheles cristatus*	Least concern	-
Australian pelican	*Pelecanus conspicillatus*	Least concern	-
Australian Raven	*Corvus coronoides*	Least concern	-
Australian swiftlet	*Aerodramus terraereginae*	Least concern	-
barn owl	*Tyto javanica*	Least concern	-
black kite	*Milvus migrans*	Least concern	-
black-chinned honeyeater	*Melithreptus gularis*	Least concern	-
black-faced cuckoo-shrike	*Coracina novaehollandiae*	Least concern	-
black-faced monarch	*Monarcha melanopsis*	Least concern	-
blue-winged kookaburra	*Dacelo leachii*	Least concern	-
brolga	*Antigone rubicunda*	Least concern	-
brown falcon	*Falco berigora*	Least concern	-
brown goshawk	*Accipiter fasciatus*	Least concern	-
brown honeyeater	*Lichmera indistincta*	Least concern	-
brown quail	*Synoicus ypsilophorus*	Least concern	-

Common Name	Scientific Name	Nature Conservation Act status	Environment Protection and Biodiversity Conservation Act status
brown treecreeper	*Climacteris picumnus*	Least concern	-
brush cuckoo	*Cacomantis variolosus*	Least concern	-
buff-rumped thornbill	*Acanthiza reguloides*	Least concern	-
bush stone-curlew	*Burhinus grallarius*	Least concern	-
channel-billed Cuckoo	*Scythrops novaehollandiae*	Least concern	-
cicadabird	*Edolisoma tenuirostre*	Least concern	-
collared sparrowhawk	*Accipiter cirrocephalus*	Least concern	-
common bronzewing	*Phaps chalcoptera*	Least concern	-
eastern koel	*Eudynamys orientalis*	Least concern	-
eastern spinebill	*Acanthorhynchus tenuirostris*	Least concern	-
eastern whipbird	*Psophodes olivaceus*	Least concern	-
eastern yellow robin	*Eopsaltria australis*	Least concern	-
fan-tailed cuckoo	*Cacomantis flabelliformis*	Least concern	-
forest kingfisher	*Todiramphus macleayii*	Least concern	-
fuscous honeyeater	*Ptilotula fusca*	Least concern	-
great cormorant	*Phalacrocorax carbo*	Least concern	-
grey butcherbird	*Cracticus torquatus*	Least concern	-
grey fantail	*Rhipidura albiscapa*	Least concern	-
grey shrike-thrush	*Colluricincla harmonica*	Least concern	-
jacky winter	*Microeca fascinans*	Least concern	-
laughing kookaburra	*Dacelo novaeguineae*	Least concern	-
Leaden flycatcher	*Myiagra rubecula*	Least concern	-
Lewin's honeyeater	*Meliphaga lewinii*	Least concern	-
little bronze-cuckoo	*Chalcites minutillus*	Least concern	-
little friarbird	*Philemon citreogularis*	Least concern	-
little lorikeet	*Parvipsitta pusilla*	Least concern	-
magpie-lark	*Grallina cyanoleuca*	Least concern	-
mistletoebird	*Dicaeum hirundinaceum*	Least concern	-
nankeen kestrel	*Falco cenchroides*	Least concern	-

Common Name	Scientific Name	Nature Conservation Act status	Environment Protection and Biodiversity Conservation Act status
noisy friarbird	*Philemon corniculatus*	Least concern	-
noisy miner	*Manorina melanocephala*	Least concern	-
olive-backed oriole	*Oriolus sagittatus*	Least concern	-
pacific black duck	*Anas superciliosa*	Least concern	-
pale-headed rosella	*Platycercus adscitus*	Least concern	-
peaceful dove	*Geopelia placida*	Least concern	-
pheasant coucal	*Centropus phasianinus*	Least concern	-
pied butcherbird	*Cracticus nigrogularis*	Least concern	-
pied currawong	*Strepera graculina*	Least concern	-
rainbow bee-eater	*Merops ornatus*	Least concern	-
rainbow lorikeet	*Trichoglossus moluccanus*	Least concern	-
red-backed button-quail	*Turnix maculosus*	Least concern	-
red-backed fairy-wren	*Malurus melanocephalus*	Least concern	-
red-browed finch	*Neochmia temporalis*	Least concern	-
red-tailed black-cockatoo	*Calyptorhynchus banksii*	Least concern	-
rufous fantail	*Rhipidura rufifrons*	Least concern	-
rufous whistler	*Pachycephala rufiventris*	Least concern	-
sacred kingfisher	*Todiramphus sanctus*	Least concern	-
sarus crane	*Antigone antigone*	Least concern	-
satin flycatcher	*Myiagra cyanoleuca*	Least concern	-
scaly-breasted lorikeet	*Trichoglossus chlorolepidotus*	Least concern	-
scarlet honeyeater	*Myzomela sanguinolenta*	Least concern	-
shining bronze-cuckoo	*Chalcites lucidus*	Least concern	-
spangled drongo	*Dicrurus bracteatus*	Least concern	-
spotted pardalote	*Pardalotus punctatus*	Least concern	-
squatter pigeon (northern subspecies)	*Geophaps scripta peninsulae*	Least concern	-
striated pardalote	*Pardalotus striatus*	Least concern	-
Torresian crow	*Corvus orru*	Least concern	-

Common Name	Scientific Name	Nature Conservation Act status	Environment Protection and Biodiversity Conservation Act status
varied sittella	*Daphoenositta chrysoptera*	Least concern	-
wedge-tailed eagle	*Aquila audax*	Least concern	-
weebill	*Smicrornis brevirostris*	Least concern	-
whistling kite	*Haliastur sphenurus*	Least concern	-
white-bellied cuckoo-shrike	*Coracina papuensis*	Least concern	-
white-browed scrubwren	*Sericornis frontalis*	Least concern	-
white-cheeked honeyeater	*Phylidonyris niger*	Least concern	-
white-faced heron	*Egretta novaehollandiae*	Least concern	-
white-throated gerygone	*Gerygone olivacea*	Least concern	-
white-throated honeyeater	*Melithreptus albogularis*	Least concern	-
white-throated needletail	*Hirundapus caudacutus*	Vulnerable	Vulnerable
white-throated nightjar	*Eurostopodus mystacalis*	Least concern	-
white-throated treecreeper	*Cormobates leucophaea*	Least concern	-
white-winged triller	*Lalage tricolor*	Least concern	-
willie wagtail	*Rhipidura leucophrys*	Least concern	-
yellow thornbill	*Acanthiza nana*	Least concern	-
yellow-faced honeyeater	*Caligavis chrysops*	Least concern	-
yellow-tinted honeyeater	*Ptilotula flavescens*	Least concern	-

3.3.2.1.2 Bird species richness over time

Bird species richness was examined overtime between each of the BBUS periods. There have been no significant changes in bird species richness from January 2017 to October 2025, see Figure 2.

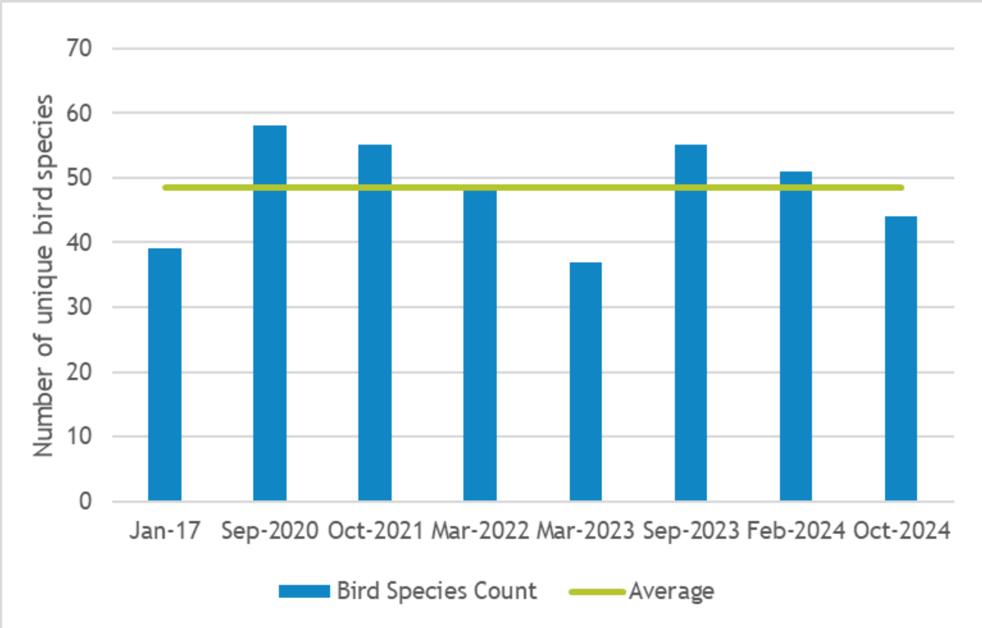


Figure 2: Bird species richness from January 2017 to October 2024.

3.3.2.1.3 Comparison of bird species richness between the different seasons

A comparison of bird species richness was performed between the wet and dry seasons. There was a total of 79 and 89 unique species detected respectively, across all wet and dry season surveys. The t-test ($p = 0.205$) suggests there is no statistical difference with species richness between the dry and wet season. However, dry season had an average of 54 species compared to the wet season 47 species indicating higher richness during the dry season, see Figure 3.

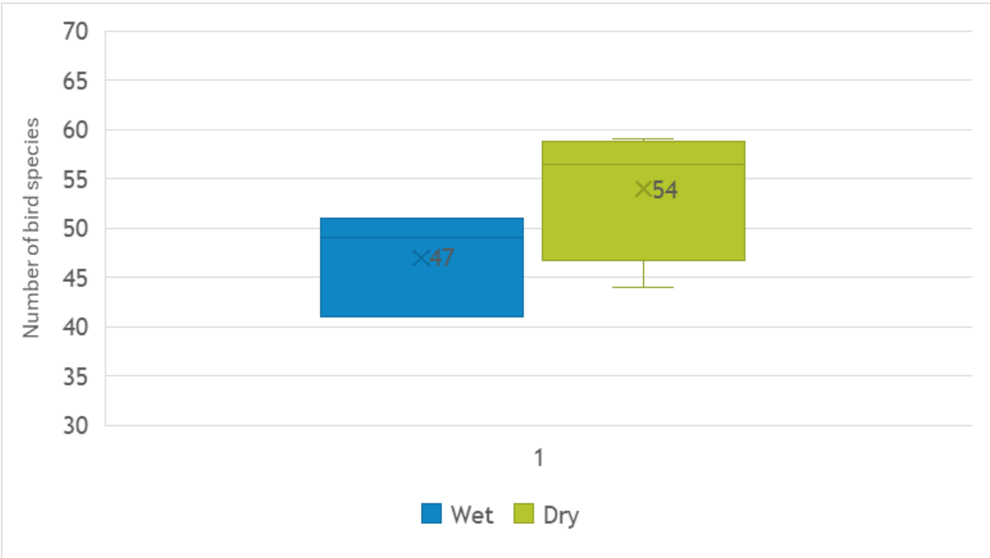


Figure 3: Bird species richness for the wet and dry seasons.

3.3.2.1.4 Bird species richness between turbines

A comparison of species richness was performed between each turbine. Kruskal-Wallis chi squared analysis (p = 0.463) indicates there was no significant difference between species richness across the different turbine sites. The lowest species count was 29 at WTG15 and the highest was observed at WTG13 with 44 different species, see Figure 4. The average number of species across all sites was 37.

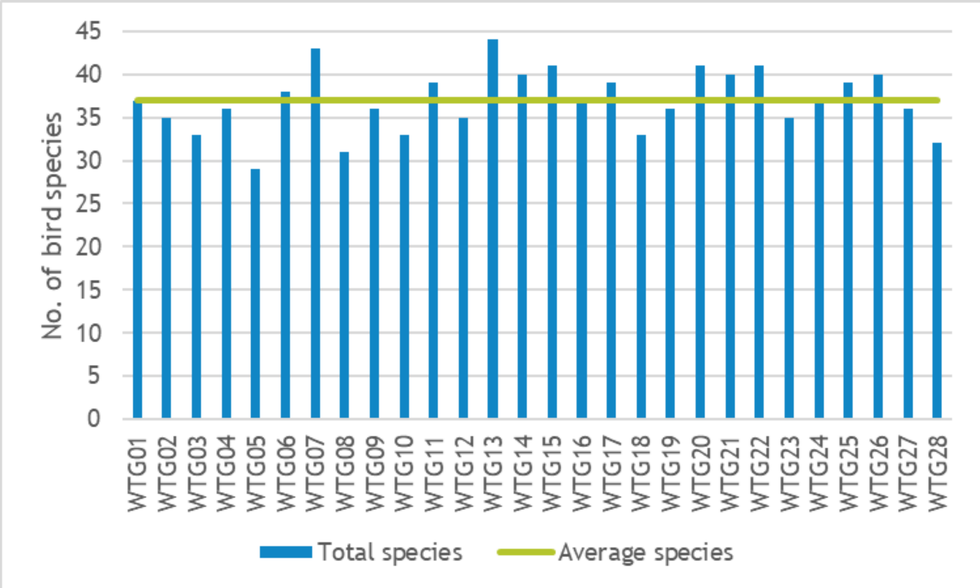


Figure 4: Number of unique bird species identified during BBUS point surveys.

3.3.2.1.5 Species richness and soil surface geology

There are two major soil groups located within the project boundaries. There are the more fertile basalt soils characterised by taller forests while the igneous soils are dominated by woodlands. A comparison of species richness against the different soil surface geology was conducted to determine if there was any difference in species richness across the two soil groups. The Kruskal-Wallis chi squared test (p = 0.104) indicates that there is no significant difference for species richness between the different soil groups.

3.3.2.1.6 Comparison of species composition between turbine sites

Species composition differs across the site according to Bray-Curtis dissimilarity test, with three different composition groupings. The three compositional groups are characterised in the hierarchical clustering map in Figure 5. The three compositional groups characterised from the Bray-Curtis dissimilarity index analysis are summarised in Table 5. The biggest difference in composition was between turbines 6 and 28 with a score of 0.69. Bray-Curtis dissimilarity heat map can be viewed in Figure 6.

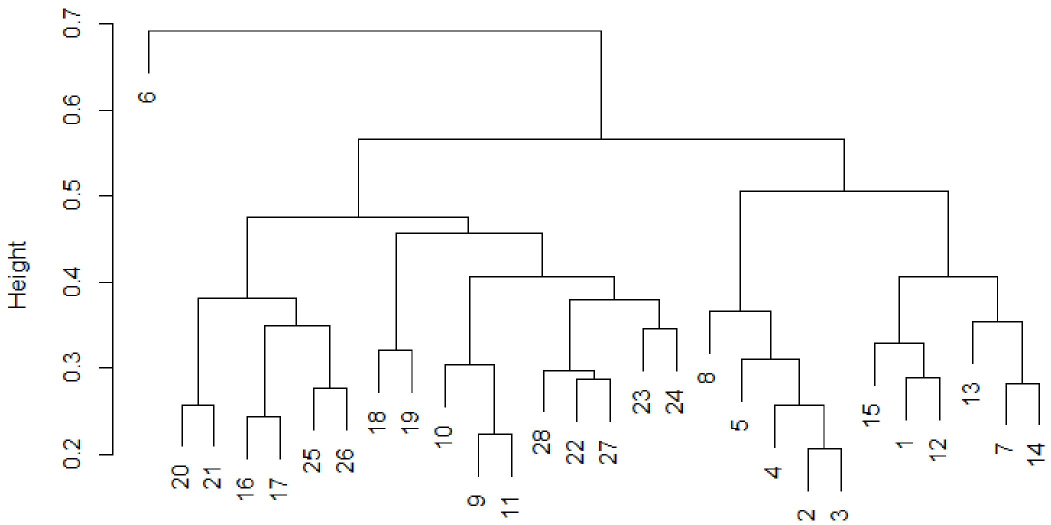


Figure 5: Bray-Curtis hierarchical clustering dissimilarity map for bird species across the 28 turbine sites.

Table 5: Bray-Curtis dissimilarity test reveals three species composition groups across sites.

Bray-Curtis Groups	Turbine groups with similar species
1	6
2	9, 10, 11, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
3	1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 15

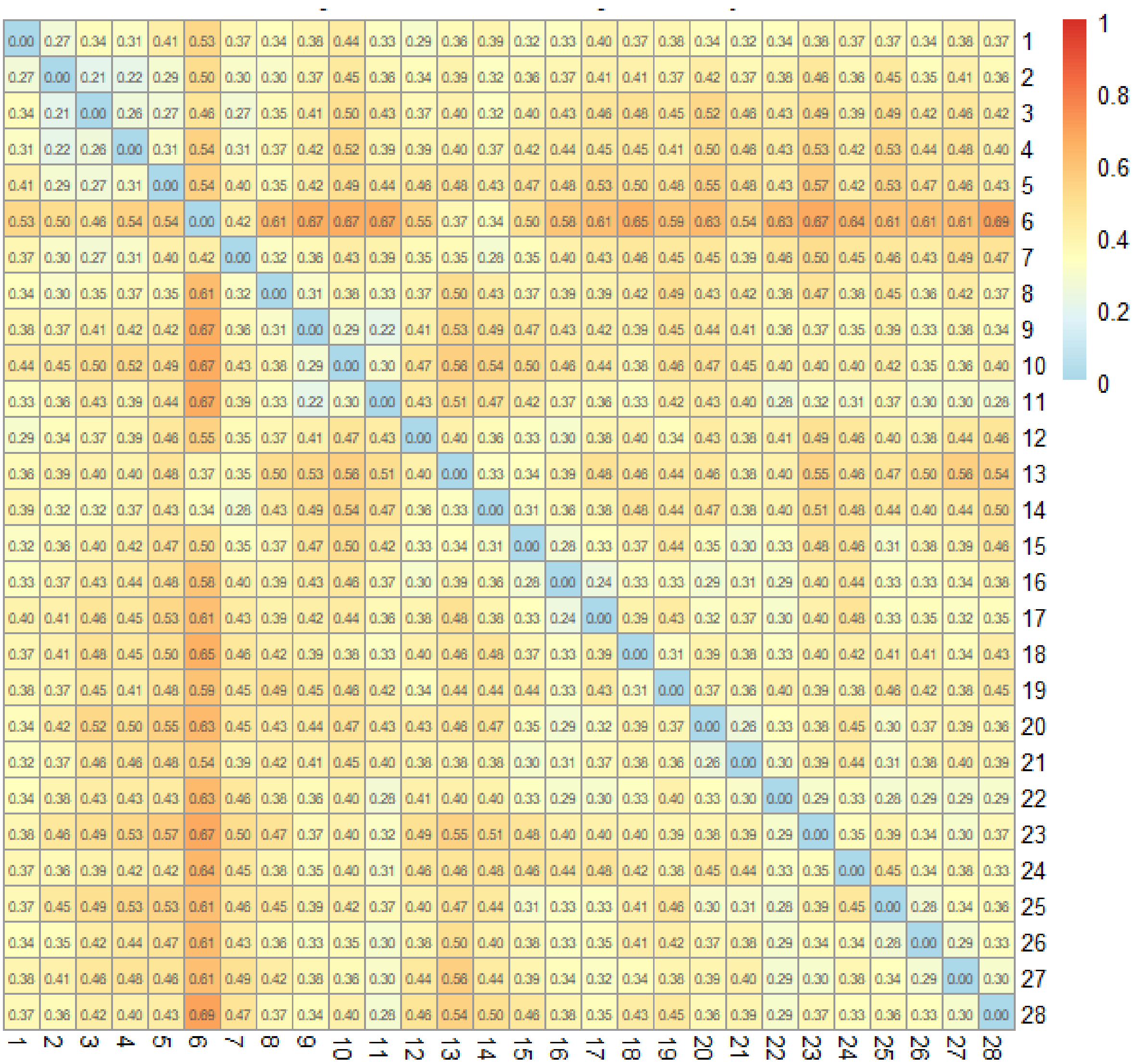


Figure 6: Bray-Curtis species composition dissimilarity heat map for bird species across site. (Turbine site numbers are on the X and Y axes)

3.3.2.1.7 Comparison of relative abundance of birds between wet and dry seasons

Relative abundance is not significantly higher in the dry-season compared to the wet-season (t-test , $p = 0.321$). However, the average number of individuals recorded, 1108 and 778 respectively, during the dry and wet season, suggests relative abundance is higher in the wet season, see Figure 7.

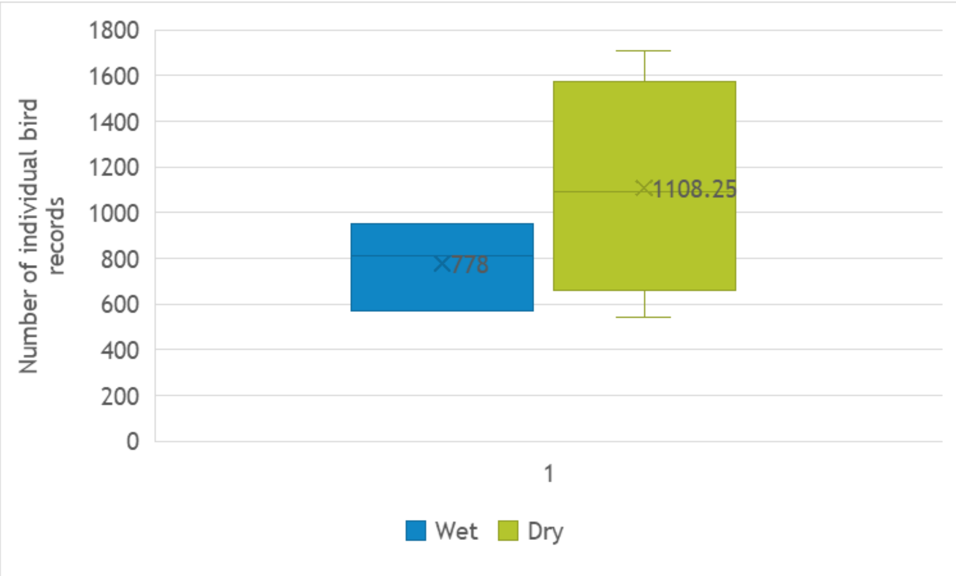


Figure 7: Box and whisker plots of bird relative abundance for the different seasons.

3.3.2.1.8 Number of bird point surveys required for detection of 90 percent of species richness

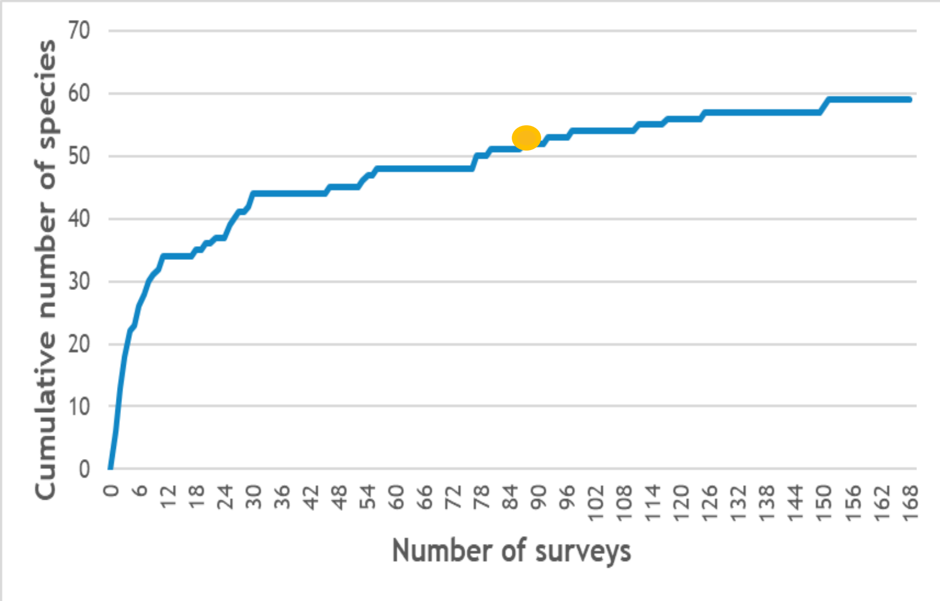
The total number of unique bird species for each BBUS is detailed in Table 6. The number of surveys when 90 percent of all species were detected for each seasonal survey is also provided in Table 6. Species accumulation curves have been provided in Table 7, along with a point indicating when 90 percent of bird species for each BBUS were detected.

Table 6: The survey number where 90 percent of bird species was observed during each BBUS.

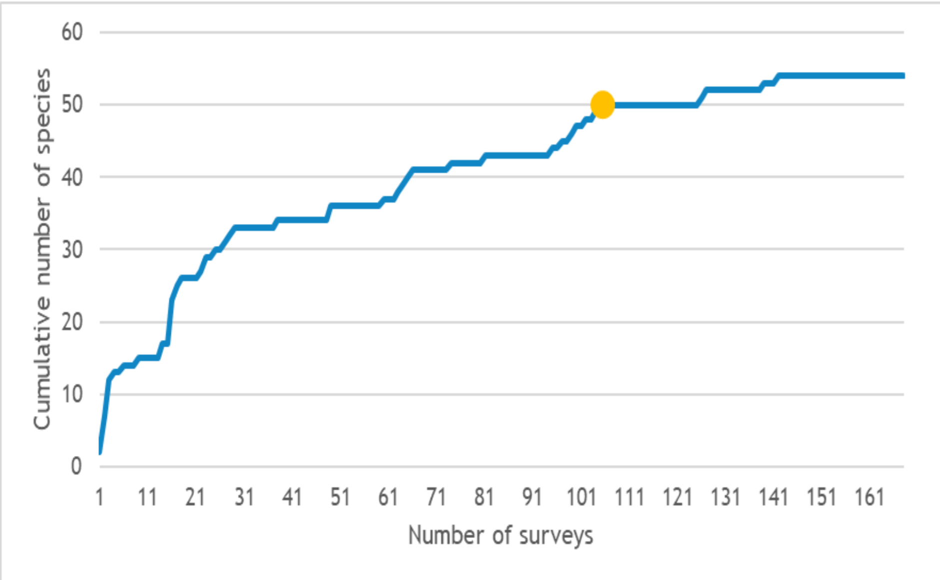
Survey Date	Total bird Species Count	90% of bird species	Survey no. where 90% of total bird species is observed
Jan-2017[1]	39	35.1	NA[1]
Sep-2020	58	52.2	88
Oct-2021	55	49.5	107
Mar-2022	49	44.1	99
Mar-2023	37	33.3	123
Sep-2023	55	49.5	63
Feb-2024	51	45.9	109
Oct-2024	44	39.6	77
Average	48.5	-	95.1

1. This was a baseline study and the survey protocol and data collection methods were different to the subsequent standardised bird surveys. As such, accumulation curves could not be generated.

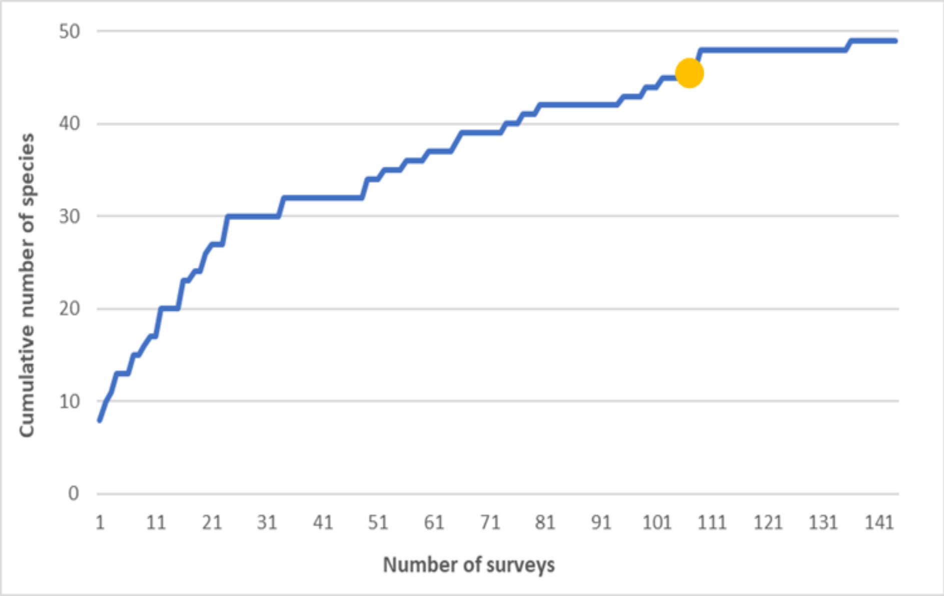
Table 7: Accumulation curves indicating the number of unique bird species for each BBUS along with the orange point showing when 90 percent of bird species had been observed.



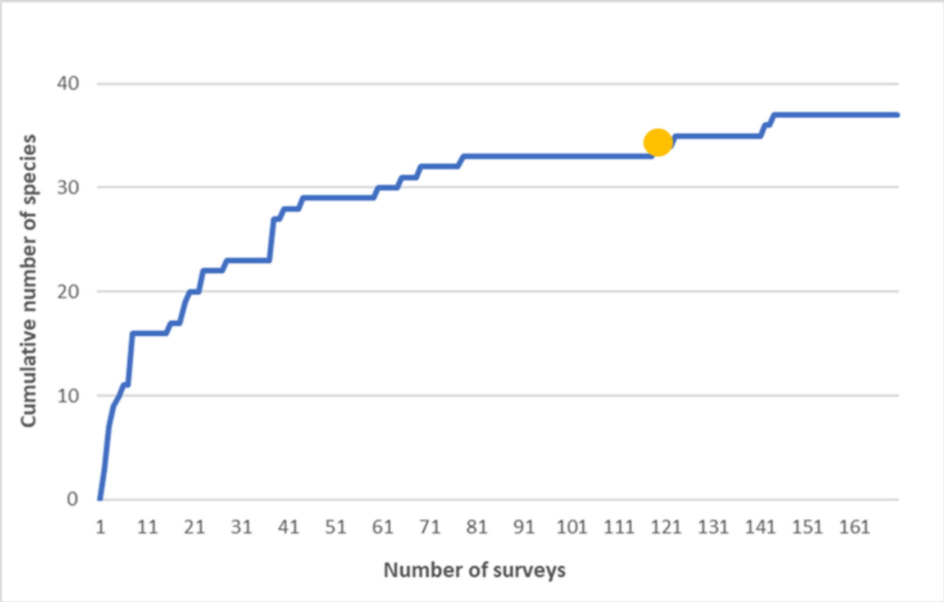
September 2020



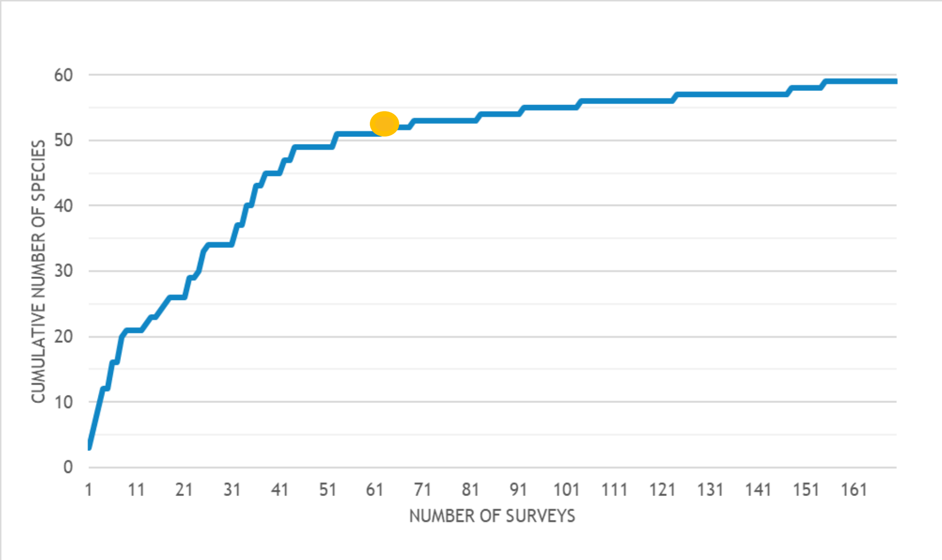
October 2021



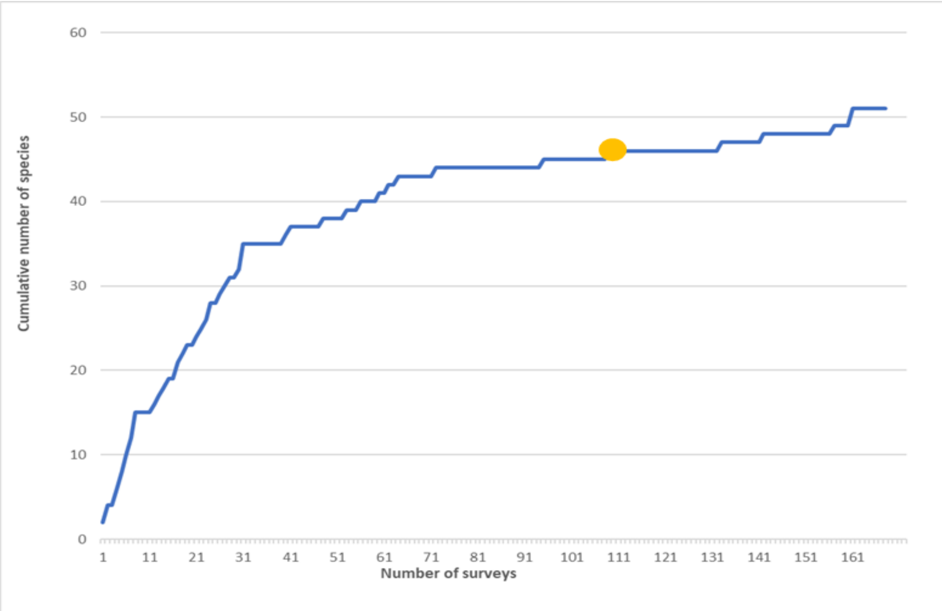
March 2022



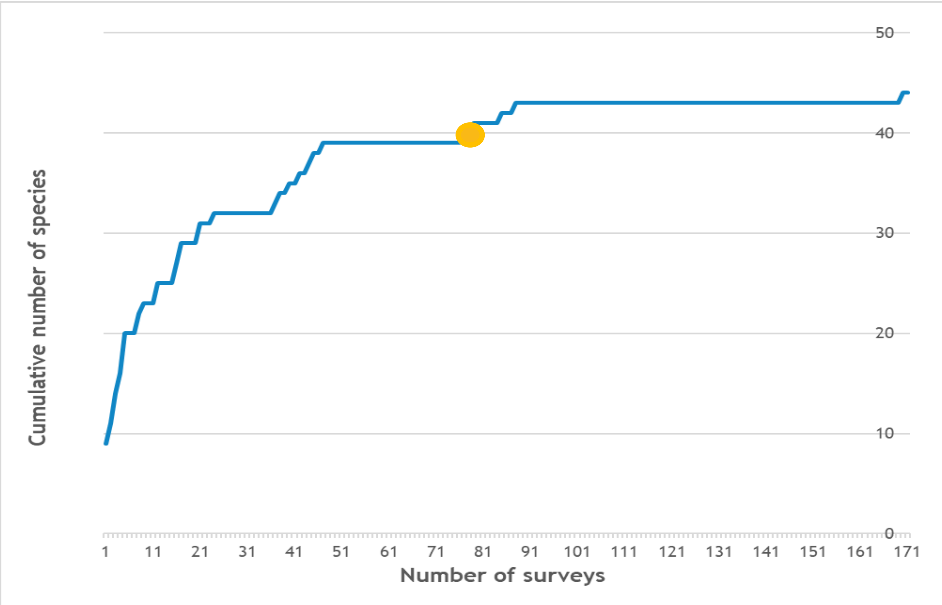
March 2023



September 2023



February 2024



October 2024

3.3.2.2 Microbat data analysis

The results of the microbat data analysis have been used for providing critical information for the timing, frequency and effort for ongoing monitoring programs. Details of the monitoring program are provided in the revised BBAMP (Revision 11). A summary of the microbat data analysis is provided below.

3.3.2.2.1 Microbat total species richness

The total number of different microbat species positively identified from September 2020 to October 2024 is twenty-two (22). A list of these species and their threatened species status has been provided in Table 8.

Table 8: Microbat species identified via audio recordings from September 2020 to October 2024

Species name	Common name	NC Act listing	EPBC Act listing
Saccolaimus saccolaimus	bare-rumped sheathtail bat	Endangered	Vulnerable
Pipistrellus adamsi	Cape York pipistrelle	Least concern	-
Chalinolobus morio	chocolate wattled bat	Least concern	-
Vespadelus troughtoni	eastern cave bat	Least concern	-
Vespadelus pumilus	eastern forest bat	Least concern	-
Ozimops ridei	eastern free-tailed bat	Least concern	-
Rhinolophus megaphyllus	eastern horseshoe bat	Least concern	-
Chalinolobus gouldii	Gould's wattled bat	Least concern	-
Scoteanax rueppellii	greater broad-nosed bat	Least concern	-

Species name	Common name	NC Act listing	EPBC Act listing
Chalinolobus nigrogriseus	hoary wattled bat	Least concern	-
Scotorepens balstoni	inland broad-nosed bat	Least concern	-
Miniopterus orianae oceanensis	large bent-wing bat	Least concern	-
Miniopterus australis	little bent-wing bat	Least concern	-
Scotorepens greyii	little broad-nosed bat	Least concern	-
Scotorepens sanborni	northern broad-nosed bat	Least concern	-
Chaerephon jobensis	northern freetail bat	Least concern	-
Ozimops lumsdenae	northern free-tailed bat	Least concern	-
Scotorepens orion	south-eastern broad-nosed bat	Least concern	-
Taphozous troughtoni	Troughton's sheathtail bat	Least concern	-
Austronomus australis	white-striped freetail bat	Least concern	-
Saccolaimus flaviventris	yellow-bellied sheathtail bat	Least concern	-

3.3.2.2.2 New threatened microbat observations

The bare-rumped sheathtail bat (*Saccolaimus saccolaimus)* is listed as endangered under the NC Act and vulnerable under EPBC Act. This species was noted as present, from audio recordings, during one survey in March 2023 but has not been recorded during any other survey sessions. There was a total of seven (7) calls recorded over three different locations during the March 2023 survey. The site locations were WTG06, WTG12 and WTG25.

3.3.2.2.3 Microbat species richness across the site over time

Microbat species richness was compared over time for each BBUS session. There has been no decrease in microbat species richness from baseline surveys (September 2020 and October 2021) compared to post construction data, see Figure 8. The lowest species richness, ten (10), was recorded in September 2020 during pre-construction survey and the highest species richness was observed post-construction with eighteen (18) unique species recorded during the March 2023 survey.

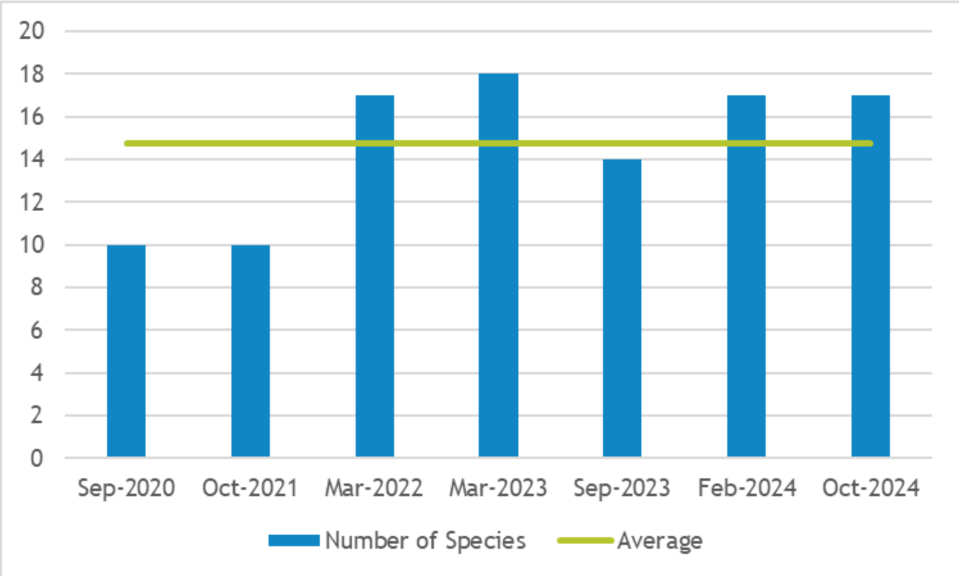


Figure 8: Number of unique microbat species identified during BBUS point surveys

3.3.2.2.4 Comparison of microbat species richness between the different seasons

A comparison of microbat species richness was conducted between the wet and dry seasons. Twenty-two (22) unique species were recorded during all wet season surveys and eighteen (18) unique species recorded during all dry season surveys. The average number of microbat species for wet and dry seasons was 17.33 and 12.75 respectively, see Figure 9, with the independent t-test showing a significant difference, (p=0.074).

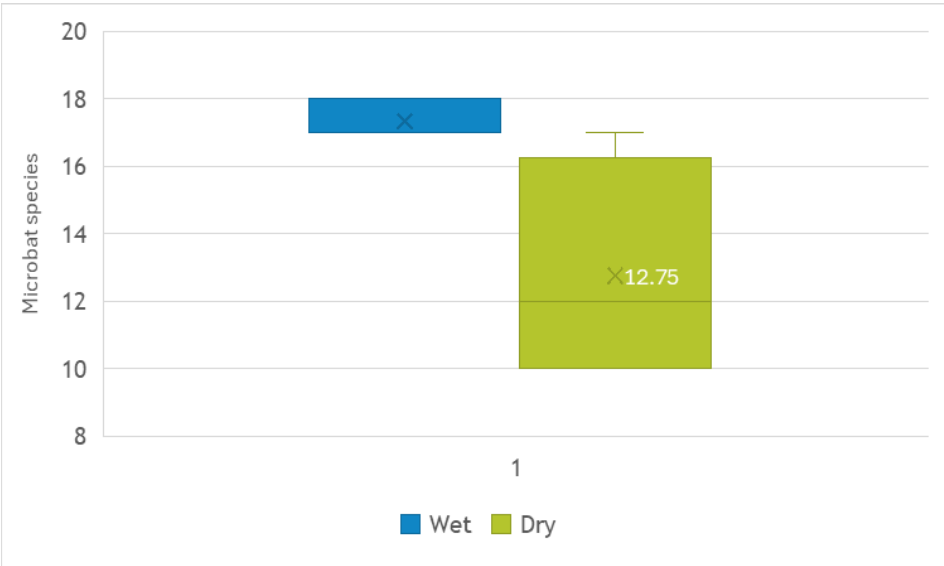


Figure 9: Microbat species richness for the wet and dry seasons.

3.3.2.2.5 Microbat species richness between turbines

A comparison of species richness was performed between each turbine. Kruskal-Wallis chi squared analysis (p = 0.464) indicates there was no significant difference between species richness across the different turbine sites. The lowest species count was 11 at turbines WTG24 and the highest was observed at WTG01 with 19 different microbat species, see Figure 4. The average number of species across all sites was 15.2.

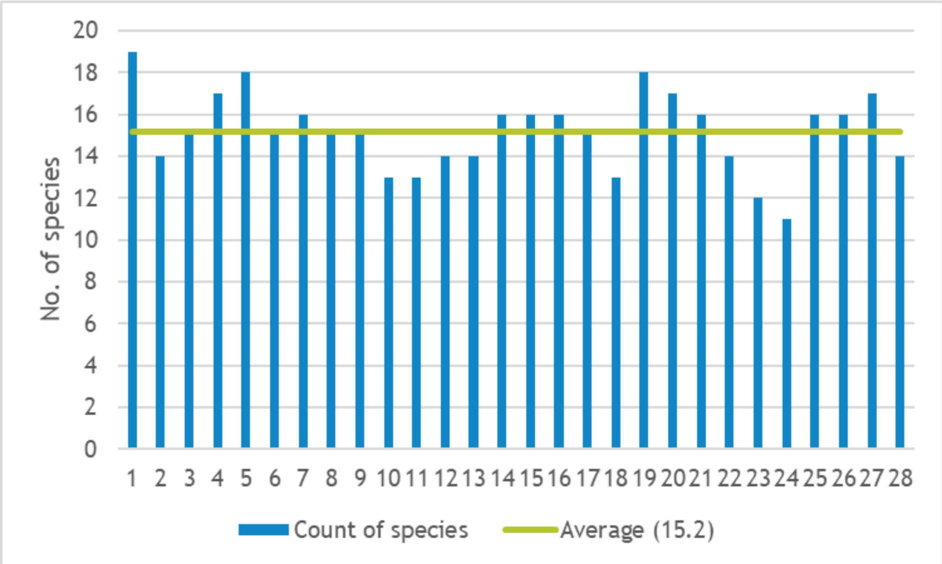


Figure 10: Number of microbat species detected at each site during BBUS call detection.

3.3.2.2.6 Microbat species richness and soil surface geology

There is no significant difference in mean microbat species richness comparing surface soil geology. That is, microbat species richness in vegetation groups on basalt soil is not different to those within vegetation groups for igneous soils (Kruskal-Wallis chi squared = 1.0512, df = 1, p = 0.305).

3.3.2.2.7 Comparison of microbat species composition between turbine sites

Microbat species composition does not differ significantly across the site according to Bray-Curtis dissimilarity test. The highest dissimilarity score of 0.38 between turbines 18 and 28 indicates no significant difference between sites. Figure 11 details the hierarchical clustering dissimilarity map for microbat species across all 28 sites. The Bray-Curtis dissimilarity heat map can be viewed in Figure 12.

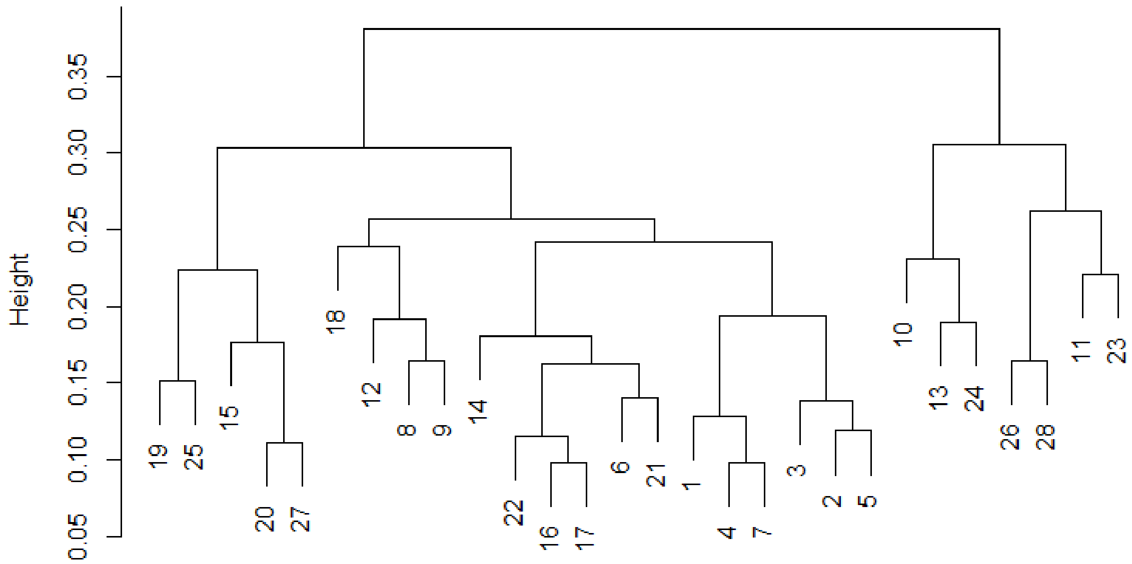


Figure 11. Bray-Curtis hierarchical clustering dissimilarity map for microbat species across the 28 turbine sites

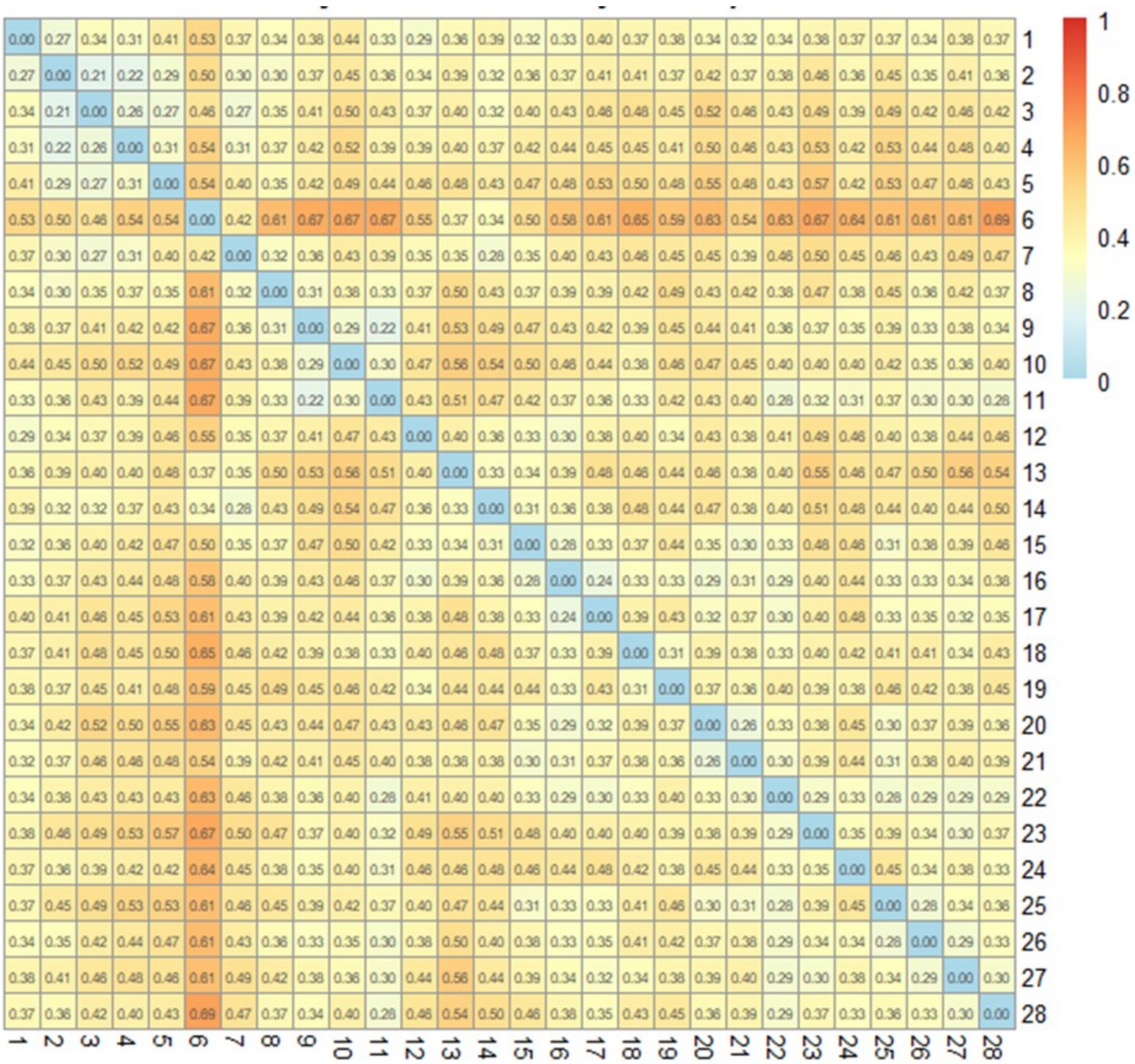


Figure 12: Bray-Curtis species composition dissimilarity heat map for bat species across site. (Turbine site numbers are on the X and Y axes)

3.3.2.2.8 Comparison of relative abundance of microbats between wet and dry seasons

The total number of microbat calls was used as a measure of relative abundance across the two seasons. Comparing the total number of microbat calls, there is no significant difference in microbat relative abundance, between the wet and dry season(t-test, $p = 0.289$). The average number of calls during the wet season was 10,373 and the average number of calls during the dry season was 8,223. A box-plot in Figure 12 provides visual representation od the datasets for the wet and dry season call records.

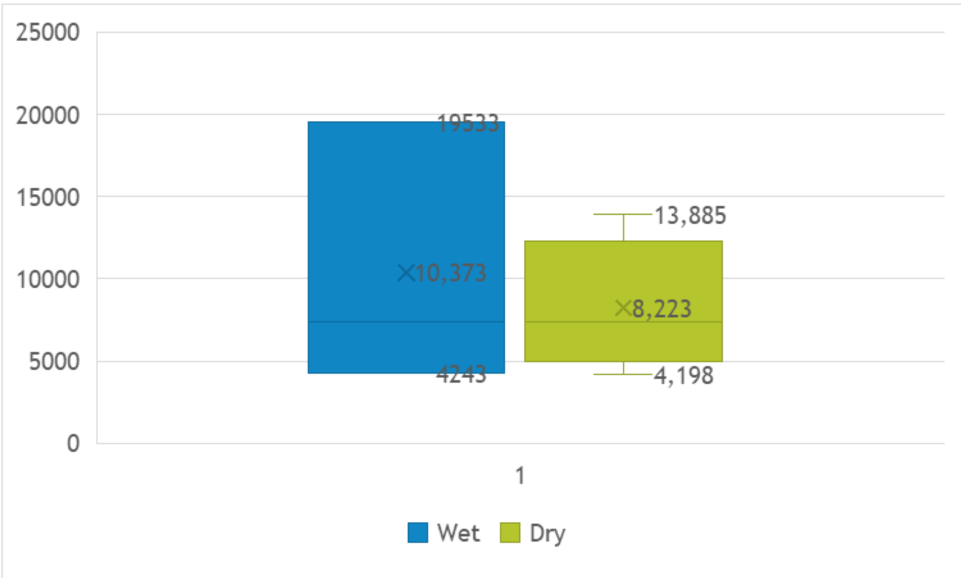


Figure 13: Total number of microbat calls detected for the different seasons

3.3.2.2.9 Comparison of relative abundance of microbats across all sites

Single factor ANOVA test identified a significant difference (p=0.0003) between average microbat calls (relative abundance) between the different sites. The lowest number of average calls recorded was at turbine 24 with 52 calls per survey and the highest number was recorded at turbines 20 and 21 with 1195 and 1153 calls respectively. All sites have equal survey effort of seven surveys each for two nights of recording. Microbat relative abundance for each site is provided in Figure 14.

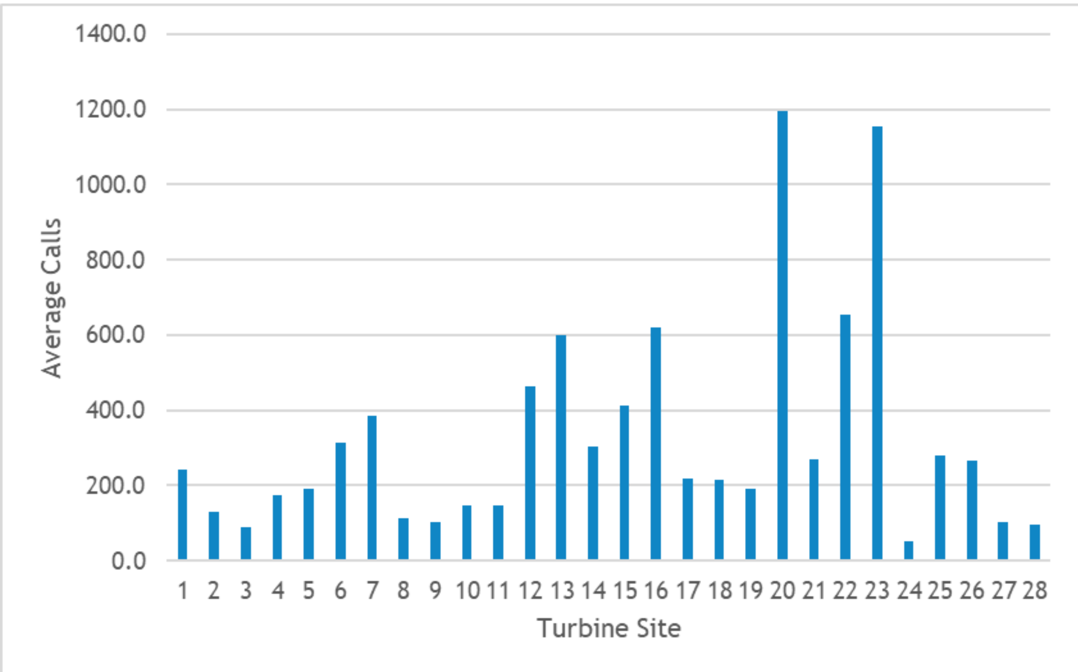


Figure 14: Total microbat calls recorded at each site

3.3.3 Monthly carcass monitoring analysis

Twice monthly carcass monitoring was completed for the detection of bird and bat species that have possibly interacted with turbines. The BBAMP defines a carcass as, "any dead or injured bird or bat, or significant parts of a bird or bat, detected during the monthly search activity". The search area is the searchable area within 120 m radius of the turbine. The searchable area is defined as any area within the 120 m radius of the turbine, that is not restricted by safety limitations such as, unexploded ordinance, steep terrain and embankments, and impenetrable ground or shrub layer. Another search limitation is scheduled turbine maintenance that restricts access to the monitoring sites.

The objective of twice-monthly carcass monitoring is to determine if there are any likely impacts to listed migratory and threatened species. Monitoring results are examined monthly and annually, to examine any likely significant impacts. The data-set also helps to understand if there are any site utilisation trends, by any of the protected species, that may be informative in site management strategies for the benefit of mitigation.

In total, 24 of the 28 turbines have undergone bi-monthly carcass monitoring. Fifteen turbine sites were nominated prior to construction, and nine additional sites were added when identified as 'high-risk'[4] turbines. Carcass monitoring commenced in September 2022, one month post commissioning of the first complete turbine. All carcass monitoring data from September 2022 to January 2025 are summarised and presented in this section.

3.3.3.1 Bird and bat mortalities

The results of the mortality data analysis provide critical information for, the timing, frequency and effort for ongoing carcass monitoring programs. Details of the monitoring program are provided in the revised BBAMP (Revision 11). A summary of the mortality data analysis is provided in the following sections.

3.3.3.1.1 Bird and bat rate of carcass detection

The rate of carcass detection is the number of carcasses found per hour search effort per month. Microbat carcass detection was three (3) times higher than birds. Microbats are detected at a monthly, per turbine, rate of 0.43 bats, and the bird detection rate is 0.14 birds pre turbine per month, see Figure 15.

[4] 'High-risk' turbines are; any turbine that any EPBC listed migratory or threatened species that are bird or bat species have been detected within 350 m of the radius of the turbine.

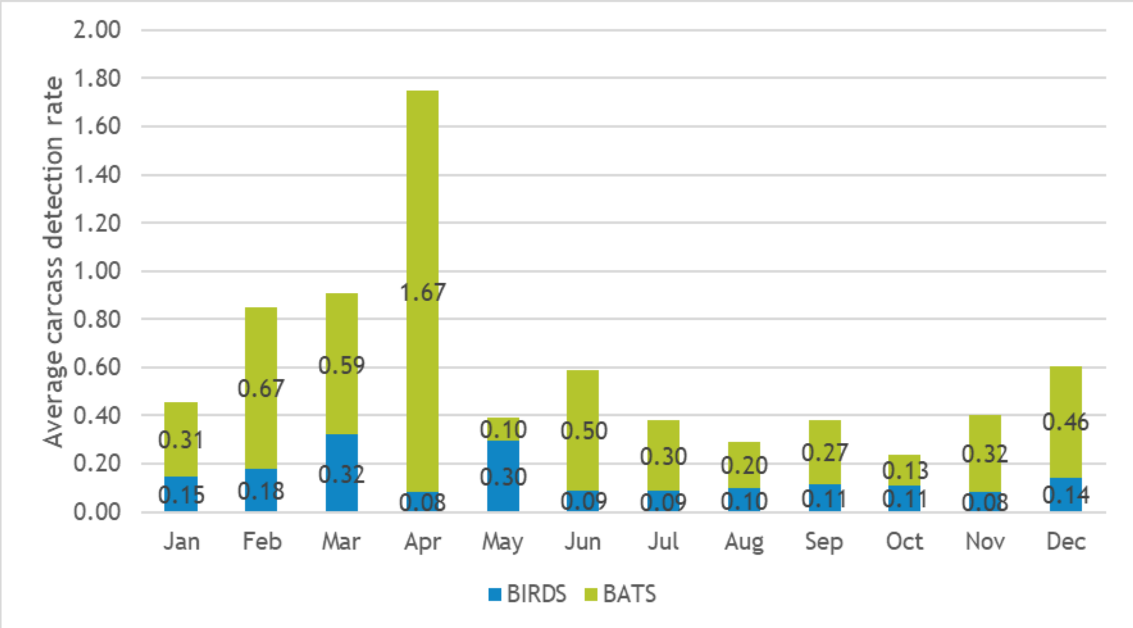


Figure 15: Average carcass detection rate of birds and bats per turbine per hour per month.

3.3.3.1.2 Bird and bat rate of carcass detection per site

A comparison between bats and birds for the rate of carcass detection was calculated for each turbine site. The rate of bat carcass detection is substantially higher than birds across all turbine sitings except for WTG05 and WTG25, see Figure 16.

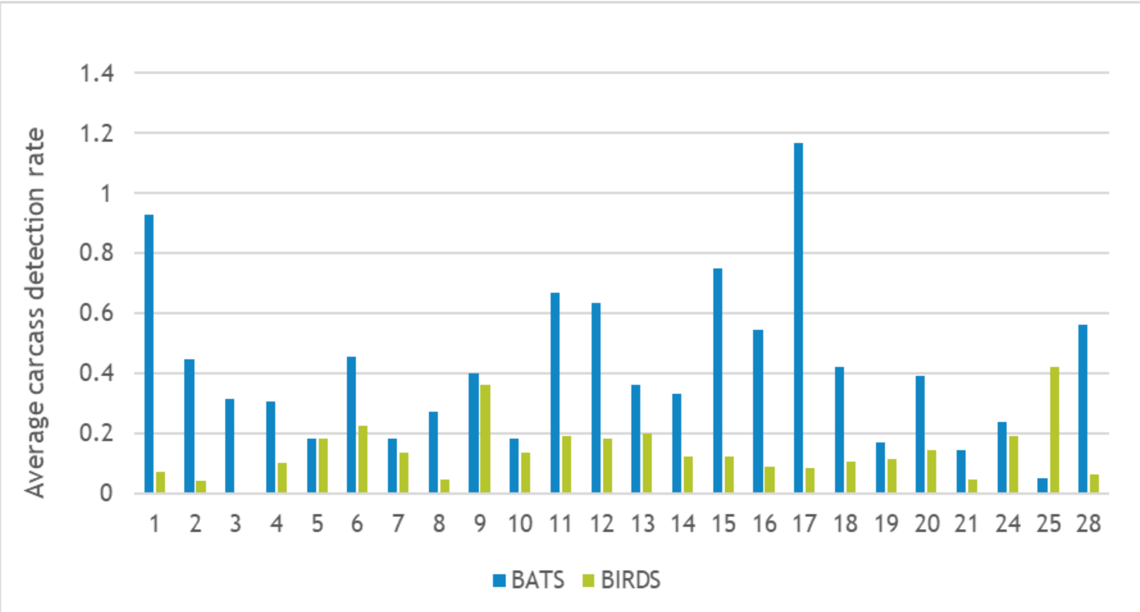


Figure 16: Average number of bird and bat carcasses found at each turbine siting per hour per month.

3.3.3.1.3 Bird and bat rate of carcass detection per month

Carcass detection rates were calculated for both species groups for each month. The three months with the highest detection rate for microbats were February, March and April, and for birds the months with the highest detection were February, March and May, see Figure 17.

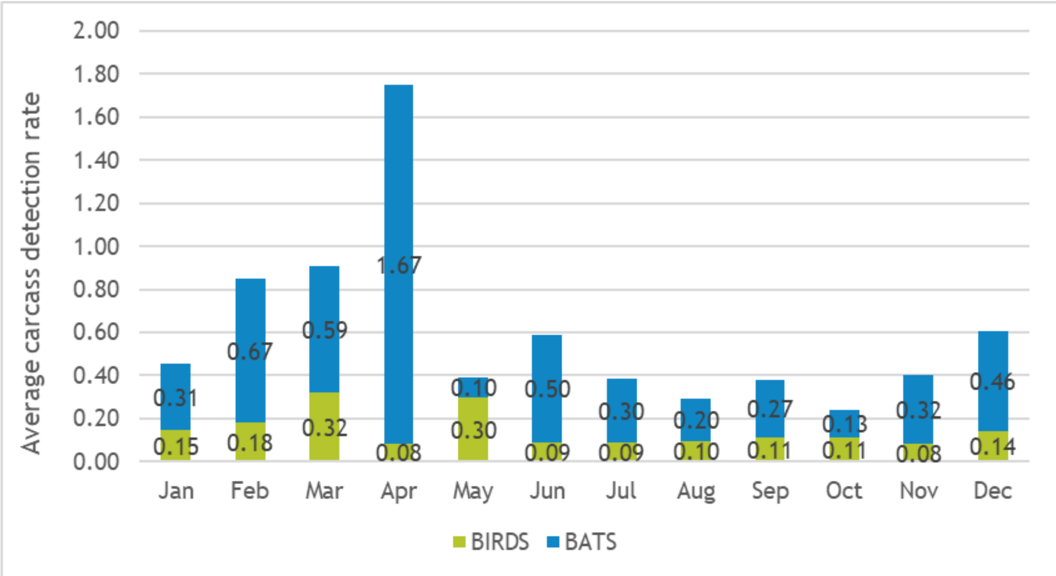


Figure 17: Average number of carcasses detected per hour search effort for each month.

3.3.3.1.4 Bird and bat rate of carcass detection across seasons

The rate of carcass detection was calculated for the different seasons. For bats the rate of detection was significantly higher in the wet season with a result of 0.67 carcasses found per hour compared to 0.25 carcasses per hour during the dry season. For birds, there was no significant difference for detection with 0.16 and 0.13 carcasses detected during the wet and dry seasons respectively. A comparison of seasonal carcass detection rates are provided in Figure 18.

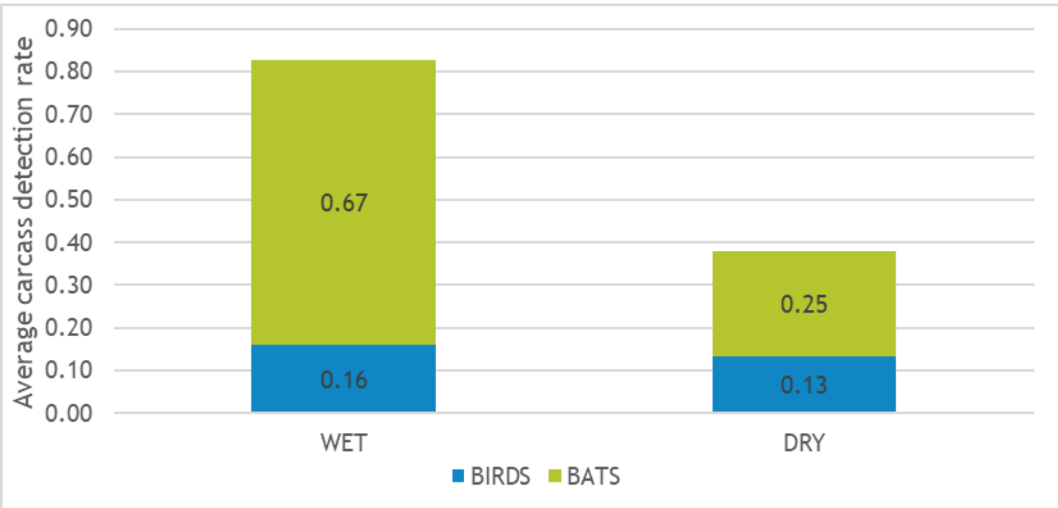


Figure 18: Average number of bird and bat carcasses detected per month per turbine, for the wet and dry seasons.

4 Summary

4.1 Survey effort

4.1.1 Bird and bat utilisation surveys

During eight years of survey from January 2017 to January 2025 and across two different seasons the following surveys were completed across the entire site:

- 1,230, twenty-minute bird point surveys
- 432 nights of microbat audio recordings
- 322, twenty-minute nocturnal megabat point surveys

4.1.2 Post-commissioning carcass search monitoring

Post-commissioning carcass search monitoring commenced in September 2022. Bi-monthly monitoring was conducted for all 15 nominal turbines and any 'high-risk' turbines were included in the monitoring program. A total of 1,018 searches have been completed from September 2022 to January 2025.

4.2 BBUS results

4.2.1 Birds

- There was a total of 94 different bird species identified from all BBUS's from 6,767 observations.
- There have been no significant changes in bird species richness comparing baseline surveys to post-commissioning surveys.
- Statistically there is no difference in bird species richness across the wet and dry seasons. However, data suggests that the dry season does record more species with an average of 54 species in the dry season compared to 47 during the wet season.
- Statistically there is no significant difference in bird species richness between each turbine.
- Statistically there is no significant difference in bird species richness between the different site soil surface geology.
- Bray-Curtis dissimilarity test indicates that there three (3) species compositional groups across site.
- Statistically there is no significant difference in relative abundance of birds comparing the wet and dry seasons. However, the data does suggest higher abundance in the dry season with an average of 1,108 records compared to the wet season average of 778 records.
- The average number of bird surveys required to reach 90 percent of bird species during BBUS point survey was 95 surveys.

4.2.2 Microbats

- From 432 nights of microbat recordings there was a total of 21 different species identified from a total of 64,009 individual call records.

- There have been no significant changes in microbat species richness comparing baseline surveys to post-commissioning surveys. Baseline surveys identified ten (10) species while the average of post-commissioning surveys was 16.5 with an overall average of 14.75 species.
- Statistically there is a significant difference in microbat species richness across the wet and dry seasons. The average microbat species richness for the wet season is 17.33 and the average for the dry season is 12.75.
- Statistically there is no significant difference in microbat species richness between each turbine.
- Statistically there is no significant difference in microbat species richness between the different site soil surface geology.
- Bray-Curtis dissimilarity test indicates that there are no different species compositional groupings across the site.
- Statistically there is no significant difference in relative abundance of microbats comparing the wet and dry seasons. However, the data does suggest higher abundance in the wet season with an average of 10,373 records compared to the dry season average of 8,223 records.
- Single factor ANOVA test identified that there is a statistical difference ($p=0.0003$) in microbat relative abundance between the different sites Turbine sites 20 and 23 had an average over 1,100 calls per survey while most other sites recorded an average less than 500 calls per survey.
- Of note was the detection of an additional microbat species listed under the EPBC Act and NC Act. The species is the bare-rumped sheathtail bat (*Saccolaimus saccolaimus*). This species was detected during one survey (March 2023) with 7 calls recorded.

4.2.3 Megabats

During the 322 twenty-minute nocturnal surveys across the site during both seasons there were no flying-fox observations.

4.3 Mortality summary

- There have been 1,018 monthly carcass searches completed from September 2022 to January 2025.
- The overall average carcass detection rate is three (3) times higher for bats compared to birds with bats having a detection rate of 0.43 individuals per turbine per month and birds a detection rate of 0.14.
- In general, there are more bats detected across all turbines compared to birds.
- Bat rate of detection is higher across all months except for May when the detection rate for birds was 0.30 and 0.10 for bats.
- Rate of detection was highest for bats during February, March and April and highest for birds during February, March and May.
- The rate of bat detection was highest during the wet season but there was no significant detection rate difference for birds between the wet and dry seasons.
- From 58 monthly carcass search surveys there were six (6) records of white-throated needletails, two (2) spectacled flying-fox and eight (8) fork-tailed swift. Seven of the eight fork-tailed swift records were observed during January and February 2023 with only one additional observation in January 2024.

5 Conclusion

Eight years of bird and bat data collected between January 2017 to January 2025 from multiple survey streams was consolidated and analysed during this data review process. The outcomes of which are to help inform the revision of the Bird and Bat Adaptive Management Plan (E2M Pty Ltd, 2025).

Of note, during this data analysis and review are the following points:

- One survey recorded the presence of an additional threatened microbat species, the bare-rumped sheathtail bat.
- Bird species richness and abundance appears slightly higher in the dry season whereas microbat species richness is higher during the wet season along with microbat relative abundance.
- There was no significant difference between turbines for bird and bat species richness.
- There was no significant difference for species richness for bird and bats at sites with different surface soil geology and different vegetation types. The more fertile basalt soils contain forests with larger denser trees while igneous soils, in comparison, have woodlands with less abundant and smaller trees.
- There were three (3) bird species compositional groups identified across site, whereas no different compositional groupings were identified for microbat populations.
- No megabats (flying foxes) were recorded during 322 nocturnal point surveys.
- Rate of carcass detection is three times higher for bats compared to birds.
- There was a higher incidence of carcass detection for bats during February, March and April and a slightly higher rate of bird carcass detection during the months of February, March and May.
- There was a significant decrease in fork-tailed swift carcass finds from seven (7) individuals to one (1) individual during January and February 2023 and January and February 2024 respectively. There were no fork-tailed swifts observed during the January and February 2025 carcass surveys. Possibly indicating that migrating birds are learning how to detect and avoid wind turbines. However, more data is required for confirmation of this conclusion.

6 References

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Appendix F: Weed Management Plan

Post-construction: Weed Management Plan

30 August 2024

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust

Level 21/570 George St, Sydney, NSW 2000

Document Management

Rev.	Issue Date	Description	Author (s)	Reviewed By	Approved	Signature
A	18/08/2024	Issue for Internal Review	Dean Jones	John van Osta	Dean Jones	
A	28/08/2024	Issue for Client Review	Dean Jones	Paul Suter (Neoen)	Dean Jones	
0	4/102024	Issue for Use	Dean Jones	Paul Suter (Neoen)	Dean Jones	DJones

Document Reference: …\JOBS\~2021\QEJ21046\DELIVERABLES\4. FY25 Jul-Dec\3A. Develop Weed Management Plan- VMP_JUL24\Weed Management Plan Aug24\RevA\21046_Kaban_WMP_Rev0.pdf

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Definitions

Term	Definition
Disturbance footprint	Any areas cleared for the purpose of the Project. The total area of disturbance is 104.88 hectares
The Project	The Kaban Green Power Hub
Vegetation Management Plan	The Vegetation Management Plan (VMP) stipulates performance criteria and management objectives for vegetation relevant to the Project
Weed Polygon Area	A specific area in which priority weeds were found

Abbreviations

Term	Definition
E2M	E2M Pty Ltd
WTG	Wind Turbine Generator
VMP	Vegetation Management Plan

1 Introduction

1.1 Background

The Kaban Green Power Hub, commonly known as the Kaban Wind Farm and herein referred to as 'the Project', consists of 28 operational wind turbines and associated infrastructure, and is located approximately 4 kilometres west of Tumoulin, Queensland, Figure 1. Construction commenced in May 2021, with the first turbine constructed and commissioned by August 2022.

E2M was commissioned by Kaban Wind Farm Trustee for the Kaban Wind Farm Trust to generate a post-construction Weed Management Plan for the operational phase of the action to help meet targets set within the Vegetation Management Plan (VMP), (E2M, 2021). The VMP stipulates performance criteria / management objectives associated with vegetation relevant to the Project, including:

- No introduction or spread of priority weed species within the site and successful removal of priority weed species within the disturbance footprint, and
- Progressive stabilisation of disturbed areas and rehabilitation of the disturbance footprint following construction.

1.2 Objectives

The aims of this document are to review the latest weed monitoring reports (E2M Pty Ltd, 2024a, 2024b), for the evaluation of weed infestations and to provide guidelines in support of the VMP. Specifically, the scope of this document is to:

- Map and monitor current and new weed infestations
- To develop guidelines for a treatment program that will effectively and progressively reduce weed infestations
- Mitigate the spread of weeds outside of the disturbance footprint

1.3 Weeds

Weeds in the context of this document are plants defined as priority weeds. Priority weeds are those plants identified within the *Biosecurity Act 2014* or locally declared weeds under the Tablelands Regional Council 2019-2024 Biosecurity Plan (Tablelands Pest Management Advisory Committee, 2019), or any weed known, or with potential, to cause negative impacts to the surrounding environment outside of the disturbance footprint. While some priority weeds were identified within the VMP, this should not be viewed as a definitive list. Latest post-construction weed surveys have identified an additional suite of weeds that are to be included as priority weeds. The current list of priority weeds, and their biosecurity risk listings, are detailed within Table 1. Any new priority weeds identified during monitoring activities are to be added, within progressive monitoring and treatment reports.

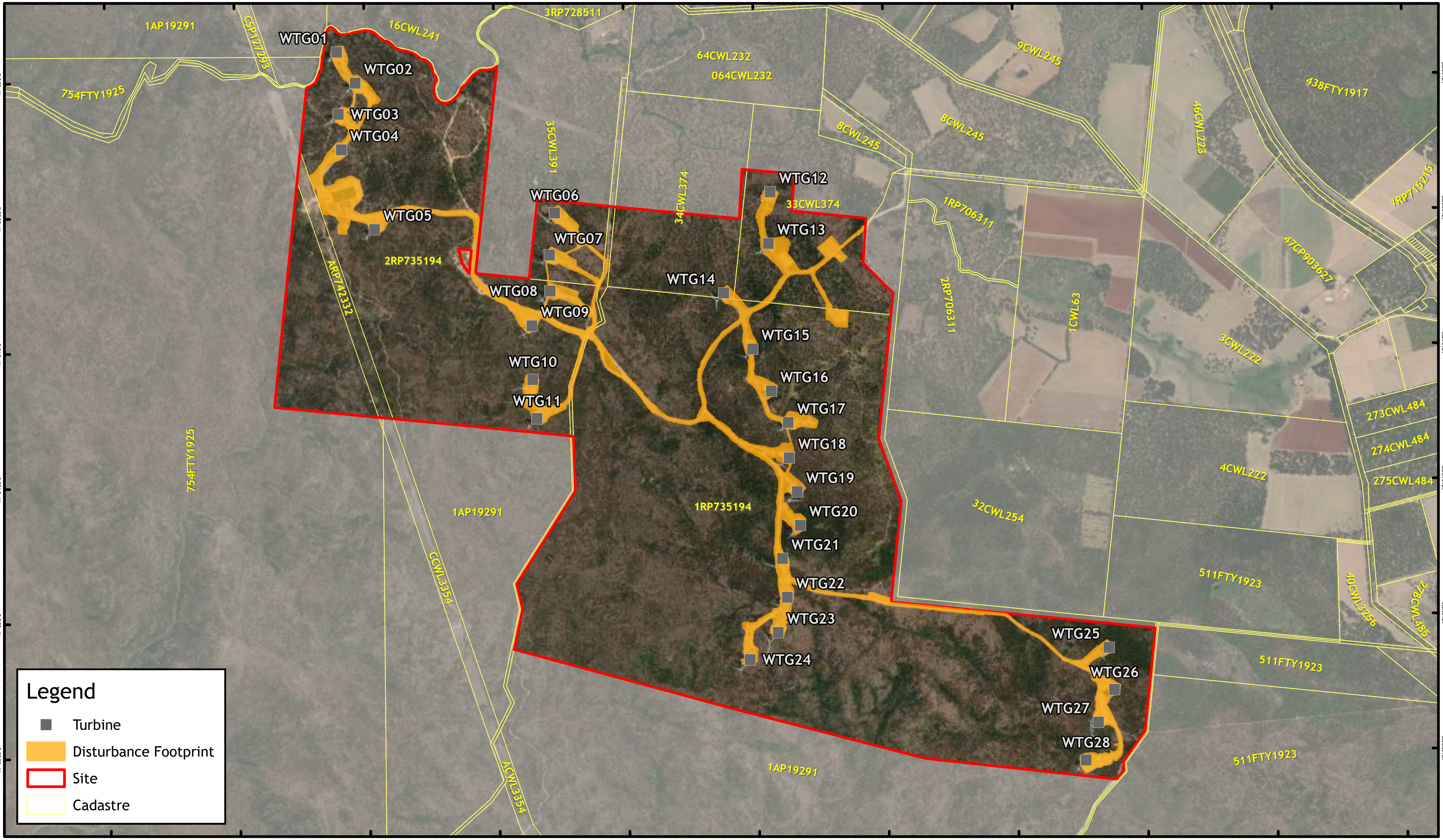
Each weed species has the potential to effect sensitive environmental matters differently. Some weeds are prolific seeders and can spread quickly throughout the landscape outcompeting native plants, some produce high fuel loads and some are difficult to control due to herbicides resistance or need specific high-risk[1] and costly herbicides. A weeds position within the landscape may also dictate priority of treatment. For example, *Mimosa pudica* (sensitive weed) growing within a sediment trap adjacent to magnificent brood frog habitat, would trigger high-priority treatment. As such, prioritising weed treatment needs to be considered, during monitoring and reporting, to mitigate the spread of the higher-risk weeds.

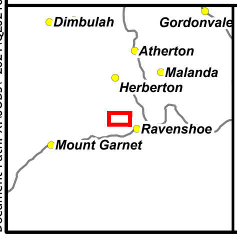
Table 1: Priority weeds identified within the Project disturbance footprint

Species	Biosecurity Act 2014	TRC Biosecurity Plan	Regarded as Environmental Weed
Devil's fig (*Solanum torvum*)	-	-	Yes[2]
Giant rat's tail (*Sporobolus pyramidalis*)	Category 3 restricted plant	Yes	Yes[1, 2,4]
Grader grass (*Themeda quadrivalvis*)	-	-	Yes[1,2,4]
Guinea grass (*Megathyrsus maximus*)	-	-	Yes[1,2,4]
Inkweed (*Phytolacca octandra)*	-	-	Yes
Lantana (*Lanata camara*)	Category 3 Restricted Matter	-	Yes[1]
Siratro (*Macroptilium atrpurpureun)*	-	-	Yes[1,2,4]
Mexican poppy (*Argemone mexicana*)	-	-	Yes[2]
Navua sedge (*Cyperus aromaticus*)	-	Yes	Yes[2, 3]
Rhodes grass (*Chloris gayana*)	-	-	Yes[1,2,4]
Sensitive weed (*Mimosa pudica*)	-	-	Yes[2]
Siam weed (*Chromolaena odorata)*	Category 3 Restricted Matter	Yes	Yes[1,2,4]
Signal grass (*Urochloa decumbens*)	-	-	Yes[1,2,4]
Singapore daisy (*Sphagneticola trilobata*)	Category 3 Restricted Matter	-	Yes[2]
Spiny sida (*Sida spinosa*)	-	-	Yes[2]
Tobacco weed (*Solanum mauritianum*)	-	-	Yes[2]

1. Increases fire intensity
2. Out competes natives
3. Poses significant threat to waterways and wetlands
4. Prolific seeder

[1] High-risk herbicides are those that can have implications to environmental values, such as frogs or non-target plants, or need specific handling, storage application measures to ensure the safety of the environment and the operator.





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Kilometers

Coordinate System: GDA2020

Notes:
Aerial Imagery: © ESRI 2024
Cadastre: © DNRME 2020

Rev	Description	Drawn	Approved	Date
A	Issued for Review	GO	DJ	27/08/2024

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FIGURE 1: PROJECT LOCATION

KABAN POST-CONSTRUCTION WEED MANAGEMENT
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
1 of 1	QEJ21046	A

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2 Monitoring

2.1 Monitoring Timing

Monitoring weed infestations should align with the growing season of weeds. During the warmer and wetter months the majority of problematic weeds are actively growing and producing reproductive material. Ideally monitoring should commence within 1 month of the first significant rains of the wet season to identify any newly established infestations and to re-examine the threat of established infestations. Monitoring early in the wet season is critical to effectively treat weeds while they are actively growing and before they produce viable seeds. A second round of monitoring to take place after the first round of seasonal treatment and while weeds are actively growing to ensure effective treatment[2]. Refer to Table 3 for recommended monitoring schedule.

2.2 Monitoring Sites

Monitoring is to take place across the entire disturbance footprint but is to be broken down into monitoring sites to ensure survey consistency and to aid with reporting and treatment program. The monitoring sites can be defined as follows:

- The immediate disturbance footprint surrounding each turbine location, n=28 sites
- The site access tracks. Previous reporting has surveyed eleven roadside sites identifiable between two turbine locations or other identifiable features within the landscape, such as the sawmill or various road intersections.

A list of current monitoring sites are further detailed in Table 2 and locations can be viewed in Figure 2.

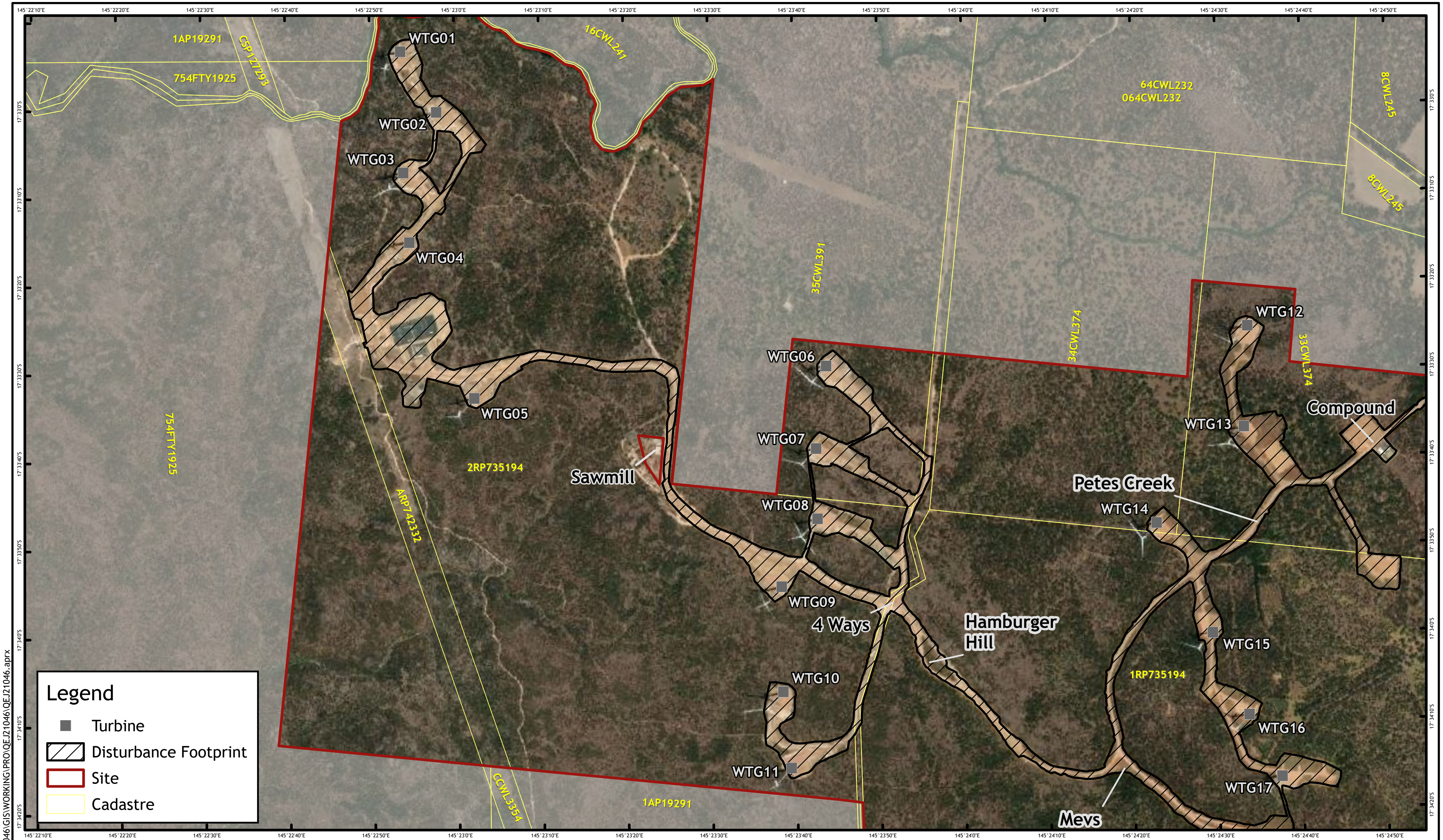
Table 2: Weed Monitoring Sites

Location Map Reference See Figure 2	Site Name	Location Description	Survey Area
WTG1, WTG2 to WTG28	WTG1, WTG2,…WTG28	Each turbine siting, n=28 sites	Rehabilitated and drainage areas immediately surrounding the turbine hardstand[1].
A	WTG5 to sawmill	Between WTG5 and sawmill.	Roadside verge and drainage
B	WTG9 to sawmill	Between WTG9 and sawmill.	Roadside verge and drainage, includes roads adjacent to sawmill
C	WTG9 to 4-Ways	Between WTG9 and 4-Ways Intersection	Roadside verge and drainage

[2] Actively growing weeds are more susceptible to herbicides.

Location Map Reference See Figure 2	Site Name	Location Description	Survey Area
D	4-Ways Intersection	The Intersection providing access to WTG8, WTG9 and WTG10.	Those areas adjacent to the road at the intersection, including the large area of rehabilitation on the south-eastern side.
E	4-Ways to WTG11	Between WTG11 and 4-Ways intersection	Roadside verge and drainage.
F	Hamburger Hill to Mevs	Between Hamburger Hill and Mevs Mountain intersection	Roadside verge and drainage
G	Mevs to WTG18	Between Mevs Mountain intersection to road fork to WTG18	Roadside verge and drainage
H	WTG20 to WTG21	Between WTG20 to WTG21	Roadside verge and drainage
I	Track 11 to WTG25	Track 11, road starting near WTG22 through to WTG25	Roadside verge and drainage
J	Gravel Stockpile	Gravel stockpile located 600m East from Track 11 intersection.	Gravel pile
K	Mevs to Pete's Creek	Mevs Mountain intersection to Pete's Creek	Roadside verge and drainage

1. Hardstand weed monitoring & treatment is the responsibility of Vestas. However, any high priority weed in isolation will be treated, if they pose a significant risk of spreading.



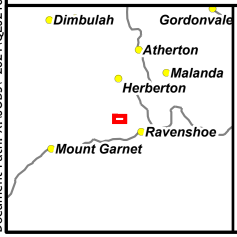


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FIGURE 2A: WEED MONITORING SITES

KABAN POST-CONSTRUCTION WEED MANAGEMENT
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
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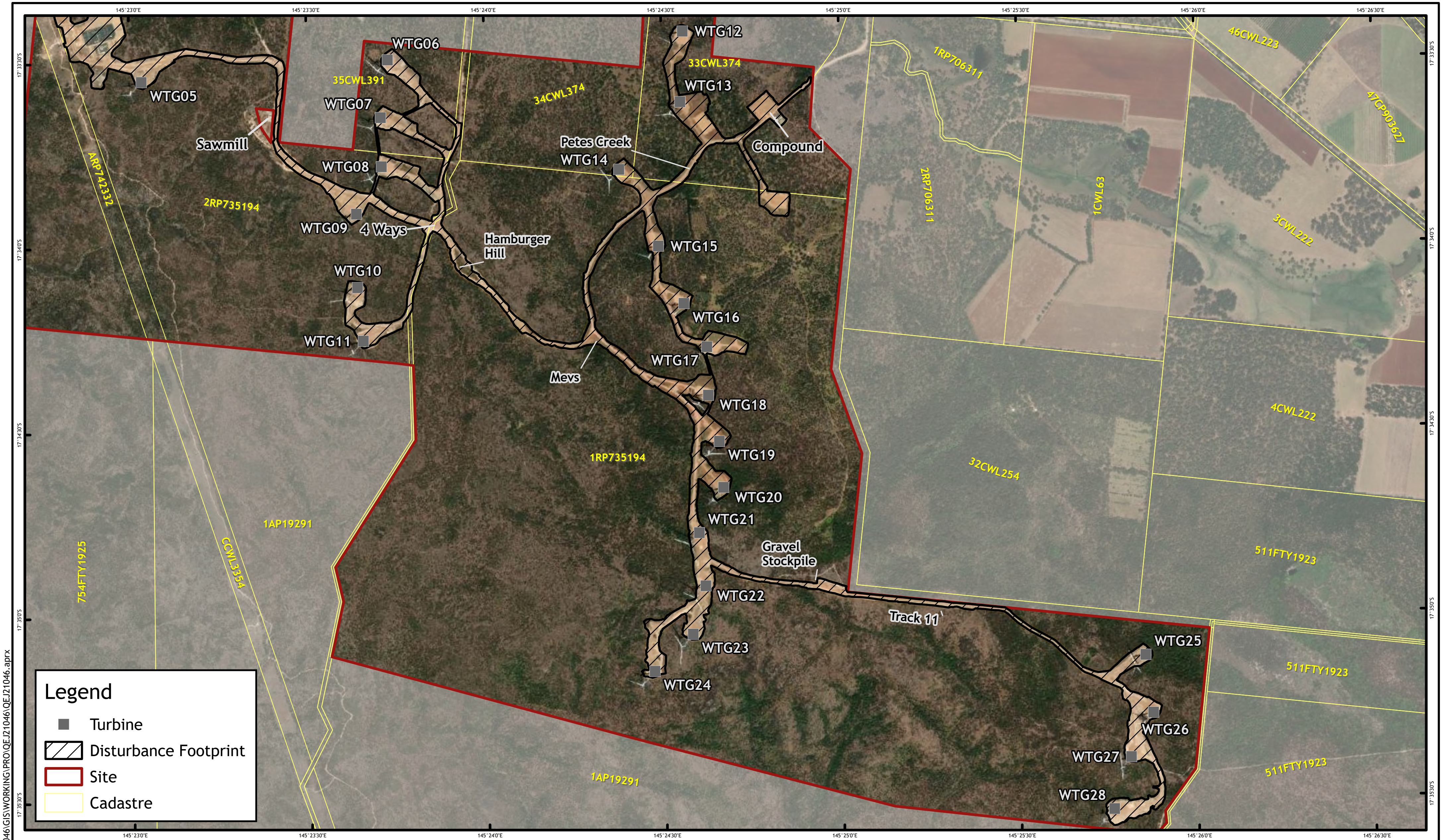

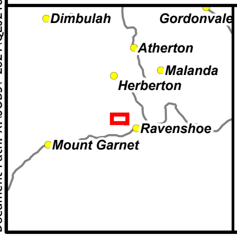

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Coordinate System: GDA2020

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Rev	Description	Drawn	Approved	Date
A	Issued for Review	GO	DJ	27/08/2024

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FIGURE 2B: WEED MONITORING SITES

KABAN POST-CONSTRUCTION REHABILITATION MONITORING
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
2 of 2	QEJ21046	A

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2.3 Monitoring Methods

Priority weeds within the context of this project have been identified in Table 1. This is a 'live' list and will be updated, and provided in each monitoring report, as new priority weeds are recorded during the survey.

The surveys are to be completed by taking a series of photos at each survey location described in Table 2. For each survey location the following data to be recorded.

- Site ID
- Date
- Time
- Latitude
- Longitude
- Location name
- Weed species
- Weed abundance (% Groundcover)
- The assignment of specific polygons indicating the area of significant weed infestations
- Photo series
- Abundance ranking:
  - None observed
  - Scattered
  - Low
  - Moderate
  - High
- Treatment priority
  - N/A
  - Low
  - Moderate
  - High

3 Reporting

Weed data will be collated and mapped following each weed field survey. A treatment plan will be developed, scheduled and provided to the weed treatment contractor. All locations listed as high-priority treatment areas are to be clearly identified and communicated to weed contractor. A report for each weed survey will be produced that will provide the following information:

- A summary of findings
- Mapped areas of weed infestations, highlighting high-priority infestation
- Records for each survey location, including photos
- Recommendations for treatment
- A summary/appendix of any treatment program taking place prior to the weed survey and outcomes of treatments

Refer to Table 3 in Section 5 for the recommended reporting schedule.

4 Treatment Program

Following each field survey a treatment plan is to be provided to the weed contractor. When conducting weed treatments, the following items are to be considered to achieve the best outcomes:

1. Maps/reports of current weed infestations are to be provided to the weed treatment contractor with high priority weed infestations highlighted
2. Consultation between the ecologist performing weed survey and the weed treatment contractor is recommended to ensure weed treatments are targeted to the highest priority areas and species to maximise weed treatment outcomes
3. All high priority weed infestations are to be treated[3]
4. When conducting treatment programs, try and eliminate scattered priority weeds to prevent them becoming established and spreading further
5. Current weed data (E2M Pty Ltd, 2024b) indicates that there are scattered weeds within the periphery elements of the Project disturbance footprint, while high abundance infestations are within the central elements such as WTG14, WTG16, WTG17, WTG18 and the roadside from Pete's Creek through to WTG21. The high abundance infestations will need a special treatment program to significantly reduce populations.
6. Specialised treatment program for high abundance infestations will be generated in consultation with a weed management and/or rehabilitation specialist. Until such a program is developed the aim of the treatment program is to significantly reduce weed infestations within periphery elements and contain the high abundance weed infestations; and
7. A map report, of areas and types of weeds treated, to be provided by the weed contractor after each treatment program.

Refer to Table 3 for recommended treatment schedule.

[3] Not all priority weed infestations are high priority. Some priority weed infestations will present a higher risk to matters of environmental significance and should be treated as such.

5 Weed Management Plan Schedule

Table 3: Summary of the monitoring, reporting and treatment program.

Event	Description	Timing	Dates
Monitoring 1	First round of seasonal weed survey.	Survey to be conducted approximately 1 month after first significant rains of the growing season.	Pending rain: November, December, Early January
Reporting 1	Weed monitoring report to be completed after survey above. Infestation mapping to be presented to weed treatment contractor	Mapping data and weed treatment information to be generated within 2 weeks of completion of monitoring survey.	2 weeks after field survey
Treatment 1	Treating weeds as per those identified within the report with a focus on high priority weed infestations.	As soon as practicable after weed treatment program is discussed with weed treatment contractor.	Treatment to start as soon as practicable after plan is discussed with contractor. First round of treatment to be completed before the end of January.
Monitoring 2	Second round of seasonal weed survey.	Survey to be conducted approximately 2-4 weeks after Treatment 1 and during the first signs of grader grass actively growing.	February March
Reporting 2	Weed monitoring report to be completed after survey 2 above. Infestation mapping to be presented to weed treatment contractor	Mapping data and weed treatment information to be generated within 2 weeks of completion of monitoring survey.	2 weeks after field survey
Treatment 2	Treating weeds as per those identified within report number 2, with a focus on high priority weed infestations. This treatment aims to coincide with actively growing grader grass[1]	As soon as practicable after weed treatment program is discussed with weed treatment contractor.	Treatment to start as soon as practicable after plan is discussed with contractor. Treatment to be completed during February March.

1. Grader grass is one of the more dominant weeds growing on site. The species grows rapidly between February and March. Spraying these weeds before seed-set is important for long-term control.

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Appendix G: Post-construction rehabilitation and weed monitoring report

Post-construction: Rehabilitation and Weed Monitoring

Survey: February 2025

Kaban Wind Farm Pty Ltd as trustee
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Definitions

Term	Definition
Disturbance footprint	Any areas cleared for the purpose of the Project. The total area of disturbance is 104.88 hectares
Priority weeds	Are those weeds listed under the Biosecurity Act 2014, the *Tablelands Regional Council 2019-2024 Biosecurity Plan* and weeds having potential to impact threatened species identified within this project.

Term	Definition
Erosion severity	Is assessed as minor, moderate or severe. Nearly all erosion precedes with the observations of bare ground and has little chance of self-rectifying and will need remedial work. • Minor erosion: sheet or gully erosion starting. Gully erosion shallow, <50mm deep and typically signs of rills • Moderated: sheet erosion has lost most top soil and evidence of coarser rubble. Gully erosion depth increased to 50 < 200 mm. • Severe: no evidence of top-soil, firm substrate and coarse rubble evident. Gully erosion is extensive and deeper than 200 mm.
The Project	The Kaban Green Power Hub
Vegetation Management Plan	The Vegetation Management Plan (VMP) stipulates performance criteria and management objectives for vegetation relevant to the Project
Weed Polygon Area	A specific area in which priority weeds were found

Abbreviations

Term	Definition
E2M	E2M Pty Ltd
WMP	Weed Management Plan
WTG	Wind Turbine Generator
VMP	Vegetation Management Plan

1 Introduction

1.1 Background

The Kaban Green Power Hub, commonly known as the Kaban Wind Farm and herein referred to as 'the Project', consists of 28 operational wind turbines and associated infrastructure, and is located approximately 4 kilometres west of Tumoulin, Queensland (Figure 1). Construction commenced in May 2021, with the first turbine constructed and commissioned by August 2022 and the last turbine constructed August 2023.

E2M was commissioned by Kaban Wind Farm Trustee for the Kaban Wind Farm Trust to conduct post construction rehabilitation and weed monitoring pursuant to EPBC approval 2018/8289. The last turbines were constructed and energised during June 2023, indicating the commencement of post-construction monitoring requirements. Conditions of the monitoring are detailed in the Vegetation Management Plan (VMP) (E2M, 2021). The VMP stipulates performance criteria / management objectives associated with vegetation relevant to the Project, including:

- No introduction or spread of priority weed species within the site and successful removal of priority weed species within the disturbance footprint, and
- Progressive stabilisation of disturbed areas and rehabilitation of the disturbance footprint following construction with a monitoring frequency of every 3 months for the first 12 months and every 6 months until 2 years or until performance criteria have been achieved.

To mitigate the spread of weeds across site a Weed Management Plan (WMP) was developed by E2M during August 2024, (E2M Pty Ltd, 2024b). The WMP provides recommendations for strategic weed monitoring and treatment to ensure problematic priority weeds to not spread and to ensure that there is a continued reduction in weed abundance across site.

1.1.1 Construction phase rehabilitation

Rehabilitation measures were progressively implemented throughout construction in accordance with Table 10 of the VMP (E2M, 2021). Four reports during construction provide details of the progress of rehabilitation and management of weeds throughout the disturbance footprint. These are (Horner, 2022), (Tucker, 2022), (Tucker, 2023a) and (Tucker, 2023b).

1.1.2 Post-construction rehabilitation

Post-construction rehabilitation management measures required by the VMP are:

1. Monitoring of rehabilitation against rehabilitation performance criteria with identification of required maintenance actions, and
2. Weed control measures such as spraying, physical removal, or planting native species to supress weed growth.

The VMP states that the final rehabilitation would meet the following performance objectives:

- Self-sustaining vegetative cover
- No signs of subsidence or erosion
- Representative of species richness and diversity of pre-disturbed condition

- Plants showing healthy growth and signs of recruitment; and
- Free of priority weeds.

Rehabilitation performance criteria have been prescribed within the VMP and are summarised in Table 1.

Table 1: Rehabilitation performance criteria (extracted from the VMP, Table 12)

Indicator	3 months	6 months	9 months	12 months	18 months	24 months
Seeded Areas / Natural Regeneration						
Native Groundcover Species Richness	≥20% of pre-disturbance species richness	≥40% of pre-disturbance species richness	≥40% of pre-disturbance species richness	≥60% of pre-disturbance species richness	≥80% of pre-disturbance species richness	≥90% of pre-disturbance species richness
Priority Weeds	≤5% priority weed cover	≤5% priority weed cover	≤5% priority cover	No priority weeds	No priority weeds	No priority weeds
Mulching	≥100mm deep mulch cover around planted stock	≥100mm deep mulch cover around planted stock	-	-	-	-
***Assisted Revegetation Areas**						
Plant Survival	≥80% survival of planted stock	≥90% survival of planted stock	≥90% survival of planted stock	≥95% survival of planted stock	≥95% survival of planted stock	≥95% survival of planted stock
Plant Height	Evidence of growth	Evidence of growth	Evidence of growth	All planted canopy & shrub stock ≥0.3m high	All planted canopy & shrub stock ≥0.4m high	All planted canopy & shrub stock ≥0.6m high

**Assisted revegetation is only to occur in areas where seeding and natural regeneration is not meeting performance criteria after 12 months.*

1.2 Scope of Works

This survey represents the ongoing commitment to monitor and track the success or failures of rehabilitation across the site. This event is the fourth survey, 18-months post-construction. A six-month post-construction weed survey was conducted from 22 to 27 February 2024, (E2M Pty Ltd, 2024c), a nine month survey completed between 30 and 31 May 2024 (E2M Pty Ltd, 2024a) and a 12-month survey completed during August 2024, (E2M Pty Ltd, 2024d).

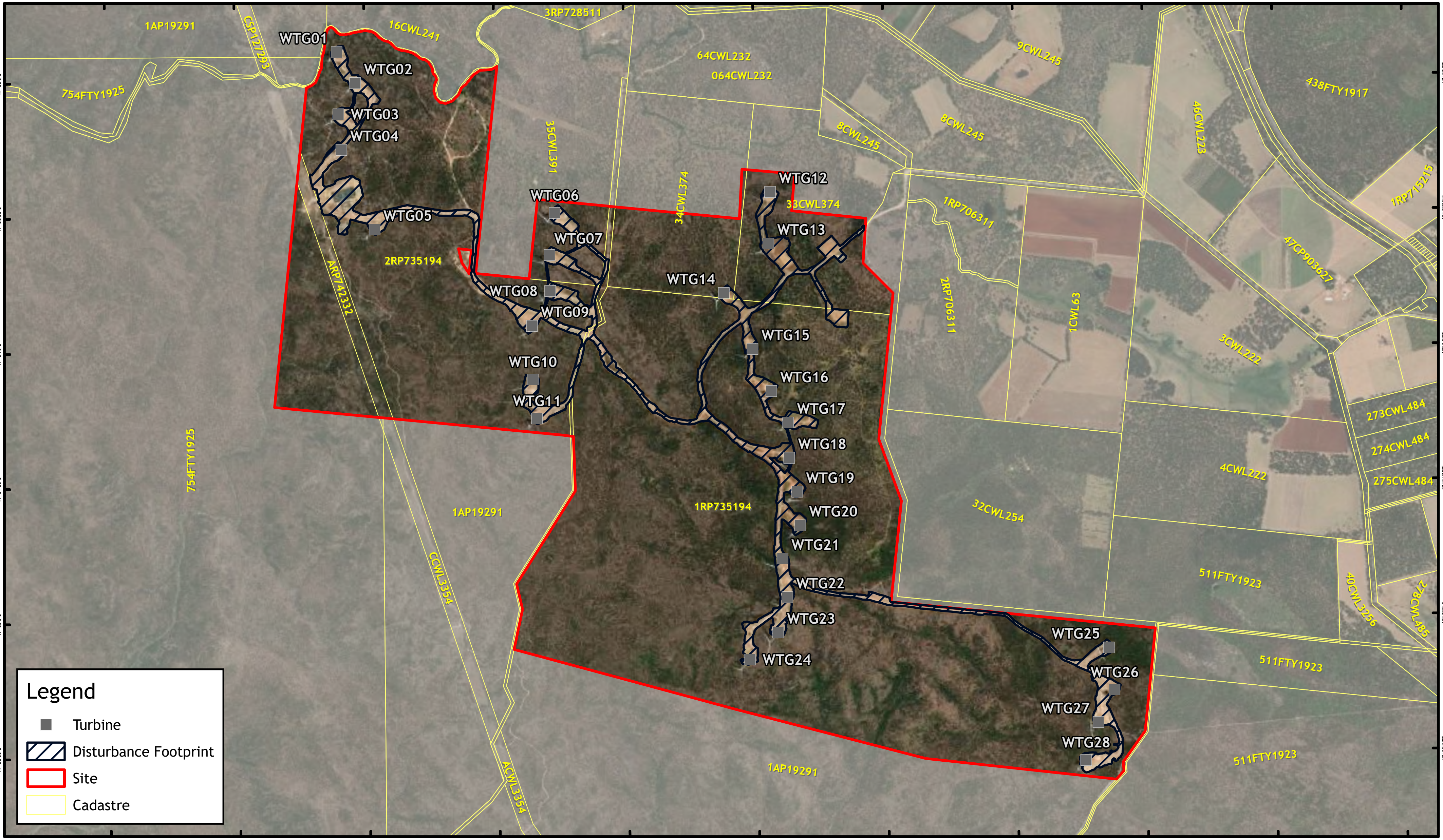
The aims of this monitoring event are to assess the Project's ongoing rehabilitation success against the performance criteria specified in the VMP. Specifically:

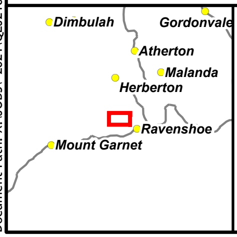
- Evaluate the relative abundance and distribution of priority weeds across the Project disturbance footprint.
- Evaluate the effectiveness of rehabilitation of areas disturbed during construction by measuring groundcover and species richness.

- Identify any erosion that is likely to compromise rehabilitation or indicate defective rehabilitation efforts.

1.2.1 Change of monitoring protocol

Previous rehabilitation monitoring identified that over 95 percent of the site had successfully met the rehabilitation criteria set within the VMP. As such, this monitoring program was used to focus on areas of rehabilitation that are not meeting the VMP performance criteria. Specifically, investigating areas of weed infestations and areas prone to erosion. The details of the successful rehabilitation efforts can be found in the August 2024 post-construction rehabilitation report, (E2M Pty Ltd, 2024d).





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0	Issued for Use	GO	DJ	28/02/2025
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FIGURE 1: PROJECT LOCATION

KABAN POST-CONSTRUCTION REHABILITATION MONITORING
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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2 Methods

2.1 Climatic data

Climate data is an important factor in the presence of weed and the success of rehabilitation. As such, rainfall data 3-months prior to the survey is presented and discussed in this report.

2.2 Survey locations

The site was assessed systematically within each turbine siting and along access roads linking turbines. There are 37 unique survey locations, each named according to the turbine number or from different geographical features used as reference points along access tracks during construction. The assessment site names are listed in Table 3.

2.3 Rehabilitation assessment methods

The success of rehabilitation is measured against rehabilitation performance criteria. The performance criteria or factors influencing rehabilitation are:

- Groundcover density
- Plant species richness
- Priority weeds; and
- Erosion.

The following data were collected at each rehabilitation/weed survey site for the quantification of rehabilitation success:

- Date
- Time
- Latitude
- Longitude
- Location name
- Native species names
- Number of native species
- Percent ground cover - total
- Percent groundcover natives
- Percent groundcover weeds
- Photo series as per weeds
- Erosion present: Yes/No
- Erosion severity: Minor, Moderate, Severe
- Type of erosion: rill, gully or sheet
- Remedial work priority:
  - Low
  - Moderate
  - High

If weeds or erosion were present, then additional information was collected for each as detailed in Sections 2.3.2 and Section 2.3.5.

2.3.1 Groundcover density and species richness

During this survey there was no re-evaluation of groundcover or species richness. The previous survey in August 2024 completed a comprehensive assessment of groundcover and species richness and identified that over 95% of the site met the groundcover and species richness targets. As such, this survey was to focus on elements not meeting rehabilitation criteria. Specifically, abundance and distribution of priority weeds, and site erosion.

2.3.2 Priority weed assessment methods

2.3.2.1.1 Priority weeds

Priority weeds within the context of this project have been defined as:

- *Biosecurity Act 2014* 'Restricted Matter' and 'Prohibited Matter' plant species
- Locally declared weeds under the *Tablelands Regional Council 2019-2024 Biosecurity Plan (TRC Biosecurity Plan)* (Tablelands Pest Management Advisory Committee, 2019); and
- High biomass exotic grasses and forbs which can quickly invade disturbed areas and degrade threatened species habitat. Of particular interest are species which may result in impacts to habitat quality for the magnificent brood frog (*Pseudophryne covacevichae*).

Prior to construction, priority weeds were identified on-site and summarised within the VMP. Since construction, other priority weeds have been identified on-site. The complete list of priority currently found within the construction footprint are detailed in Table 2. Any new priority weeds found in successive surveys will be added to the list of priority weeds.

Table 2: Priority weeds known to occur within the site recorded during baseline weed surveys and from construction and post-construction weed surveys

Species	Biosecurity Act 2014	TRC Biosecurity Plan	Regarded as Environmental Weed
Grader grass (*Themeda quadrivalvis*)	-	-	Yes
Guinea grass (*Megathyrsus maximus*)	-	-	Yes[1]
Lantana (*Lanata camara*)	Category 3 Restricted Matter	-	Yes
Praxelis (*Praxelis clematidea*)	-	-	Yes
Rhodes grass (*Chloris gayana*)	-	-	Yes
Signal grass (*Urochloa decumbens*)	-	-	Yes
Singapore daisy (*Sphagneticola trilobata*)	Category 3 Restricted Matter	-	Yes
Devil's fig (*Solanum torvum*)	No	No	Yes
Giant rat's tail (*Sporobolus pyramidalis*)	Category 3 restricted plant	Yes	Yes[1, 2]
Inkweed (*Phytolacca octandra)*	No	No	Yes
Mexican poppy (*Argemone mexicana*)	No	No	Yes

Species	Biosecurity Act 2014	TRC Biosecurity Plan	Regarded as Environmental Weed
Navua sedge (*Cyperus aromaticus*)	No	Yes	Yes[2, 3]
Sensitive weed (*Mimosa pudica*)	No	No	Yes[2]
Spiny sida (*Sida spinosa*)	No	No	Yes[2]
Tobacco weed (*Solanum mauritianum*)	No	No	Yes
Siam weed (*Chromolaena odorata)*	Category 3 restricted plant	Yes	Yes[2]

Reason for inclusion: [1.]High fuel load, [2.]Out competes natives, [3.]Poses significant threat to waterways and/or wetlands

2.3.3 Weed survey protocol

The survey was completed by visual assessment at each wind turbine generator (WTG) siting and along site access track. If there were significant weed infestations these were marked with area polygons and the additional information was collected to further describe characteristics of the infestation. A weed treatment priority field was also completed to highlight the importance of weeds receiving treatment. The higher the treatment priority, the higher the risk that the weed infestation presents to site environmental values. The following details were recorded at each weed infestation site.

- Date
- Time
- Latitude
- Longitude
- Location name
- Weed species
- Abundance of weeds as percent groundcover in each polygon.
- The assignment of specific polygons indicating the area of significant weed infestations
- Photo series
- Abundance ranking:
  - Scattered
  - Low
  - Moderate
  - High
- Treatment priority: Low, Moderate, High.

2.3.4 Calculating site-wide weed cover

Any scattered weeds within the disturbance footprint were noted as scattered and represent a negligible groundcover percentage. However, for more significant weed infestations the area of occupancy was calculated through spatially mapping the extent using GPS devices and providing the percent of weed groundcover for each polygon. The area and percentage of each weed infestation was then used to calculate the overall percentage of site weed cover. Site-wide weed cover calculations are presented in Section 3.3.

2.3.5 Erosion assessment

Erosion often presents itself due to inadequate rehabilitation. Specifically poor groundcover will, on most occasions, result in some level of erosion pending soil type, slope and the amount of watershed. This assessment was performed to map the extent of those areas showing signs of erosion. The type and severity of erosion was also noted. The following details for each erosion site were collected.

- Date
- Time
- Latitude
- Longitude
- Location name
- Area polygon: the area of the infestation was marked digitally on the mapping device.
- Erosion type:
  - Sheet
  - Rill
  - Gully
- Erosion Severity:
  - Low
  - Moderate
  - High
- Erosion treatment priority:
  - Low
  - Moderate
  - High
- Photo series
- Treatment recommendations: preliminary advice for suggested remedial activities were provided[1]

[1] Further recommendations by experts in this field should be sought for the most appropriate remedial activities.

3 Results

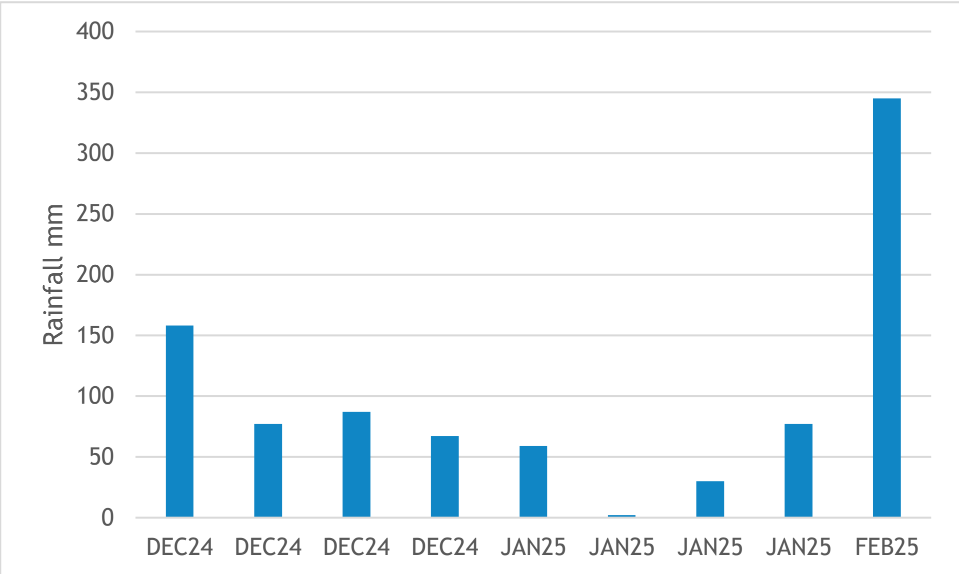
3.1 Survey timing and effort

An eighteen-month post-construction rehabilitation survey was completed between 4 - 5 February 2025 across the entire disturbance footprint of the Kaban Wind Farm. Appendix A provides images of each of the turbine locations visited and provides a visual representation of the status of rehabilitation across site.

3.2 Climatic data

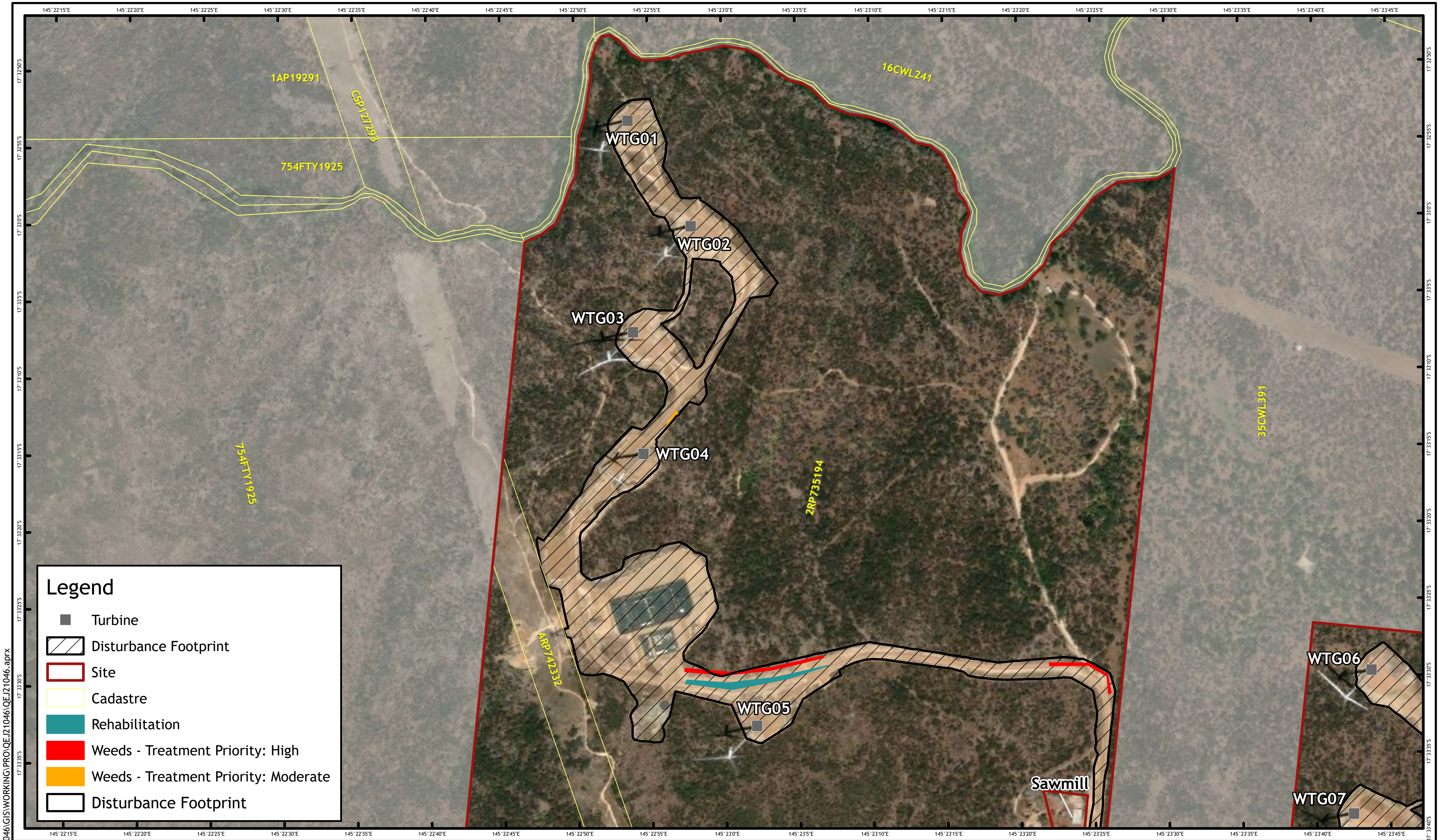
Prior to the survey there has been good seasonal rains throughout December 2024, January 2025 and the first week of February, Figure 2. The good rainfall and warm summer temperatures have provided ideal growing conditions. There has been no significant wind events or excessive heat or extended dry periods that have impacted the progress of rehabilitation.

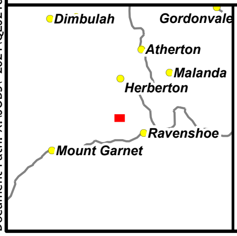
Figure 2: Weekly rainfall totals prior to the February 2025 rehabilitation survey.



3.3 Priority weed assessment results

Priority weeds were found throughout the disturbance footprint, ranging from scattered individuals to high density patches. For each weed assessment site, an overall abundance estimate of priority weed groundcover was recorded. The area in hectares was calculated for each priority weed infestation, and representative polygons generated, and provided in Figure 3. The ‘Weed Polygon Area’ is the specific area in which the weed infestation was found. ‘Weed Polygon Areas’ were generated to help inform the approval holder and contractors of priority weed infestation locations. The infestations were ranked Low, Moderate or High depending on the density of weed cover. Infestations were ranked low if less than 20 percent, Moderate between 20 and 50 percent, and High if greater than 50 percent cover. If priority weed cover was less than one percent, area polygons were not generated. A summary of results is included in Table 3.





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Meters

Coordinate System: GDA2020

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FIGURE 3A: REHABILITATION AND WEED DEFECT OBSERVATIONS

KABAN POST-CONSTRUCTION REHABILITATION MONITORING
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
1 of 5	QEJ21046	0

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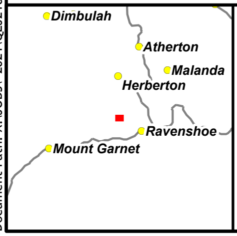

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Coordinate System: GDA2020

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FIGURE 3B: REHABILITATION AND WEED DEFECT OBSERVATIONS

KABAN POST-CONSTRUCTION REHABILITATION MONITORING
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
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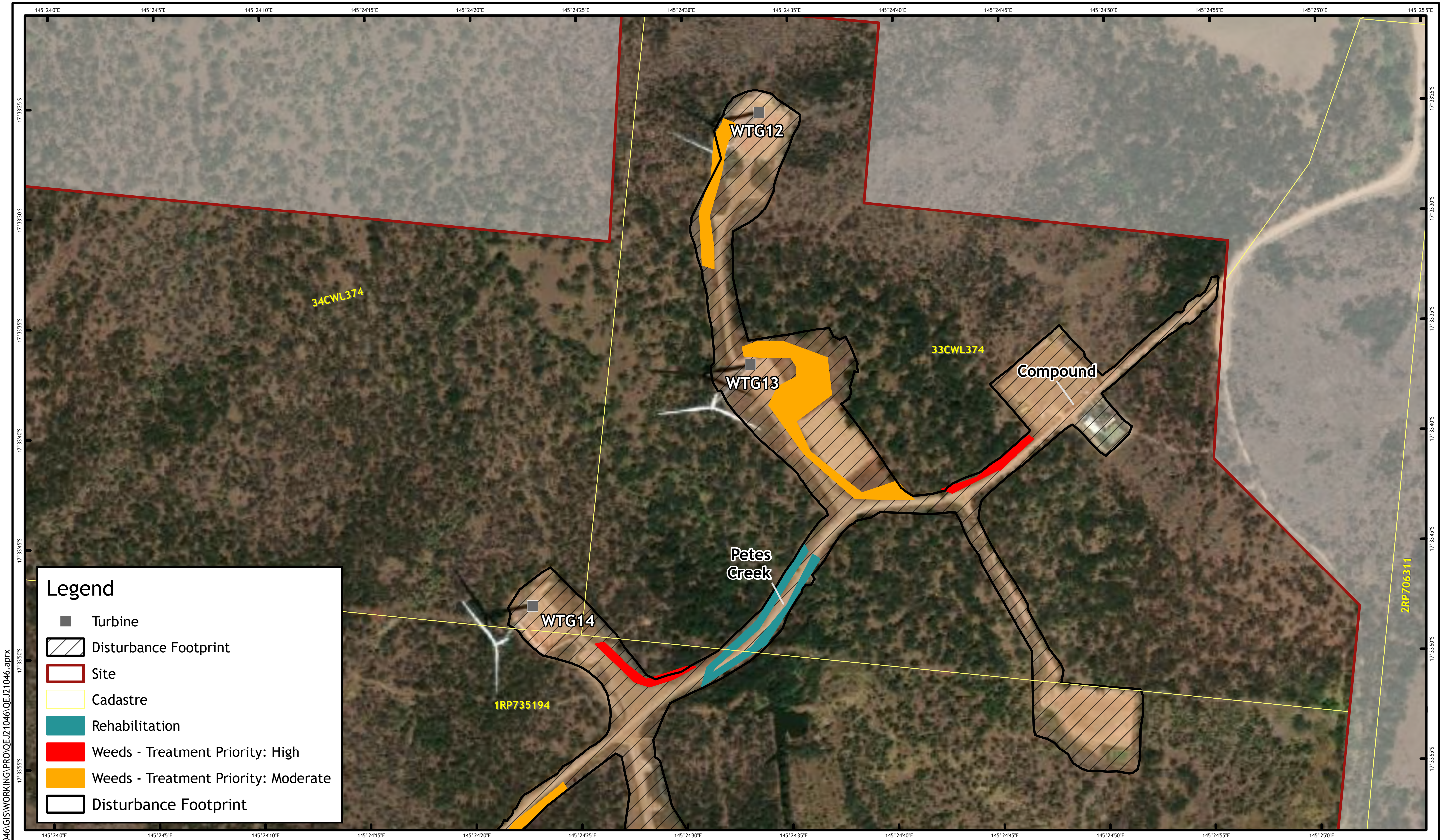

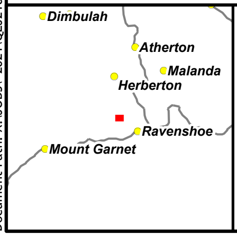

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Aerial Imagery: © ESRI 2025
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FIGURE 3C: REHABILITATION AND WEED DEFECT OBSERVATIONS

KABAN POST-CONSTRUCTION REHABILITATION MONITORING

KABAN GREEN POWER HUB

Map Number	Job Number	Rev
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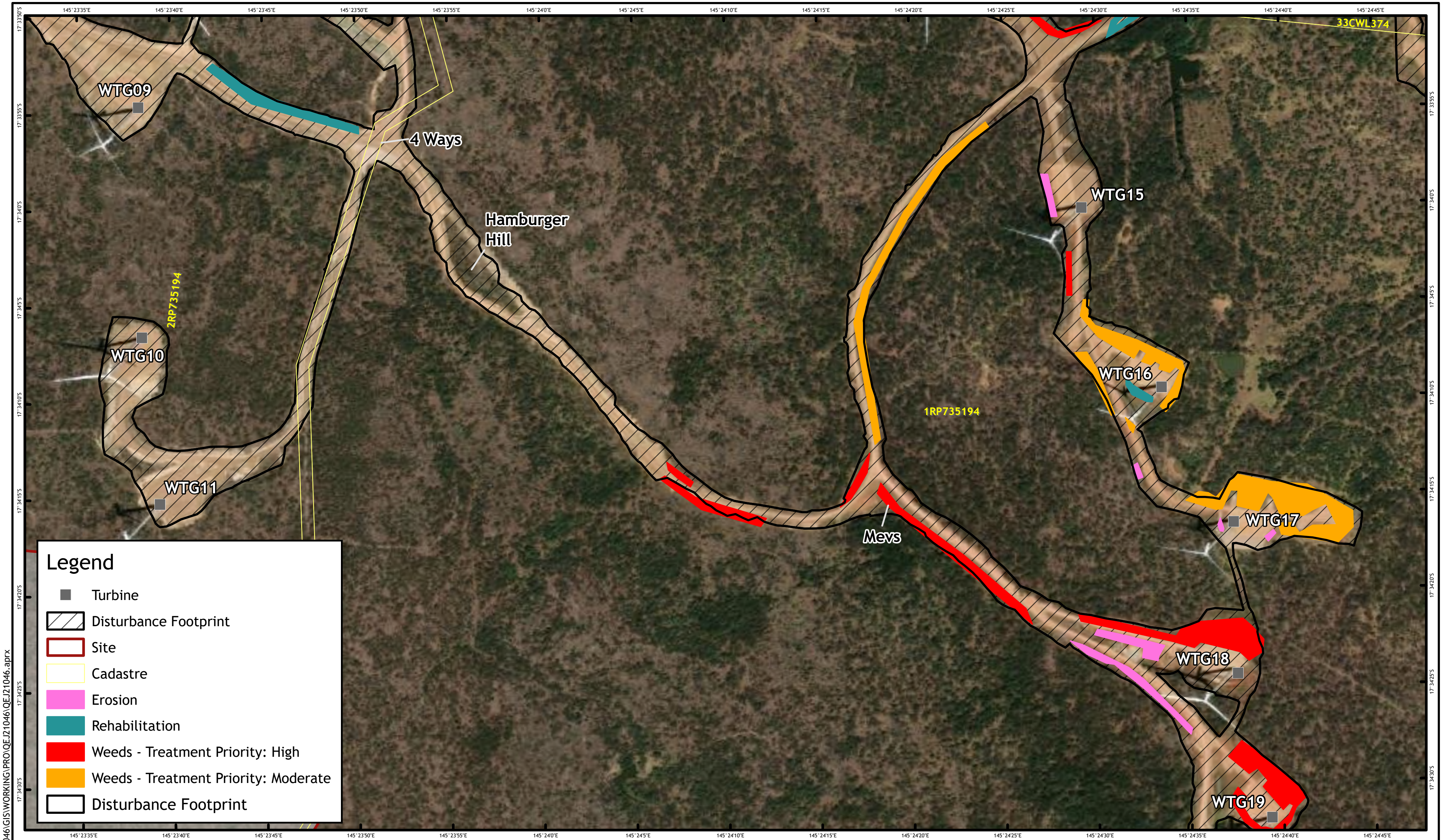

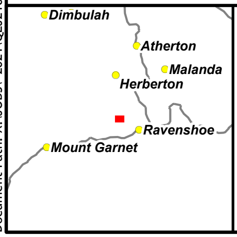

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0	Issued for Use	GO	DJ	28/03/2025
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FIGURE 3D: REHABILITATION AND WEED DEFECT OBSERVATIONS

KABAN POST-CONSTRUCTION REHABILITATION MONITORING

KABAN GREEN POWER HUB

Map Number	Job Number	Rev
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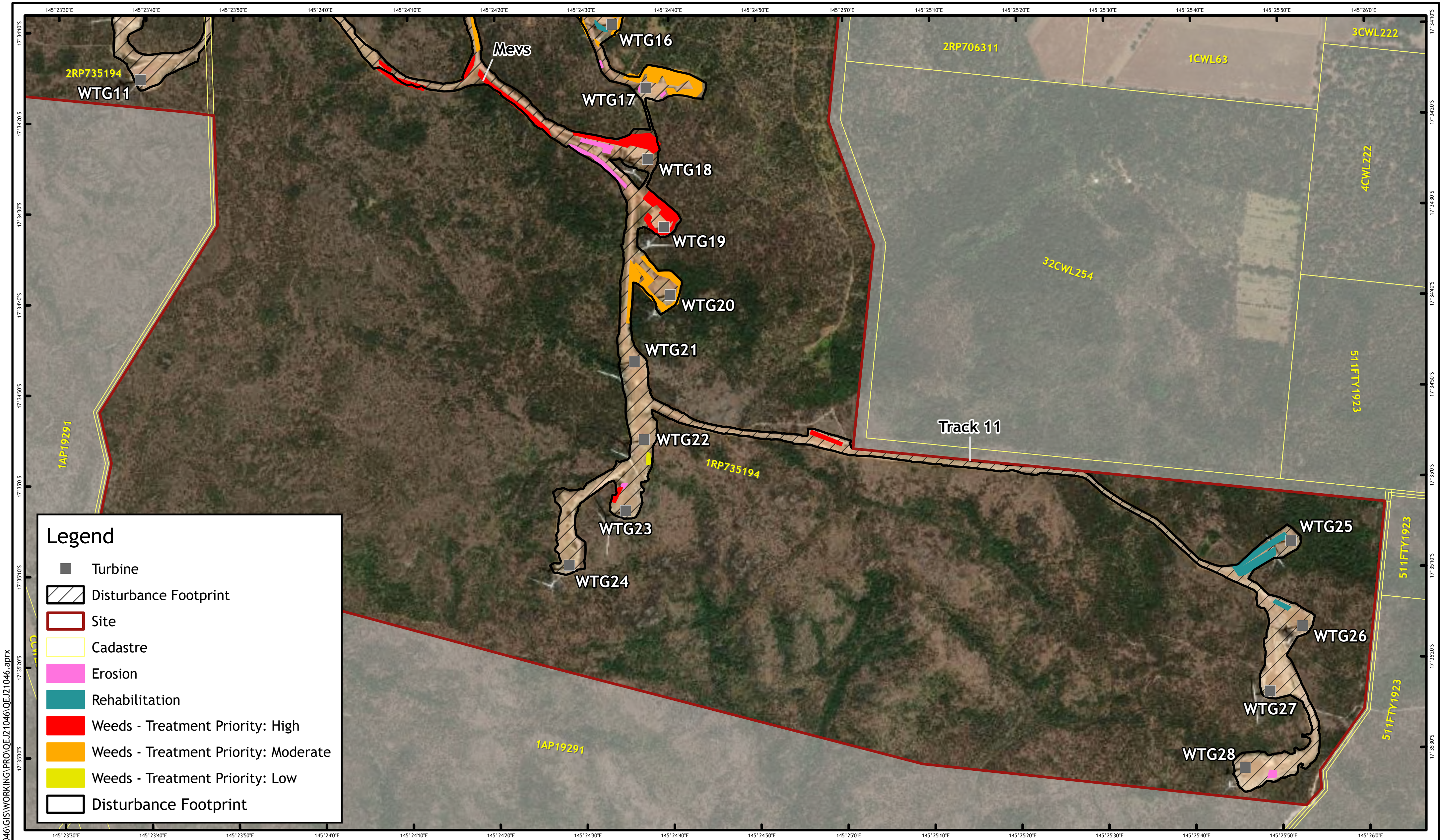

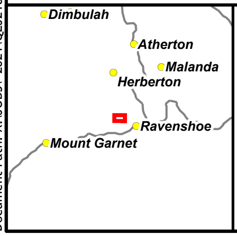

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FIGURE 3E: REHABILITATION AND WEED DEFECT OBSERVATIONS

KABAN POST-CONSTRUCTION REHABILITATION MONITORING
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
5 of 5	QEJ21046	0

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Table 3: Priority weed infestations recorded within the disturbance footprint

Location	Weed Polygon Area (Ha)	% Priority Weed Cover	Area of Weeds (Ha)	Weed Infestation Rank	Priority Treatment March to April 2025	Dominant Priority Weeds
TURBINE SITINGS						
WTG01	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]
WTG02	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]
WTG03	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]
WTG04	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]
WTG05	0.23	30	0.07	High	High	Grader grass
WTG06	0	<1	0	Low	Monitor & maintain	No signs of weeds[1]
WTG07	0	<1	0	Scattered	YES	Grader grass
WTG08	0.47	40	0.19	High	High	Rhodes grass
WTG09	0	<1	0	Low	Monitor & maintain	No signs of weeds[1]
WTG10	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]
WTG11	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]
WTG12	0.32	15	0.05	Moderate	NO[4]	Grader grass
WTG13	0.95	15	0.14	Moderate	NO[4]	Grader grass
WTG14	0.16	30	0.05	High	YES	Signal grass
WTG15	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]
WTG16	0.57	60	0.28	High	POSTPONE[2]	Signal grass
WTG17	1.09	60	0.55	High	POSTPONE[2]	Signal grass
WTG18	0.73	30	0.22	High	POSTPONE[2]	Signal grass + Rhodes grass
WTG19	0.61	5	0.03	High	Monitor & maintain	Signal grass
WTG20	0.68	50	0.34	High	POSTPONE[2]	Signal grass
WTG21	0	<1	0	None observed	Monitor & maintain	No signs of weeds[1]

Location	Weed Polygon Area (Ha)	% Priority Weed Cover	Area of Weeds (Ha)	Weed Infestation Rank	Priority Treatment March to April 2025	Dominant Priority Weeds
WTG22	0.04	10	0.004	High	YES	Signal grass
WTG23	0.07	10	0.007	Moderate	YES	Signal grass
WTG24	0	<1	0	None	Monitor & maintain	-
WTG25	0	<1	0	Scattered	Monitor & maintain	Signal grass
WTG26	0	<1	0	Scattered	Monitor & maintain	Signal grass
WTG27	0	<1	0	Scattered	Monitor & maintain	Signal grass
WTG28	0	<1	0	None	Monitor & maintain	-
Access tracks						
Track 11	0	<1	0	Moderate	NO	Signal grass
WTG5 to Sawmill	0.06	25	0.015	High	YES	Grader grass
Mevs to WTG18 South of road	0.42	5	0.02	Moderate	YES	Rhodes grass, grader grass,
Petes Ck to Mevs	0.63	80	0.51	High	POSTPONE[2]	Signal, grader and Rhodes grass plus spiny sida
WTG20 to 21 Roadside	0.28	40	0.11	Moderate	POSTPONE[2]	Signal + Grader grass
Mevs to Hamburger Hill	0.36	40	0.14	High	YES	Grader grass
Gravel stockpile	0.13	10	0.013	High	YES	Grader grass
WTG13 to compound	0.12	15	0.02	High	YES	Grader grass
Road from WTG15 to WTG16	0.05	50	0.025	Moderate	NO	Signal grass
TOTAL			**2.89**			

1. Weed treatment very effective. No priority weeds observed. Continue monitoring.
2. Weed management to be postponed until the planned rehabilitation works are completed in the early wet season of 2024 to 2025.
3. Giant rat's tail grass (GRT) (*Sporobulus pyramidalis)* is listed as a Category 3, Restricted Invasive Plant under the *Biosecurity Act 2014*.
4. Cattle graze these areas and are being used to control growth of weeds. Weeds are small and scattered, making chemical treatment difficult, and too numerous for manual removal. Maintain monitoring and treat using herbicides when desirable. Alternatively, slashing during flowering to reduce seed production.

3.3.1 Total area of priority weed cover

The total area of priority weeds was calculated as the sum of the proportion of priority weeds (area of weeds ha) within each weed polygon (Table 3). The total project disturbance footprint is 104.88 ha and the total area of priority weed cover for this survey was 2.89 ha. Therefore, the percent priority weed cover across the project disturbance footprint was 2.75 percent. The total current weed cover is 50 percent less from the total weed cover estimate since February 2024. A comparison of weed cover from the previous surveys is presented in Table 4 and Figure 4

Table 4: Percentage of total weed cover throughout the site disturbance footprint.

Survey Date	Area Weed Cover Ha	Weed Cover %	% Change Since Feb2024
February 2024	5.91	5.55	-
May 2024	5.15	4.91	-13
August 2024	4.71	4.49	-20
February 2025	2.89	2.75	-51

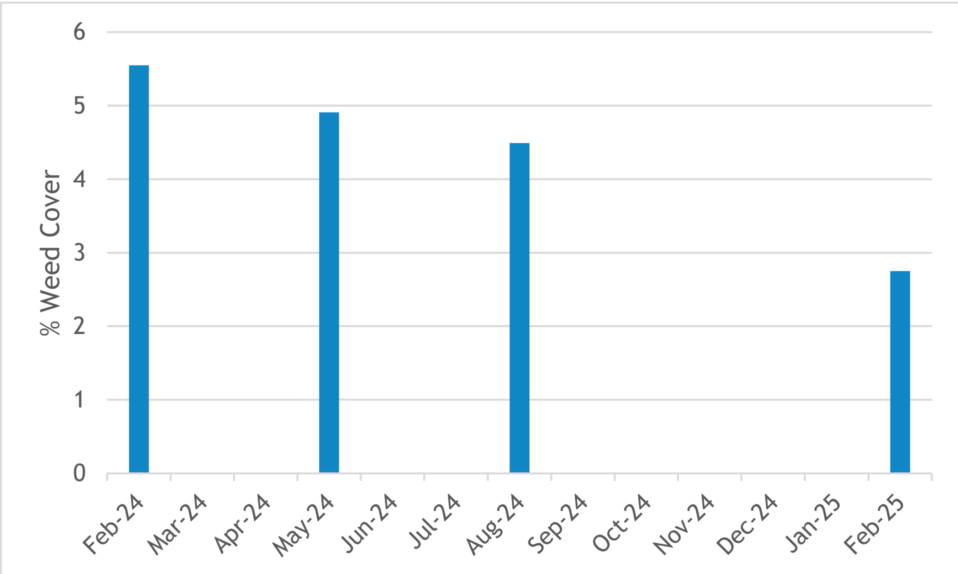

Figure 4: Percent total weed cover within the disturbance footprint.

3.3.2 New priority weed species

There were no new priority weed species identified during this survey.

3.4 Erosion assessment results

Areas of erosion were assessed throughout the disturbance footprint. Most sites with erosion were located on exposed basalt soils, from the roadside near Pete’s Creek, and within the disturbed areas at turbines

15, 16, 17, and 18. The erosion on the basalt soils was largely minor to moderate gully erosion as indicated in Plate 1 and Plate 2 The most significant gully erosion was observed at WTG18 and there is some minor sheet and gully erosion on the northern side of the road from Four-Ways intersection to WTG09, see Plate 3 and Plate 5. Further details for each site of observed erosion are provided in Table 5 and locations can be viewed in Figure 3.

Plate 1: Moderate gully erosion on basalt soils at WTG15.

Plate 2: Moderate gully erosion on basalt soils at WTG17.

Plate 3: Gully erosion at WTG18 on basalt soils.

Plate 4: Minor sheet and gully erosion on roadside verge between Four-Ways intersection and WTG09, on granitic soils.

Table 5:Details of erosion on site.

Location Name	Co-ordinates	Approximate size Ha	Erosion Type	Severity	Treatment Priority	Possible remedial treatment[2]
WTG15	-17.56656, 145.40757	0.08	Gully	Moderate	High	Rock armour or vegetation rehabilitation
WTG16	-17.56934, 145.40905	0.06	Gully	Moderate	High	Rock armour or vegetation rehabilitation
WTG17	-17.57133, 145.41018	0.01	Gully	Moderate	High	Rock armour or vegetation rehabilitation
WTG17	-17.57152, 145.410817	0.01	Gully	Moderate	High	Rock armour or vegetation rehabilitation
WTG18	-17.57284, 145.40844	0.16	Gully	Moderate/ High	High	Rock armour or vegetation rehabilitation. Turtle mat could work in steeper sections
WTG23	-17.58341, 145.40952	0.02	Gully	Moderate	High	Vegetation rehabilitation
WTG28	-17.59246, 145.43023	0.06	Gully	Moderate	High	Vegetation rehabilitation
High road between WTG18 and WTG19	-17.57345, 145.40884	0.21	Gully	Moderate	High	Rock armour or vegetation rehabilitation
Roadside between WTG16 and WTG17	-17.57053, 145.40894	0.02	Gully	Moderate	High	Rock armour or vegetation rehabilitation
Roadside Four-Ways to WTG09	-17.56506, 145.39575	0.39	Gully and sheet	Low	Moderate[1]	Vegetation rehabilitation
Roadside at Pete's Creek	-17.56366, 145.40939	0.41	Gully	Moderate	Moderate[1]	Rock armour or vegetation rehabilitation

1. While these are regarded as a moderate priority for erosion treatment, they are a high priority for rehabilitation treatment.
2. These are recommendations only, for possible remedial actions. Further advice is recommended from erosion and rehabilitation professionals.

3.5 Rehabilitation observations

The August 2024 report (E2M Pty Ltd, 2024d) identified that most of the site is meeting rehabilitation targets in relation to groundcover and species richness. As such, this report only provides details of areas within the disturbance footprint that do not meet the criteria for satisfactory rehabilitation such as the presence of weeds and erosion. While the impact of weeds and erosion reflect poor rehabilitation these have been discussed separately in Sections 3.3 and 3.4. This section talks specifically to those sites that are defective in groundcover and/or native species richness. In such cases, remedial activities will likely be needed in the form of vegetation rehabilitation.

There were six (6) locations within the disturbance footprint that do not meet the criteria for successful rehabilitation. The location, size and treatment priority are provided in Table 6. Recommendations of possible remedial works has also been provided but further advise from rehabilitation professionals is recommended.

Table 6: Locations on site not fulfilling rehabilitation criteria.

Location Name	Co-ordinates	Approximate size Ha	Treatment Priority	Defective criteria	Possible remedial treatment[1]
WTG05	-17.59246, 145.43023	0.23	Moderate	Groundcover & species richness	Revegetation: light ripping followed by hydroseed.
WTG16	-17.57345, 145.40884	0.06	High	Groundcover & species richness	Revegetation: light ripping followed by hydroseed.
WTG25	-17.57053, 145.40894	0.72	High	Groundcover & species richness	Revegetation: light ripping followed by hydroseed.
WTG26	-17.56506, 145.39575	0.07	Moderate	Groundcover & species richness	Revegetation: light ripping followed by hydroseed.
Roadside verge at Pete's creek[2]	-17.56366, 145.40939	0.41	High	Groundcover & species richness	Revegetation: horizontal ripping followed by hydroseed.
Four-Ways to WTG09[2]	-17.56506, 145.39575	0.39	High	Groundcover & species richness	Revegetation: light ripping followed by hydroseed.

1. These are recommendations only for possible remedial actions. Further advice is recommended from rehabilitation professionals.
2. These locations have also been mentioned in the erosion section. The duplication has been made due to the importance of receiving remedial action to help protect adjacent creeks.

4 Discussion and recommendations

The 18-month, post-construction, rehabilitation monitoring survey was performed across the Project disturbance footprint from 4 to 5 February 2025. Included in this survey was the assessment of rehabilitation progress measured against criteria stipulated within the VMP. This includes the presence of weeds, erosion, abundance of groundcover and native species richness within rehabilitated areas. The aim of the assessment is to evaluate the progress of rehabilitation, and identify priority weed infestations and erosion that may impact the success of rehabilitation and jeopardise site ecological values.

Pre-survey weather conditions included good summer rainfalls and warm temperatures, resulting in excellent growing conditions for both native vegetation and weeds.

4.1 Priority weeds

The priority weed cover has dropped from 5.55 to 2.75 percent of total ground cover from February 2024 to February 2025. This represents a 51 percent decrease in priority weed cover. This significant decrease is wholly attributable to the weed treatment programs conducted in March 2024, April 2024, December 2024 and January 2025.

Currently, the most abundant priority weeds are grader grass and signal grass. However, there was a notable decline in signal grass within those sites receiving treatment. There was also a significant decrease in giant rat's tail grass across the disturbance footprint. The absence and decline of these priority weeds re-enforce the importance and success of the current weed treatment program and the implementation of the Weed Management Program (WMP).

The VMP performance criteria targets recommend zero percent priority weeds 12-months post-construction. While these targets have not been met there has been many thousands of weeds treated during multiple campaigns, resulting in a very significant decrease in priority weed cover. A WMP (E2M Pty Ltd, 2024b) was developed in August 2024 in response to the challenges of treating weeds in a tropical environment. While it is unlikely that weed populations will be reduced to zero, the application of the WMP is being very beneficial in reducing weed populations. As such, it is highly recommended that the WMP be followed and updated where necessary.

4.2 New priority weeds

There was no additional priority weed species identified during this survey.

4.3 Erosion

Erosion has been noted at eleven different locations across site. Most of which has been on exposed basalt soils. The type of erosion observed was largely gully erosion at a moderate level of severity and without treatment will worsen over time. Many areas with gully erosion would benefit from rock armouring or vegetation rehabilitation but some erosion on steep banks will need to be assessed professionally to determine the most appropriate strategies. Sheet erosion was noted along the roadside between the Four-Ways intersection and WTG09. This site would benefit from vegetation rehabilitation and would help reduce the likelihood of sediments entering downstream magnificent brood frog habitat.

4.4 Rehabilitation

There is adequate ground cover and good native species richness across much of the site. Rehabilitation has benefited from the WMP. Weed treatment has been selective thereby protecting any surrounding native plants allowing them to flourish. However, there were a few locations noted with inadequate ground cover, inadequate species richness and some with erosion. The deficiencies were identified in Table 5 and Table 6, and various treatments such as hydroseeding, hydromulching or hand planting are recommended where groundcover and species richness is lacking. Where erosion is present, appropriate soil preparation, stabilisation and top dressing will be required before commencement of any revegetation activities. Any measures to improve rehabilitation and erosion should be done in consultation with those experts qualified to perform these activities. Prior to implementing these activities, advice from ecologists familiar with the site should be sought to ensure that the appropriate measures are taken to protect site matters of environmental significance. During any significant, broad acre, weed treatment, rehabilitation should be performed congruently, to improve the chances of weed eradication and rehabilitation. Strategies for monitoring and treating weeds is detailed in the Weed Management Plan (E2M Pty Ltd, 2024b).

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Appendix A

A.2 Images of rehabilitation across site

Plate 5: WTG01

Plate 6: WTG 02

Plate 7: WTG 04

Plate 8: WTG 03

Plate 9: WTG 05

Plate 10: WTG 06

Plate 11: WTG 07

Plate 12: WTG 08. Yellowing vegetation is treated weeds.

Plate 13: WTG 09

Plate 14: WTG 10

Plate 15: WTG11

Plate 16: WTG 12

Plate 17: WTG 13

Plate 18: WTG 14

Plate 19: WTG 15

Plate 20: WTG15, 083

Plate 21: WTG 17

Plate 22: WTG 18. Yellowing vegetation is herbicide treated weeds.




Plate 23: WTG 19

Plate 24: WTG 21

Plate 25: WTG 22

Plate 26: WTG 23

Plate 27: WTG 24

Plate 28: WTG 25. Deficient groundcover.

Plate 29: WTG 26 Bottom image indicating deficient groundcover.

Plate 30: WTG27

Plate 31: WTG 28

Appendix H: Residual Impacts Report

Post-commissioning: Residual Impacts Report

1 August 2024

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust

Level 21, 570 George Street, Sydney NSW 2000

Document Management

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Definitions

Term	Definition
The Department	Commonwealth Department of Agriculture, Water and Environment (DAWE) and Department of Climate Change, Energy, and the Environment and Water (DCCEEW)
Disturbance footprint	The approved area for clearing within the EPBC Act approval (EPBC 2018/8289)
Matters of National Environmental Significance	In the context of this report, MNES are those nationally listed threatened flora, fauna and migratory species.
The Project	The Kaban Green Power Hub
Suitable habitat	A species' preferred environment required to sustain a viable population. Suitable habitat may include breeding, foraging and shelter resources.
Site	The areas of Lot 1 on RP735194, Lot 33 on CWL374, Lot 35 on CWL391, Lot 2 on RP735194 and Lot 34 on CWL374 which contain turbines.
Threatened species	Extinct (EX), extinct in the wild (XW), critically endangered (CE), endangered (E), vulnerable (V) or conservation dependent (CD) under the *Environment Protection and Biodiversity Conservation Act 1999* or extinct in the wild (PE), Endangered, Vulnerable or Near Threatened (EVNT) under the *Nature Conservation Act 1992*.

Abbreviations

Term	Definition
DAWE	Commonwealth Government Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, and the Environment and Water
E2M	E2M Pty Ltd
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FMP	Fauna Management Plan
MNES	Matters of National Environmental Significance
NC Act	Nature Conservation Act 1992
OAMP	Offset Area Management Plan
SPRAT	Species Profile and Threats database provided by DCCEEW.
WTG	Wind turbine generator

1 Introduction

1.1 Project background

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust (Kaban Wind Farm) have entered the post-commissioning stage of the Kaban Green Power Hub wind farm (the Project) in north Queensland. The first wind turbines were commissioned during August 2022. The wind farm is located near the township of Tumoulin, Queensland, within the Tablelands Regional Council Local Government Area. The wind farm contains 28 wind turbine generators (WTGs) and associated vehicular access tracks located across the following land parcels, herein collectively referred to as the 'Site' (refer to Figure 1).

- Lot 1 on Plan RP735194
- Lot 33 on Plan CWL374
- Lot 35 on Plan CWL391
- Lot 2 on Plan RP735194
- Lot 34 on Plan CWL374 and a section of local road reserve.

1.2 Scope and objectives

Pursuant to condition 26 of EPBC Act Approval (EPBC 2018/8289):

> At least 12 months and no more than 24 months following commissioning, the approval holder must submit a Residual Impacts Report which details the actual residual impact of the action on magnificent brood frog (MBF) habitat and greater glider habitat to the Department.

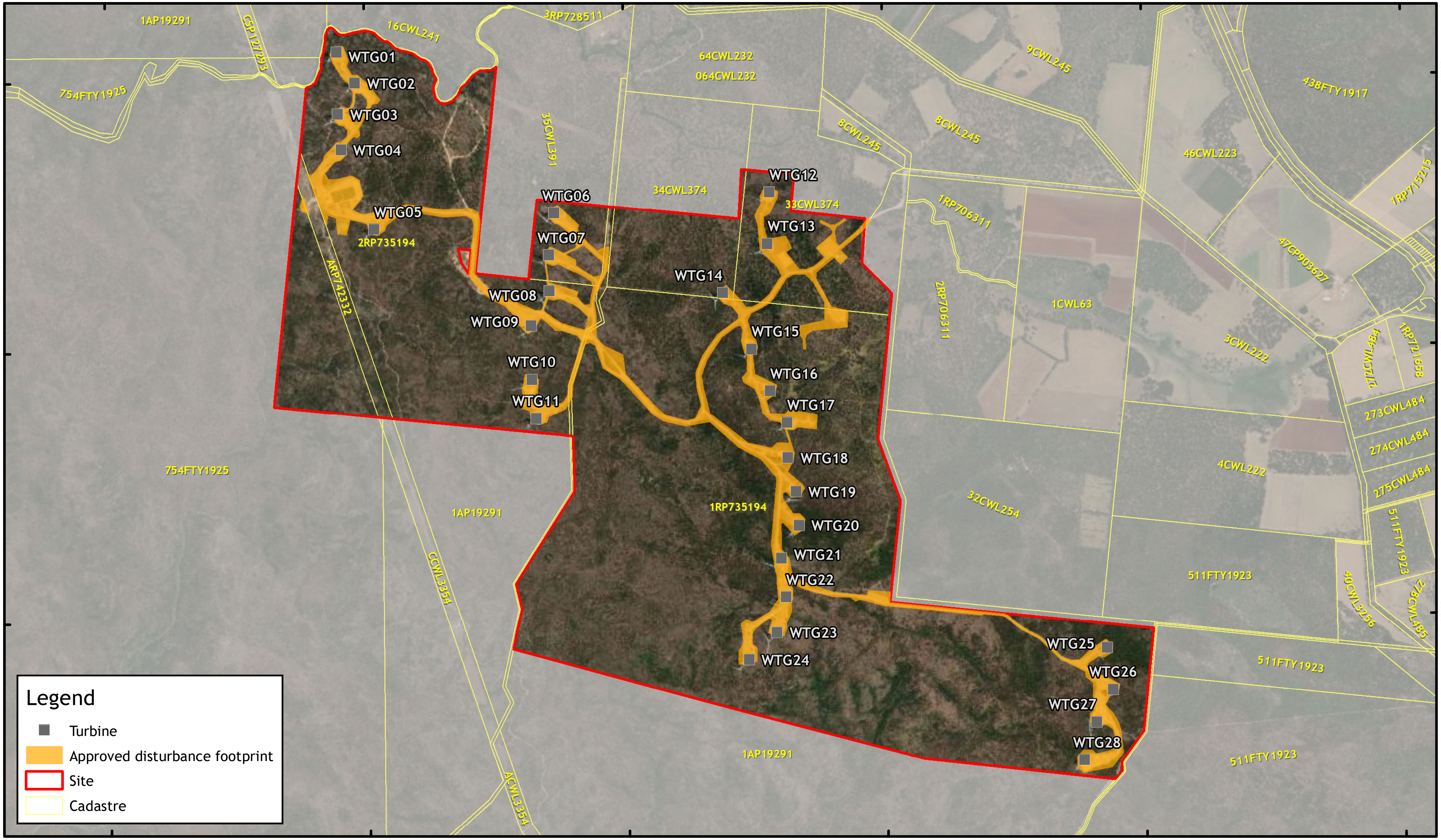
The aim of this report is to identify any project activities, either during or post construction, which have caused significant residual impacts to the magnificent brood frog and the greater glider, including direct clearing impacts and those indirect impacts, resulting from the action. The assessment of the any direct and indirect impacts are to be provided in this report to evaluate actual residual impacts to both species.

1.3 Species Conservation Status Review

The Department approved this Project on 21 April 2020. At the time of approval the greater glider was recognised as one species, *Petauroides volans*, and listed as vulnerable under the EPBC Act. According to genetic research published in November 2020 (McGregor et al., 2020) *Petauroides volans sensu lato* comprises three distinct taxa: *Petauroides volans* (southern greater glider), *Petauroides armillatis* (central greater glider) and *Petauroides minor* (northern greater glider). Due to unresolved issues with the delineation of southern and central taxa, the Australian Faunal Directory (Australian Faunal Directory, 2021) recognises two species of greater glider: *Petauroides minor* (northern) and *Petauroides volans* (southern and central).

The greater glider species found within the Kaban Wind Farm site is the northern greater glider (*Petauroides minor)*, with the southern and central greater glider reaching its northern limit south of Townsville (DCCEEW, 2022). The northern greater glider is currently listed as vulnerable under the EPBC Act.

There has been no conservation status changes for the magnificent brood frog (*Pseudophryne covacevichae)* and, at the time of reporting, the species is listed as vulnerable under the EPBC Act and the NC Act.



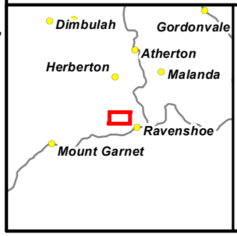


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FIGURE 1: SITE LOCATION

KABAN OAMP RESIDUAL IMPACTS REPORT
KABAN GREEN POWER HUB

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1.4 Vulnerable species significant impact criteria

The assessment of this report will be completed, keeping-in-mind the following criteria for assessing significant impacts for vulnerable species.

The Commonwealth significant impact guidelines (Department of the Environment (DotE), 2013) state that an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an **important population** of a species
- reduce the area of occupancy of an **important population**
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an **important population**
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

What is an **important population** of a species? An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

2 Methods

2.1 Review regional climate data

Review the regional climate data from local BoM weather station 32100 to help recognise any climate related trends or considerations on magnificent brood frog populations.

2.2 Measuring significant residual impact

Significant residual impact was assessed from the following quantifiable data for both species:

- Annual relative abundance
- Assessing the approved suitable habitat clearance areas against the final habitat cleared for both species
- Evaluating if suitable quantities and qualities of offset areas were secured and maintained
- Habitat quality assessment outside the disturbance footprint

Significant impacts can be identified through the direct measurement of population abundance or indirect measure through the degradation of habitat outside of the approved disturbance footprint that will lead to a decline in the population. Within the Project Fauna Management Plan, annual relative abundance surveys and habitat quality surveys have been conducted to measure changes in population abundance and habitat quality over time, to help ascertain significant impacts.

Indirect impacts have been recognised as a potential threat, such as erosion and sedimentation of MBF habitat, or the loss of large hollow bearing trees, used by greater glider, through uncontrolled fires. Or weed infestations, threatening habitat quality for both species. Within the FMP and OAMP, mitigation measures have been established to reduce threats for these two species. These measures are:

For both species

- A fire management plan, utilising controlled burns to reduce the likelihood of damaging, hot uncontrolled fires
- Monitoring and controlling weed populations within the offset areas and disturbance footprint
- Monitoring habitat quality within offset areas to ensure ongoing improvements to habitat quality are realised and targets are met.

For the greater glider

- Remove cattle
- Cattle-proof fencing to prevent cattle entering the site
- Remove and replace top-barbed wire with barbless wire

For the magnificent brood frog

- Erosion and sedimentation control measures, such as;
  - Large sedimentation traps at the disturbance footprint interface
  - Rock-lined drainage adjacent to any MBF habitat

    - Returning groundcover to disturbed areas
- During construction, monthly habitat quality assessment for all Impact Sites[1] and on-site Control Sites[2]

This report will review the items above, and along with relative abundance data, determine if there are any significant residual impacts for each species.

[1] Impact Sites are MBF habitat adjacent to or within the disturbance footprint where foreseen direct impacts were assumed to occur during the development.

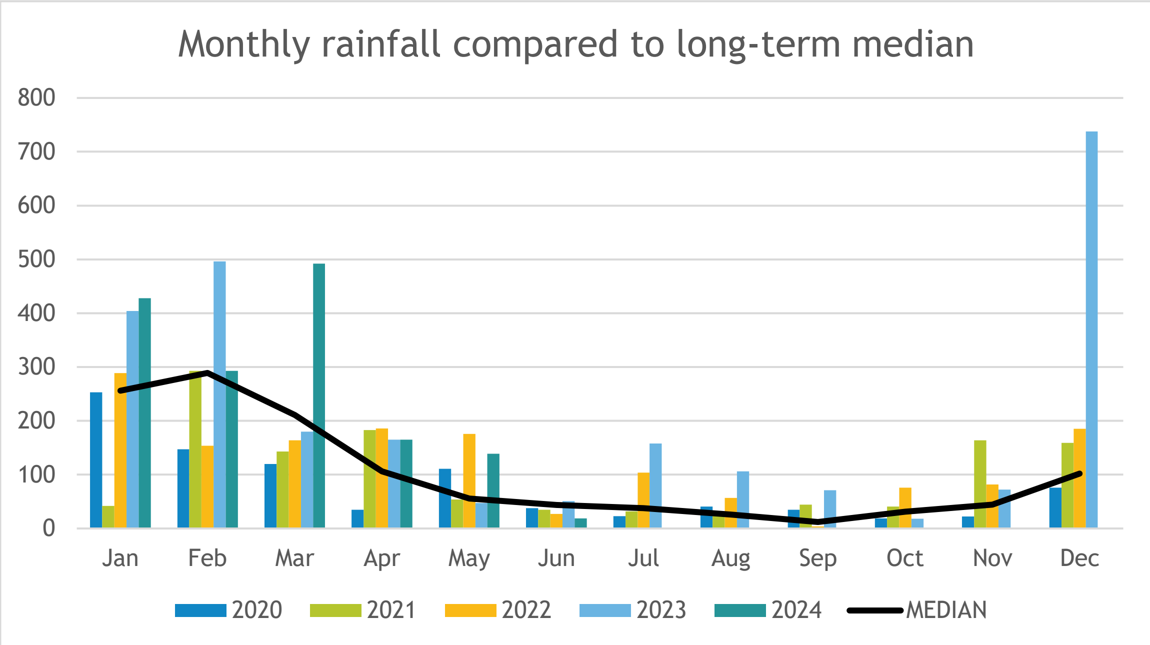
[2] On-site Control Sites are reference MBF populations found within the Site but not impacted by the Project.

3 Results

3.1 Climate Data

Monthly rainfall data, from the nearest BoM weather station (031200), was plotted from January 2020 through to July 2024 against long-term median values. Annual monthly rainfall figures suggest rainfall was close to long-term median values. This would suggest that there was adequate rainfall for MBF breeding throughout all seasons during relative abundance monitoring.

Figure 2: Regional monthly rainfall data from local BoM weather station 031200.



3.2 Assessment of Residual Impact

3.2.1 Relative Abundance

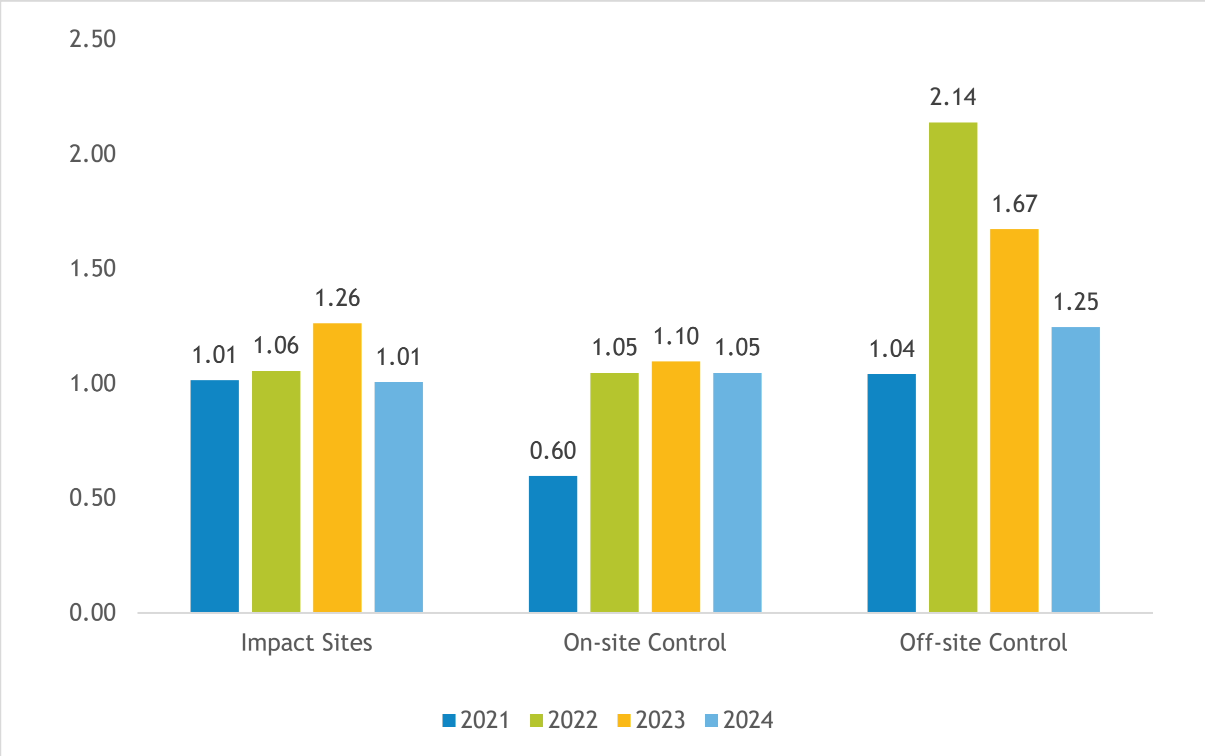
3.2.1.1 Magnificent Brood Frog Relative Abundance

Eleven MBF populations have been monitored annually for relative abundance and changes in habitat quality, over the last four years. There are five Impact Sites[3], three On-site Control sites[4] and three Off-site Control sites[5]. The relative abundance results for each treatment group are summarised in Figure 3. Relative abundance is expressed as the average number of MBF found within a 10m section of the survey

[3] Impact Sites are those sites identified during approval, that are directly adjacent to the disturbance footprint in areas of MBF habitat where the species is known to occur. These sites will determine whether indirect impacts associated the project are impacting the abundance of MBF within the site.
[4] On-site control sites, are those MBF habitat located on SIte, within offset areas at a minimum distance of 100m from disturbance.
[5] Off-site Control Sites are reference MBF populations found outside the Site but share the same regional context.

transect. The minimum and maximum abundance within Impact Sites ranges from 1.01 to 1.26, for On-site Control sites 0.6 to 1.05 and 1.04 to 2.14 for the Off-site Control sites.

Figure 3: MBF relative abundance over time for each treatment group.



Four annual abundance surveys were conducted and reported on between 2021 and 2024 by suitably qualified ecologist from E2M Pty Ltd, (E2M Pty Ltd, 2021c), (E2M, 2022a), (E2M Pty Ltd., 2023) and (E2M Pty Ltd, 2024e). Figure 4 to Figure 6 show the relative changes of abundance compared to baseline data. The baseline (starting population) has been normalised to one and subsequent changes in population abundance over time in comparison to baseline data. There were some fire events impacting MBF habitat. Fires are indicated by crosses within Figure 4 to Figure 6 and minor to moderate erosion event indicated by the black dot, Figure 6.

Figure 4: On-site Control sites; change in MBF relative abundance overtime normalised to baseline data. Dashed line represents baseline population size. Crosses indicate fire events.

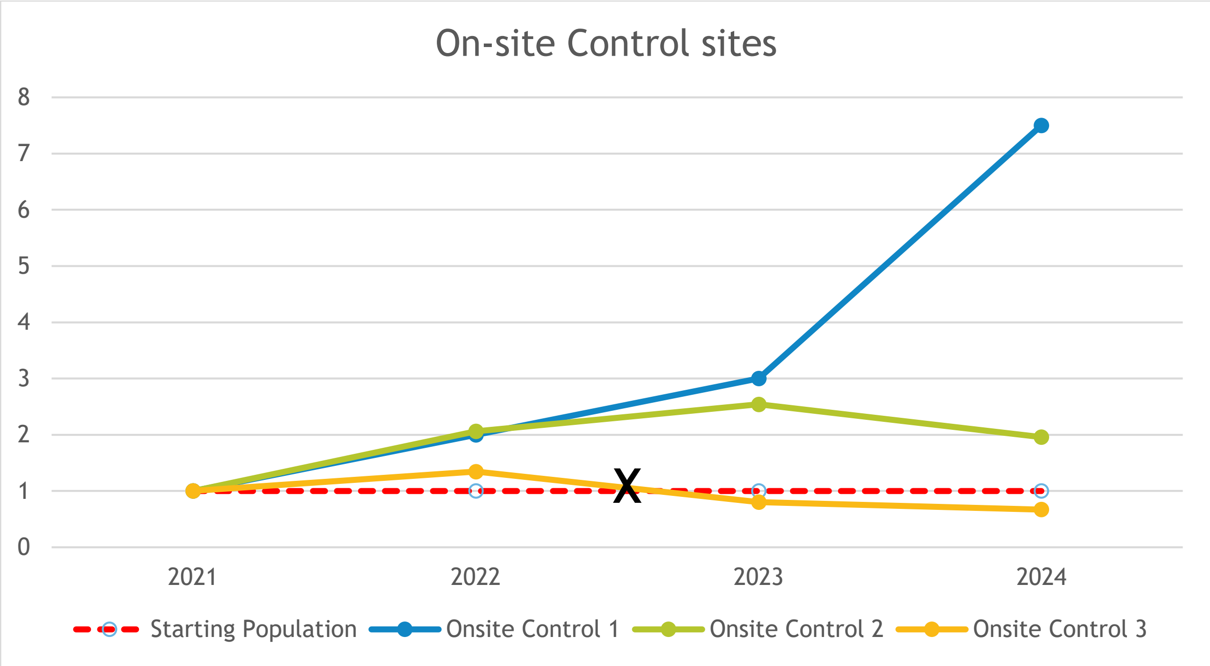


Figure 5:Off-site Control Sites; change in MBF relative abundance overtime normalised to baseline data. Dashed line represents baseline population size. Crosses indicate fire events.

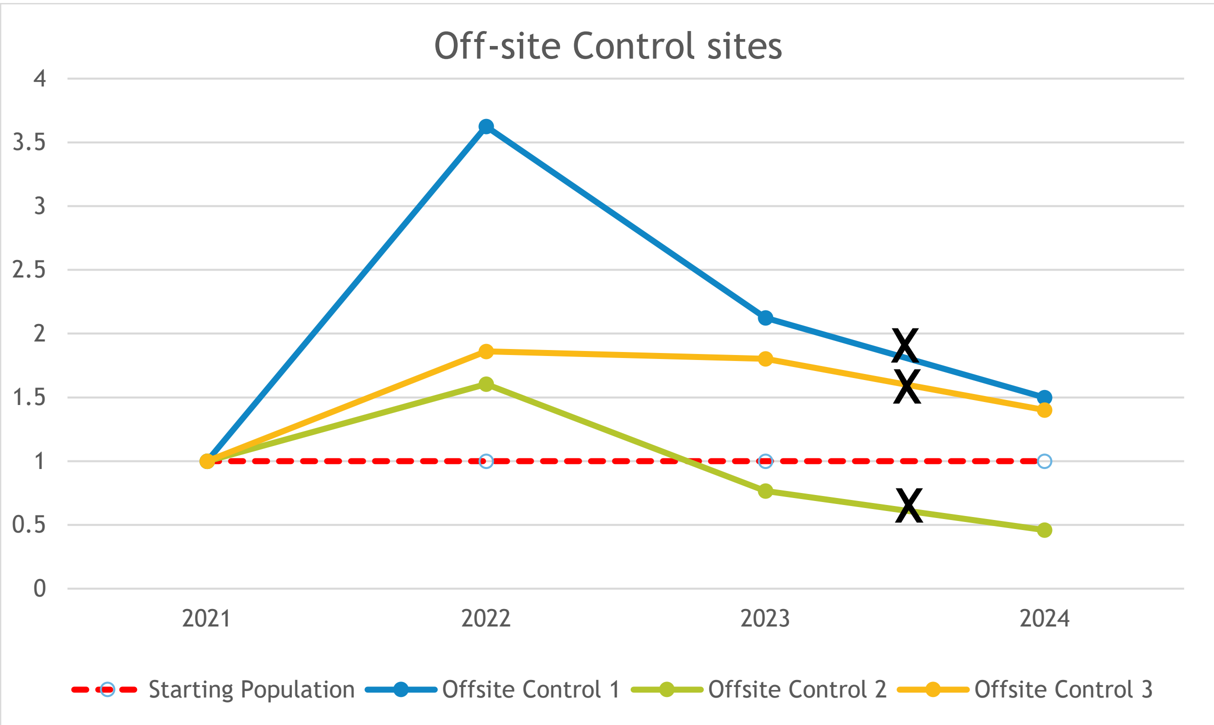
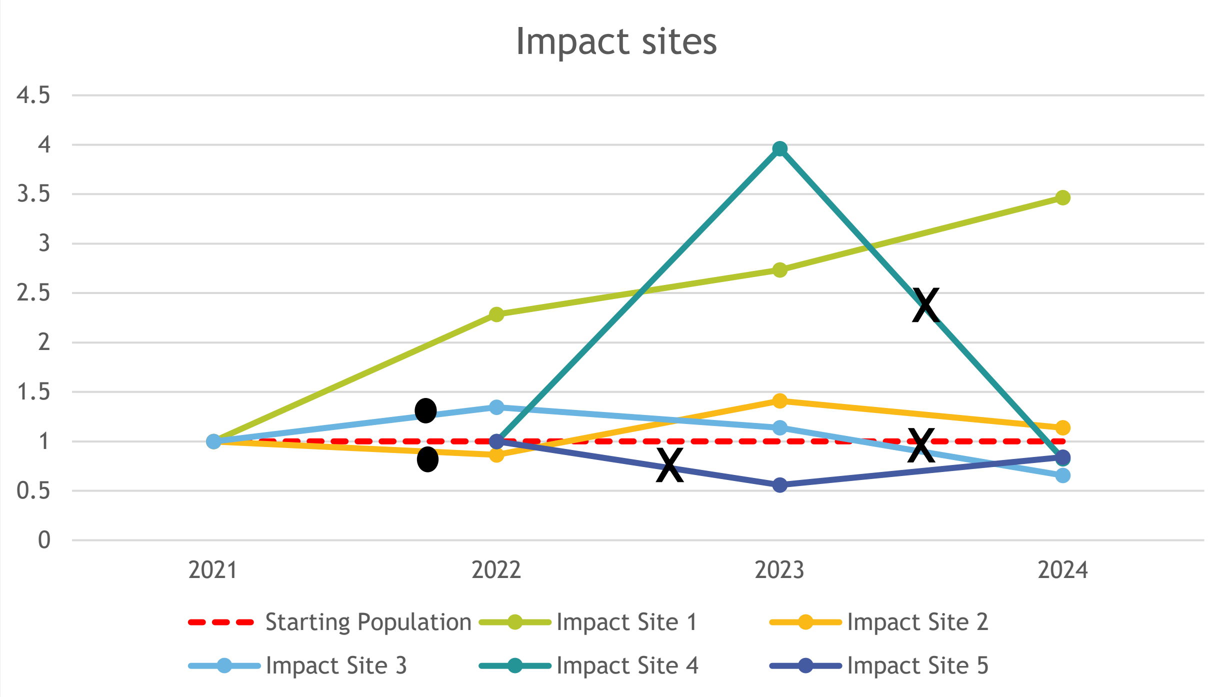


Figure 6: Impact Sites; change in MBF relative abundance overtime normalised to baseline data. Dashed line represents baseline population size. Crosses indicate fire events. Dots indicate erosion.



3.2.1.2 Greater Glider Abundance

The annual greater glider relative abundance data is summarised in Table 1. There have been three annual surveys at each of the three monitoring transects. Surveys are conducted between October and November annually. The fourth survey will take place in November 2024. From 2021 to 2023 the total annual observations have been 7, 5 and 5. Annual surveys have been conducted and reported by E2M Pty Ltd,(E2M Pty Ltd, 2021a), (E2M Pty Ltd, 2022a), and (E2M Pty Ltd, 2023a).

Table 1: Comparative greater glider (*Petauroides minor*) records for surveys 2021, 2022 and 2023

Transect	Greater glider observations 2021	Greater glider observations 2022	Greater glider observations 2023
T1 (on-site transect)	1	1	1
T2 (on-site transect)	3	1	2
T3 (off-site transect)	3	3	2
Total Observations	7	5	5

3.2.2 Assessment of approved habitat clearing against actual clearing values

Habitat suitability was assessed for MNES via a formal desktop and field survey process during the approval process. High habitat suitability was identified for the magnificent brood frog and the greater glider and the areas anticipated for clearing were then calculated from the proposed disturbance footprint. The areas of suitable habitat impacted were then recalculated against the actual disturbance footprint at the end of construction, to identify any additional residual impacts to MNES. The EPBC Act approved disturbance and actual disturbance values are summarised in Table 2.

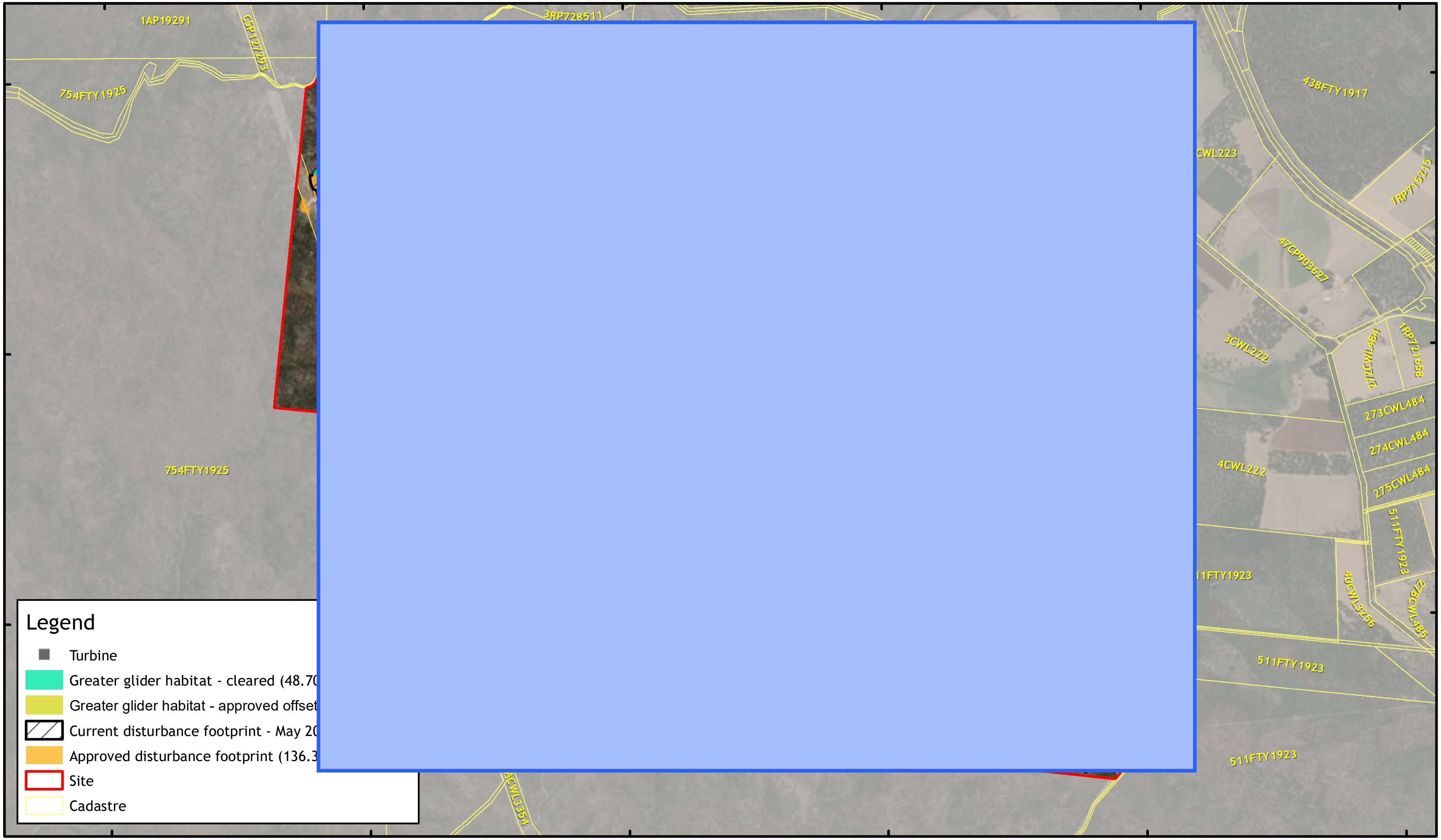
Table 2: Approved and actual clearing values

Species	EPBC Approved disturbance limits (ha)	Actual disturbance (ha)
Magnificent brood frog	3.0	1.1
Greater glider	61.0	48.7

The approved area for clearing, of high suitability habitat, for greater glider and magnificent brood frog habitat was 61 and 3 hectares, respectively. The actual area cleared during construction process was 48.7 and 1.1 hectares for the greater glider and magnificent brood frog, which is 80% and 37% of the total approved areas for clearing, see Figure 7 and Figure 8.

3.2.3 Assessing if secured offset areas are satisfactory

Suitable offset areas were established for both species during the approval process, proportionate to the anticipated suitable habitat to be cleared. All calculations were performed using approved offset calculator guidelines and tools, and a formal calculation provided within the Offset Area Management Plan, (E2M Pty Ltd, 2021b). From the original anticipated impact areas, 61.0 and 3.0 hectares, total suitable habitat for the greater glider and MBF was calculated as 295 and 15.75 hectares, respectively. Actual offsets secured for greater glider and MBF were 301.38 and 16.27 hectares, see Figure 7 and Figure 8. Actual habitat disturbance, 48.7 and 1.1 hectares, was significantly less than the anticipated and approved values. As such, the secured offsets are more than adequate for both species.



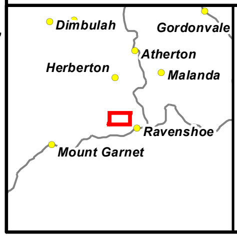


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FIGURE 7: GREATER GLIDER ACTUAL vs APPROVED IMPACTS

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KABAN GREEN POWER HUB

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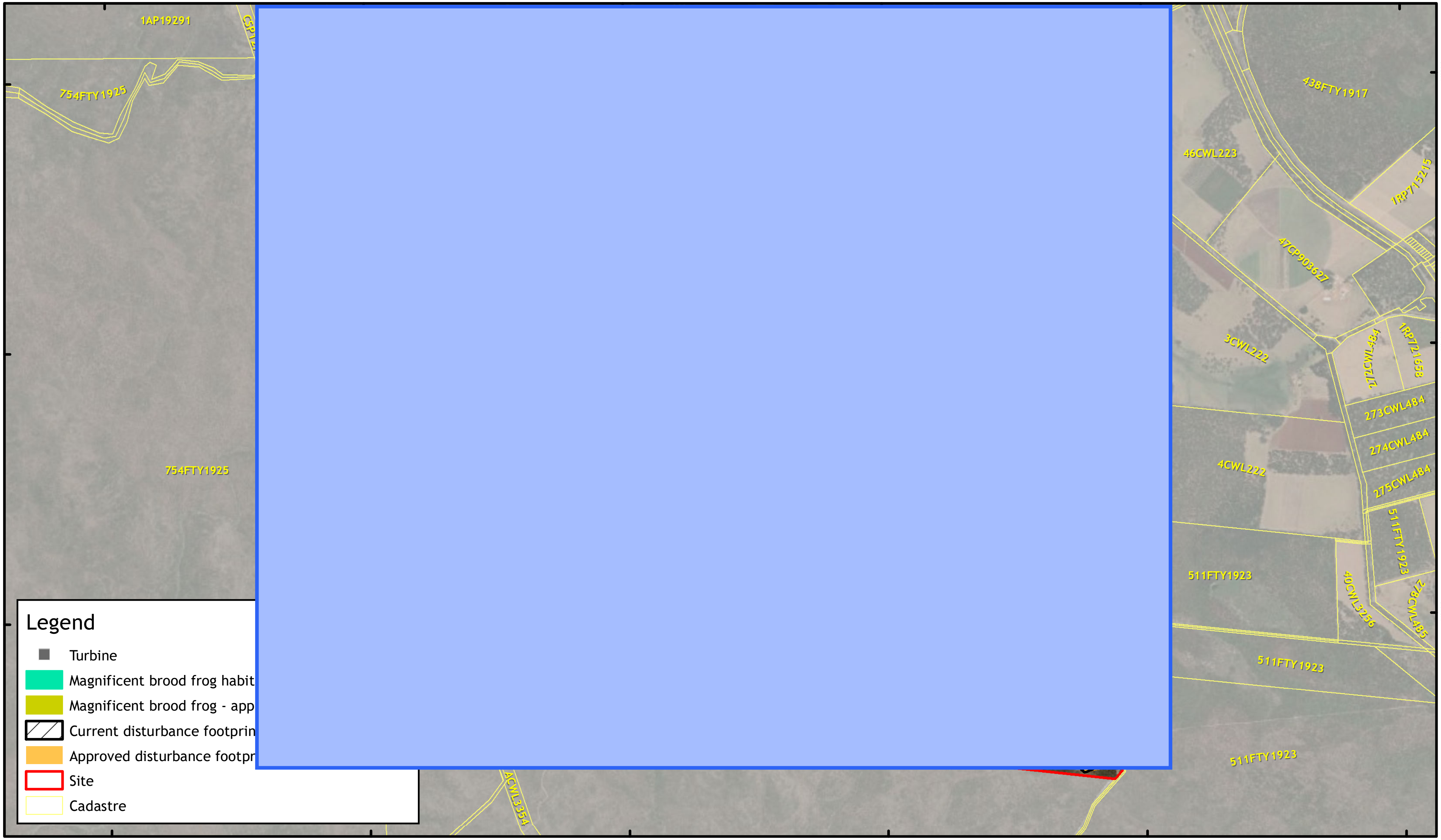

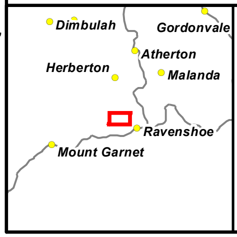

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FIGURE 8: MAGNIFICENT BROOD FROG ACTUAL vs APPROVED IMPACTS

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KABAN GREEN POWER HUB

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3.2.4 Habitat quality assessment

3.2.4.1 Magnificent brood frog habitat quality

Monthly microhabitat quality assessments and reporting were performed within magnificent brood frog habitat during construction and annually post construction, (E2M, 2022c), (E2M Pty Ltd, 2024d), (E2M, 2022c), (E2M, 2022b),(E2M Pty Ltd, 2022c), (E2M Pty Ltd, 2023d), (E2M Pty Ltd, 2022d), (E2M Pty Ltd, 2022e), (E2M Pty Ltd, 2023c),. Minor sedimentation and erosion was noted after significant rain events within some impact sites intercepting the disturbance footprint. However there, were no detectable changes in MBF abundance associated with these events. There was, however, a correlation of fire disturbance within MBF habitat and a decrease in relative abundance. These fire impacts were noted across each population group. All three off-site controls sites, one on-site control site and three of the five impact sites were impacted by fires, see Figure 4 to Figure 6.

3.2.4.2 Greater glider habitat quality

Habitat quality for greater glider habitat has been maintained across the project area through implementation of management practises outlined within the FMP (E2M, 2020) and OAMP (E2M Pty Ltd, 2021b). Baseline habitat quality values were calculated prior to construction (E2M Pty Ltd, 2019) and again two years post-commissioning (E2M Pty Ltd, 2023b). There has been notable improvements to habitat quality across the site. Baseline habitat quality score averaged 8.07 and post-commissioning results averaged 8.35. There have been no post-construction project activities impacting greater glider habitat.

4 Discussion

As per the FMP and OAMP, all mitigation measures and strategies have been employed to reduce any potential project related impacts. A summary of these activities is provided in the annual compliance reports, (E2M Pty Ltd, 2022b) (E2M Pty Ltd, 2023b) and (E2M Pty Ltd, 2024a). This report provides a summary of all relative abundance data, changes in habitat quality, a comparison of approved and actual habitat cleared, and the assessment of appropriate offset allocation, to assess for any significant residual impacts from construction and post-commissioning activities and adequacy of offsets.

4.1 Residual Impacts Assessment

4.1.1 Magnificent brood frog

From the annual abundance data there is no indication that there has been any additional project related significant impacts on the MBF. There have been increases and decreases in relative abundance across all impact and control sites. The most noticeable impact to MBF habitat has been through fire damage. All MBF sites experiencing fires, preceding monitoring events, have recorded low range to significant, decreases in abundance. While there have been fire related decreases in some sites, the latest relative abundance results, January 2024, indicate that average abundance figures are the same or above baseline abundance figures.

While there was a low to moderate erosion event at Impact Site 3 and Impact Site 5 during the construction phase, there has been insignificant changes in MBF relative abundance at these sites, suggesting no project related impacts.

Clearing of 3 hectares of high suitability MBF habitat was anticipated, and approved, for this action. As such, 16 hectares of high suitability MBF habitat was secured for offsets. However, the actual clearing footprint, 1.1 hectares, was significantly less, or 37 percent of the approved 3 hectares. Therefore, current offset provisions are significantly more than expected and more than adequate to compensate for any project related impacts.

4.1.2 Greater glider

Greater gliders naturally occur in low abundance throughout landscape, with typical home ranges varying from 1.03 to 19.3 hectares (Smith et al., 2007), (Starr et al., 2021) and (McGregor et al., 2023). Therefore, the natural low abundance of these animals can make interpreting the data very difficult, especially when analysing potential impacts from project activities. However, the Offset Area Management Plan (E2M Pty Ltd, 2021b) states: *possible project impacts may occur, if there is an absence of greater glider at a single monitoring site for three consecutive years*. To date, each annual relative abundance survey has detected greater glider at each of the three monitoring transects. As such, this would indicate no significant residual impacts from project related activities.

301.38 hectares of offsets were secured for the anticipated clearing of 61 hectares of high suitability habitat for greater glider. However, the final clearing footprint only removed 48.7 hectares of greater glider habitat. Again, the current offset provisions for greater glider are more than adequate for the actual impacts.

5 Conclusions

The residual impacts, for the two vulnerable species, were assessed against the significant impact criteria detailed within the departments significant impacts guidelines,(Department of the Environment (DotE), 2013). Abundance figures for the greater glider and magnificent brood frog, suggests that there have been no additional impacts on populations relating to project activities, with latest relative abundance values being similar to baseline values. Offsets were secured for the anticipated impacts calculated during the approval process. The final clearing values of suitable habitat were significantly less, than those originally predicted, for both species. Only 1.1 hectares of the predicted 3 hectares of MBF habitat was cleared and 48.7 hectares of the predicted 61 hectares of greater glider habitat was cleared. Therefore, offset provisions are more than adequate for the impacts to both species.

6 Recommendations

6.1 Magnificent brood frog

Current MBF abundance data suggests no residual impacts from Project related activities. However, continued annual abundance monitoring as per the FMP is recommended to track MBF population dynamics, especially around those sites impacted by fire. The recommendations within the latest MBF abundance monitoring and microhabitat assessment reports, (E2M Pty Ltd, 2024d) and (E2M Pty Ltd, 2024d), to mitigate against fire damage, should be followed.

The current remedial activities to mitigate erosion and sedimentation have been largely effective, however altered water shedding at two impact sites may continue to cause erosion if not addressed. Further remedial activities to restore pre-construction waterflows have been recommended and are commissioned for this year (2024). As such, it is important to maintain vigilance for changes to microhabitat and abundance where erosion has been detected as a result of project related changes to waterflows.

6.2 Greater glider

While there have been no significant changes with greater glider abundance, it has been recommended that greater glider nest boxes be installed, to further improve habitat quality. Ten nest boxes, were purchased and installed during July 2024, within an offset area identified as having a low abundance of suitable tree hollows. Pending utilisation of these nest boxes additional nest boxes should be considered to improve denning resources for greater glider.

6.3 Habitat Maintenance

The most recent rehabilitation and weed monitoring reports, (E2M Pty Ltd, 2024b)and (E2M Pty Ltd, 2024c) have indicated the presence of some infestations of environmental weeds within the disturbance footprint. While the current weed monitoring and treatment program is being effective for control, within the offset areas and disturbance footprint, continued monitoring and treatment of weeds is important to prevent the spread of these weeds into surrounding MBF and greater glider habitat.

It is important to maintain the controlled burns program, to safeguard against damage from high intensity fires, and ensure that habitat qualities of the greater glider and magnificent brood frog are preserved. As noted above, some additional management strategies, prior to and during, the controlled burns are needed to protect MBF habitat and the frogs found within.

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Appendix I: BBAMP - Second Annual Impact Trigger Report

Second Annual Bird and Bat Mortality Trigger Assessment

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust

Level 21, 570 George Street, Sydney NSW 2000

Document Management

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Definitions

Term	Definition
Bird and Bat Adaptive Management Plan	The Kaban Green Power Hub – Bird and bat Adaptive Management Plan
EPBC Approval	The EPBC Act Approval associated within the Kaban Green Power Hub (EPBC 2018/8289)
Impact Trigger	As defined in the EPBC Act Approval and BBAMP.
Migratory Species	Species listed as Migratory under the EPBC Act, at the date of EPBC Referral submission.
Symbolix	Symbolix Pty Ltd, qualified statistical consultants.
The Project	The Kaban Green Power Hub, also known as the Kaban Wind Farm
Threatened Species	Species listed as Critically Endangered, Endangered, Vulnerable or Near Threatened, under the EPBC Act or Nature Conservation Act 1992, at the date of EPBC Referral submission.

Abbreviations

Term	Definition
BBAMP	Bird and Bat Adaptive Management Plan
DCCEEW	The Department of Climate Change, Energy the Environment and Water
E2M	E2M Pty Ltd
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999

Executive Summary

This report is the second annual bird and bat mortality trigger assessment of the Kaban Green Power Hub, commonly known as the Kaban Wind Farm. This report assessed the performance against mortality impact triggers specified in the *Kaban Green Power Hub – Bird and bat Adaptive Management Plan (BBAMP)* (E2M, 2021). The results from the second annual *Kaban Wind Farm Mortality Estimate report,* conducted by statisticians, Symbolix Pty Ltd, (Appendix A), were used to evaluate any mortality impact trigger events. The mortality estimate report provides the modelled mortality values of listed species identified during monthly and incidental carcass searches. The statistical mortality model adjust carcass finds against outcomes of searcher efficiency and scavenger rate trial results to generate best mortality estimates of listed migratory birds and threatened species.

Results from the second annual mortality estimate report indicate that no impact trigger events occurred for any listed migratory or threatened species, and the comparison of month to month carcass finds indicated that there were no trigger events for any non-threatened species.

1 Introduction

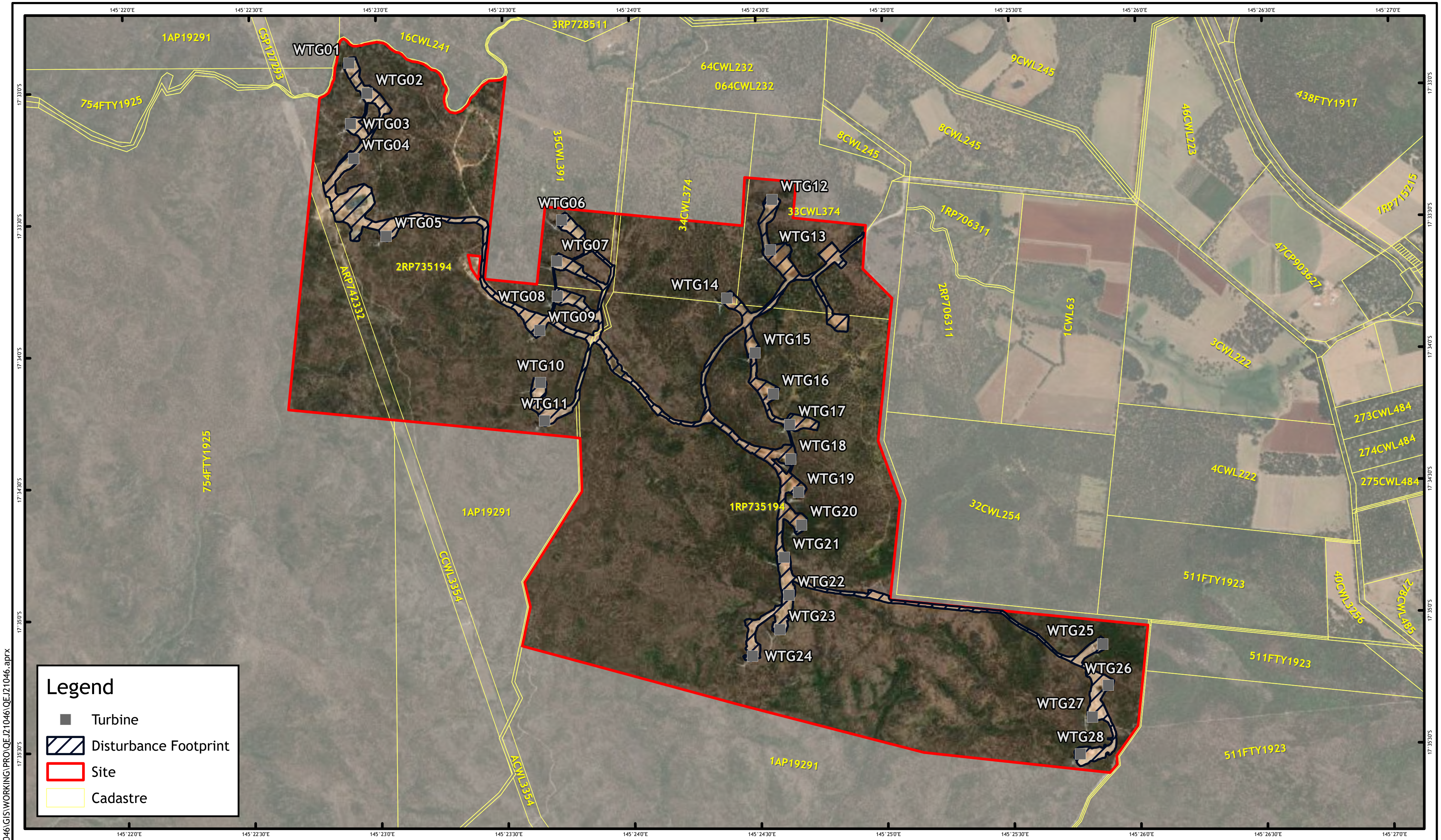
1.1 Background

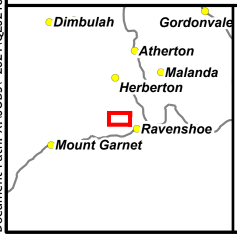
The Kaban Green Power Hub, commonly known as the Kaban Wind Farm and herein referred to as the 'Project', consists of 28 operational wind turbines and associated infrastructure. The Project is located approximately 4 kilometres west of Tumoulin, Queensland, Figure 1. Construction of the Project commenced in May 2021, with the last turbine constructed and commissioned by August 2023.

E2M Pty Ltd (E2M) was commissioned by Kaban Wind Farm Trustee for the Kaban Wind Farm Trust to prepare the Second Annual Mortality Assessment pursuant to EPBC Approval (EPBC 2018/8289) and detailed within the *Kaban Green Power Hub – Bird and bat Adaptive Management Plan (BBAMP)* (E2M, 2021). This Annual Mortality Assessment reports details findings of Year 1 of operational monitoring, specifically between 01/09/2023 to 24/09/2024.

1.2 Scope of Works

The scope of the assessment was to review the annual mortality estimate (Appendix A) and data collected during monthly carcass surveys and incidental carcass finds, pursuant to Condition 14 of the EPBC Approval, against the impact trigger values identified within the BBAMP, and where required report against any measures implemented to avoid and mitigate impacts.





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Coordinate System: GDA2020

Notes:
Aerial Imagery: © ESRI 2025
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0	Issued for Use	GO	DJ	16/06/2025
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FIGURE 1: PROJECT LOCATION

KABAN BBAMP ANNUAL TRIGGER REPORT
KABAN GREEN POWER HUB

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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2 Methods

As per the current BBAMP (E2M, 2021), the following actions were taken to assess for possible mortality impact trigger events for bird and bat species:

- monthly assessment of targeted carcass searches and incidental carcass observations (Section 2.2); and
- annual mortality estimates undertaken by Symbolix (Section 2.3, Appendix A).

The different type of impact triggers defined within the EPBC Act approval (Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2022) are described in the following section.

2.1 Impact Triggers

Assessment was undertaken against the following impact triggers identified within the BBAMP and EPBC Approval:

- Threatened Species[1]: Identification of any threatened bird or bat species carcass (or recognisable parts thereof) within 180[2] metres of any wind turbine.
- Migratory Species[3]: Accounting for scavenger rate and searcher efficiency, impacts on half of the nationally significant proportion of a population of any migratory species, as listed in the *Draft - referral guideline for 14 birds listed as migratory species under the EPBC Act* (Department of the Environment (DotE), 2015). A turbine collision impact on a migratory species is considered the identification of a migratory species carcass (or recognisable parts thereof) within 180[2] metres of a turbine. Specific impact triggers for species relevant to the site are detailed in Table 1.
- Non-threatened / Non-migratory Species: Identification of a at least four carcasses of a single species (or recognisable parts thereof) within 180[2] metres of the same turbine in two consecutive months (i.e. four individuals recorded each month).

Table 1: Impact triggers for migratory species

Species	Impact trigger (0.05%) of total population
Fork-tailed swift (*Apus pacificus*)	50
Rufous fantail (*Rhipidura rufifrons intermedia*)	2400
Black-faced monarch *(Monarcha melanopsis)*	230[A]
White-throated needletail (*Hirundapus caudacutus*)	5

A. Trigger values were not identified within the BBAMP as this species was considered 'unlikely' to occur during the Fauna Technical Report, (AECOM, 2017). However, one individual was found during an incidental search within the first year of operation. As such, the 0.05% trigger value has been included.

[1] Species listed as Critically Endangered, Endangered, Vulnerable or Near Threatened, under the EPBC Act or Nature Conservation Act 1992, at the date of EPBC Referral submission.
[2] Maximum fall distance based on formula presented in (Hull & Muir, 2010)
[3] Species listed as Migratory under the EPBC Act, at the date of EPBC Referral submission.

2.2 Monthly Assessments

Following the completion of every twice monthly targeted carcass searches, assessment was undertaken to determine whether impact triggers had been reached for threatened species, migratory species and non-threatened/non-migratory species. Outcomes are provided in the Section 3.

2.3 Annual Mortality Estimates

Annual mortality assessments were conducted by statisticians Symbolix, and the process involved using a statistical model which incorporates results from monthly carcass searches, searcher efficiency and scavenger rate trial to generate annual mortality estimates. The period of the annual assessment was between 1 September 2023 to 24 September 2024. The reporting season was extended beyond 12-months because the December 2023 survey was cancelled due to cyclone Jasper making site access unsafe. Therefore, the September 2024 survey results were added to ensure the mortality analysis was inclusive of 12-months' worth of data. Detailed methodology of the statistical model is provided in Appendix A.

3 Results

3.1 Monthly trigger assessments

3.1.1 Threatened species trigger assessment

Monthly assessment of impact triggers for threatened species identified no triggers had been reached during the annual survey period, with no threatened species carcasses recorded.

3.1.2 Migratory Species

Monthly assessment of impacts on migratory species against impact triggers identified no triggers had been reached based on direct observations of individuals. Table 2 summarises the total number of migratory species identified during Year 2, including formal targeted searches and incidental records.

Table 2: Migratory species carcasses recorded during Year 1

Species	Monthly survey carcass records	Incidental carcass records
Fork-tailed swift (*Apus pacificus*)	1	0
Black-faced monarch *(Monarcha melanopsis)*	2	1
White-throated needletail (*Hirundapus cauducutus*)	1	0

3.1.3 Non-threatened Species

Impact triggers for non-threatened were assessed, on a month-to-month basis comparing data from consecutive months. There were no consecutive months where four carcasses were found of a single species during each month. Therefore, no triggers were identified during this annual assessment period for non-threatened bird or bat species.

3.2 Annual Mortality Estimate

Annual mortality estimates were generated to compare against BBAMP impact trigger values prepared by Symbolix (Appendix A), for those listed migratory birds found during this survey period. The results of the annual mortality estimates are provided in Table 3, and when compared to trigger values there has been no trigger activated

Mortality estimates for non-threatened and non-migratory species are also provided in Appendix A.

Table 3: Site-wide (total) percentiles of mortalities for threatened and migratory species

Species	0%	50% (Median)	Trigger limit	At or above trigger limit
Fork-tailed swift (*Apus pacificus*)	1	4	50	No
Black-faced monarch *(Monarcha melanopsis)* [1]	2	8	230	No
White-throated needletail (*Hirundapus cauducutus*)	1	4	5	No

4 Conclusions

The mortality records observed during this assessment period, collected from the twice-monthly carcass surveys and from incidental observations, were assessed against the BBAMP trigger values for all bird and bat species. The assessment included comparing the annual mortality estimates, provided by Symbolix, for listed migratory birds and from the comparison of monthly carcass observations for non-threatened birds and bats. The assessment concludes that there were no trigger events for any birds or bats for this assessment period.

5 Recommendations

Based on the findings and observations from this assessment the following recommendations have been identified.

Ongoing updates to the BBAMP to:

1. Reflect current listed migratory bird population estimates.
2. Update BBAMP monitoring program to reflect those listed migratory and threatened species known to occur on-site.
3. Open a discussion with the Department for the consideration of an administrative change to remove any de-listed migratory species, such as the black-faced monarch *(Monarcha melanopsis)*, satin flycatcher (*Myiagra cyanoleuca*) and rufous fantail (*Rhipidura rufifrons)* from within the EPBC Act approval.

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Appendix A Symbolix: Second Annual Mortality Estimates

Kaban Wind Farm Mortality Estimate - Year 2

Prepared for E2M, 20 November 2024, Ver. 1.0

This report outlines an analysis of bird and bat mortality at Kaban Wind Farm from 2023-09-01 to 2024-09-30, the "second year period" of operation. The analysis is broken into the three related components below:

- Searcher efficiency / detectability – estimated from trials in October 2023 and March 2024
- Scavenger loss rates – estimated from trials in October 2023 and March 2024
- Mortality estimates - based on surveys at 24 turbines, from 2023-09-22 to 2024-09-24

We estimate overall bird and bat mortality, and mortality for the following species of interest:

- Black-faced Monarch
- Fork-tailed Swift
- White-throated Needletail

We note that the following migratory and threatened species are also of interest; however, we have not included them in a mortality analysis as there is no evidence of their mortality in this period. These species are:

- Ghost Bat
- Spectacled Flying Fox
- Latham's Snipe
- Oriental Cuckoo
- Rufous Fantail
- Satin Flycatcher

1 Available data

Turbine data, mortality survey data, and adjunct survey data was provided by E2M.

Species archetype data was taken from Hull and Muir (2010) (bat and small/medium bird archetypes).

1.1 Data cleaning

Carcass finds (formal), incidental finds, searcher efficiency, scavenger efficiency data:

- Unidentifiable/unknown birds were recoded to “Unidentified Bird”
- Unidentifiable/unknown bats were recoded to “Unidentified Bat”
- Capitalisation and hyphenation made consistent

Otherwise, data was used as provided by E2M.

2 Statistical methodology overview

Mortality through collision is an ongoing environmental management issue for wind facilities. Different sites present different risk levels; consequently different sites have different monitoring requirements. In order to estimate the mortality loss at a given site (in a way that is comparable with other facilities) we must account for differences in survey effort, searcher and scavenger efficiency. We used a Monte Carlo method to achieve this.

Best practice estimators project the number of found carcasses (C) up the number of actual mortalities (M). They should account for:

- The probability a carcass will be detected by the searcher (p)
- The probability a carcass is not lost to scavenge or decay prior to the search (r)
- The probability a carcass falls within the searched area (a)
- The fraction of turbines searched (f)

Most mortality estimators, e.g. (M. M. Huso 2011), can be conceptualised as a ratio estimator

$$\hat{M} = \frac{C}{\hat{p} \cdot \hat{r} \cdot \hat{a} \cdot f} \qquad (1)$$

with the terms in the denominator providing a "boost factor" to the number of carcasses found, C.

However, a limitation of analytical methods is estimating r when the time between surveys is not constant. In Australia, it is common for the time between searches to vary due to seasonal changes in effort or the use of a pulsed design in which the turbine is searched monthly with a return visit a few days later. Additionally, ratio estimators cannot handle the cases when zero carcasses are found, as zero multiplied by any number still gives zero.

To address this, Symbolix have developed a Monte Carlo algorithm. We have used this method for mortality estimates at over forty wind farms in Australia to date.

Monte Carlo methods (Sawilowsky (2003), Ripley (1987)) simulate a large set of possible survey results, by simulating the actual survey protocol, and sampling from empirical distributions for scavenge loss and searcher efficiency. In this way, we directly sample the probability a carcass was lost before the survey, negating the need to calculate r analytically each time.

We then estimate how many carcasses were truly generated, given the range of searcher and scavenger efficiencies, the survey frequency and coverage, and the true "found" details. After many simulations, we can estimate the likely range of mortalities that could have resulted in the recorded survey outcome (number of carcasses found).

This method has been benchmarked against analytical approaches (M. M. Huso (2011), Korner-Nievergelt et al. (2011)). Its outputs are equivalent but it is able to robustly model more complex survey designs (e.g. pulsed surveys, rotating survey list).

Figure 1 provides an overview of the methodology. A detailed explanation can be found in Stark and Muir (2020).

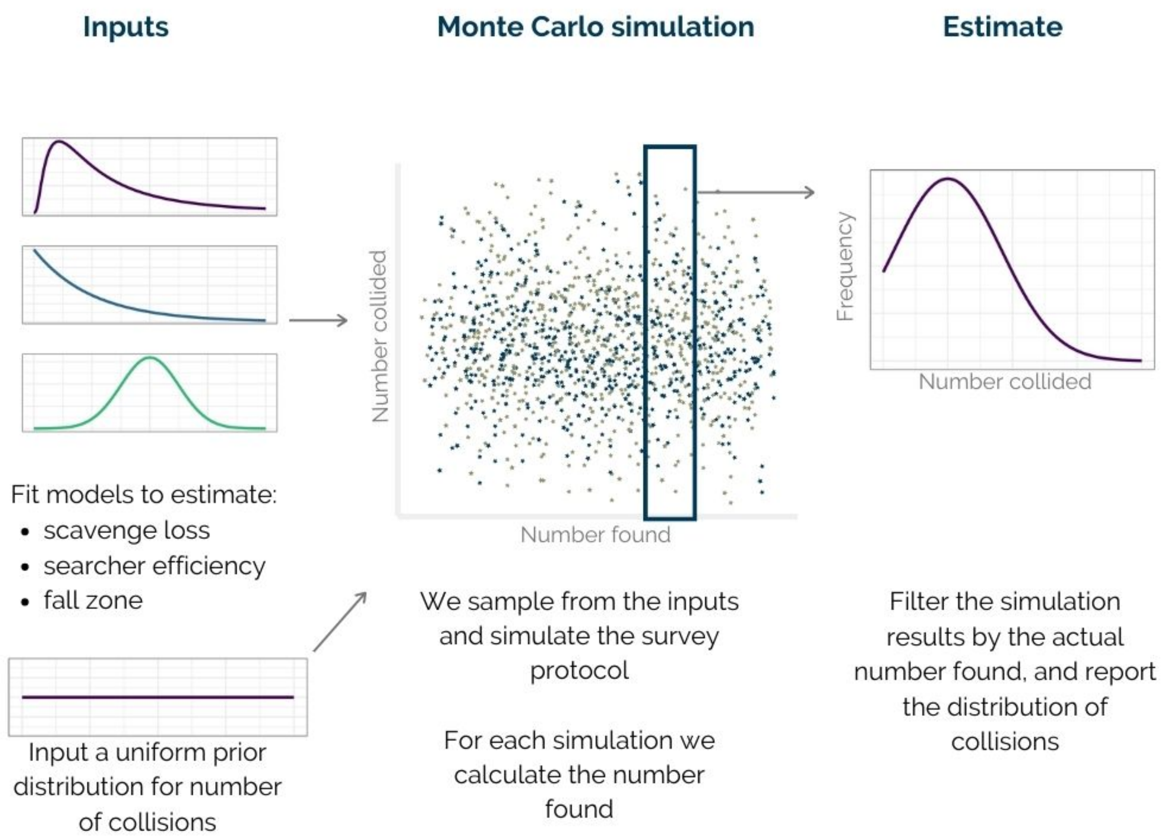

Figure 1: Overview of how the mortality estimation works.

The following sections outline how we estimate p, r and a. C is given by the field observation data, and f is defined by the survey design.

3 Analysis and modelling

The survey program consisted of carcass searches, and adjunct scavenger and detection trials. We summarise the methods, field data and analysis results for each below.

3.1 Carcass search data

In the second year, carcass searches for birds and bats were undertaken by scent dog, with a trained handler.

The carcass searches provide the C and f terms in Section 2.

3.1.1 Survey effort

The original survey was based upon a list of 15 selected turbines. According to the EPBC Approval Conditions 11 and 13 for Kaban Wind Farm (E2M 2021), all “high risk” turbines must be surveyed, and if a EPBC listed bird or bat species is detected in the vicinity of a “low risk” turbine, that turbine is re-classified as “high risk”. Therefore, the number of turbines searched evolved over the first year of surveys. In the second year, the number remained constant at 24 turbines.

Two dog teams specifically trained for the detection of birds and bats, were used throughout the second year of mortality assessment. For consistency, the same two detection dogs and handlers were used for each survey throughout this survey period.

In the second of year of surveying, an irregularly shaped but consistently searched area, per turbine, was surveyed. This is discussed and accounted for in Section 3.5.

The search effort per month is summarised in Table 1. Turbines were searched twice every 28 days, meaning that in some months less surveys appear to have been conducted. These were conducted early the next month within the same 28-day period. Surveys could not be completed in December 2023, due to a cyclone so an extra round of surveys were conducted in September 2024.

Table 1: Number of surveys per month during the second year analysis period.

Date	Surveys
2023 Sep	46
2023 Oct	46
2023 Nov	48
2024 Jan	47
2024 Feb	47
2024 Mar	48
2024 Apr	48
2024 May	13
2024 Jun	59
2024 Jul	71
2024 Aug	48
2024 Sep	48
Total	569

3.1.2 Carcass finds

The breakdown of found carcasses per species are summarised in Table 2.

Table 2: Carcasses found during formal surveys over the second year of survey. Key species highlighted.

Species	Bat	Bird
Australian Swiftlet		2
Black-faced Monarch		**2**
Brown Quail		1
Forest Kingfisher		1
Fork-tailed Swift		**1**
Grey Shrike-thrush		1
Peaceful Dove		3
Rainbow Bee-eater		1
Rainbow Lorikeet		1
Red-legged Crake		1
Sacred Kingfisher		1
Superb Fruit-Dove		1
Unidentified Bird		15
Wedge-tailed Eagle		1
White-throated Needletail		**1**
Eastern Freetail Bat	5	
Hoary Wattled Bat	12	
Northern Freetail Bat	12	
Unidentified Bat	43	
White-striped Freetail Bat	29	
Yellow-bellied Sheathtail Bat	4	

A number of carcasses were also found incidentally. While these can't be included in the formal mortality estimate, we report them for completeness in Table 3.

Table 3: Incidental finds.

Species	Number found
Black-faced Monarch	**1**
Bush Stone-curlew	1
Grey Teal	1
Rainbow Lorikeet	1
Unidentified Bat	1

3.2 Searcher efficiency

The aim of searcher efficiency trials is the quantify the effectiveness of observers, at finding carcasses. They provide the p term in 2.

3.2.1 Field methods

The searcher efficiency data is primarily sourced from trials conducted in 2023 Oct and 2024 Mar. Carcasses were laid out in accordance to the specification in Section 5.2.2.5 of E2M (2021). Trained detection dogs (with a human handler) searched for the carcasses using the same protocol as the main mortality survey. If the carcass was found, “success” was recorded, else “failure” was the dog missing the carcass. For consistency the same two detection dogs and handlers were used in the trials and surveys throughout the second year period.

The detectability trials used bird (26 replicates) and bat (26 replicates) of various size classes.

Table 4: Count of species types and sizes used during the detection trials.

Species	Size	Replicates
Bat	Small	10
Bat	Medium	10
Bat	Large	6
Bird	Small	13
Bird	Medium	7
Bird	Large	6

3.2.2 Statistical methods

We estimated searcher efficiency by fitting binomial generalised linear models (GLMs). The optimal model was determined, guided by the small-sample Akaike Information Criterion (Anderson and Burnham 2004), otherwise known as the AICc.

The theory of AIC is deep and complex, and beyond the scope of this report. However, to summarise, AIC is a method for choosing the best approximating model of the “truth”. For each model we fit to the data, we calculate the AIC. We compare the differences in AIC between models, which in turn informs us of the weight of evidence for that particular model.

AIC is not the same as significance testing. We do not aim to state anything is significant at the 5% level, instead we aim to find a good model fit for the data. Additionally, we also consider two other principles guiding model selection. They are parsimony (a simpler model is preferable to a more complex model), and application (for example, it’s all well and good to find that cloud cover affects detection rates, but it’s not feasible to incorporate cloud cover into a mortality estimate).

AICc is a modification of AIC, which is appropriate for smaller sample sizes.

3.2.3 Results

The most parsimonious model of searcher efficiency models was the “intercept-only” model (i.e. all carcasses have the same expected searcher efficiency). Therefore, bird and bat detection efficiencies are aggregated in the following mortality estimate, for canine-based surveys.

We assume that dogs have a 81% chance of detecting a carcass (birds and bats), with a 95% confidence interval of [67%, 90%].

Table 5 shows the results.

Table 5: Detection efficiencies for canine searchers.

Variable	Dogs (all species)
Number found	42
Number placed	52
Mean detectability proportion	0.81
Detectability lower bound (95% CI)	0.67
Detectability upper bound (95% CI)	0.9

3.3 Scavenger efficiency

In order to accurately estimate mortality, we must account for carcass loss to scavengers. Scavenger trials are performed to quantify the time until a carcass is completely lost as a result of scavenger activity, which is the r term in Section 2.

3.3.1 Field methods

Scavenger efficiency trials were conducted in October 2023 and March 2024. The trials ran over approximately 30 days. In total, 27 bird carcasses and 25 bat carcasses were used. Trials used motion sensitive cameras in order to record exact times of scavenge events, and were held in accordance with Section 5.2.2.4 of E2M (2021).

Table 6: Species types for scavenger trials.

Species	Replicates
Bird	27
Bat	25

3.3.2 Statistical methods

Survival analysis (Kaplan and Meier (1958), Kalbfleisch and Prentice (2011)) was used to determine the distribution of time until complete loss from scavenge (or decay). Survival analysis was required to account for the fact that we do not necessarily know the exact time of scavenge loss, only an interval in which the scavenge event happened. For example, any carcass which is unscavenged at the end of the trial, has its scavenge event in the interval [x, ∞] (where x is the length of the trial). By performing survival analysis we can estimate the time until carcass loss after a given length of time, despite these unknowns.

We fit parameterised models to analyse significant factors influencing time to scavenge (carcass species type etc), and to find the most appropriate distribution to fit the time-to-loss curve (e.g. log-normal, exponential).

Time to carcass loss is influenced by the parameters discussed above and the distribution of the loss curve we fit to the data (M. M. P. Huso, Dalthorp, and Korner-Nievergelt 2015). The choice of loss function is important because it should capture the behaviours and relative time dependence of the various scavengers. Generally, the best distribution is the log-normal distribution (Stark and Muir 2020).

However, at Kaban Wind Farm, the standard log-normal shape did not suit the data. Therefore, we used a custom “hurdle” model. This two-part model accounted both for the rapid scavenge loss rate in the first 5-10 days, and the very slow rate of loss after this time period. This model is technically a weighted mixture/hurdle model between a fitted log-normal distribution, and infinity.

3.3.3 Results

The three Chicken carcasses used in the year 1 scavenger trials were removed from the modelling set. This is because there is a significant body of evidence suggesting Chickens are removed much faster than bats or birds (Stark and Muir 2020). The year 2 trials used only native birds and bats.

AICc and visual analysis of the survival data, showed the most parsimonious model contained no difference between the bat and bird scavenger rates. Therefore, in the following mortality estimations, aggregated survival curves are used.

As mentioned in Section 3.3.2, we used a custom modelling technique. This was because no standard distribution could fit the survival curve shape at Kaban Wind Farm (the black step function in Figure 2). The red smooth curve is the fitted survival curve from the custom model, which we can see accurately models the empiricial behaviour.

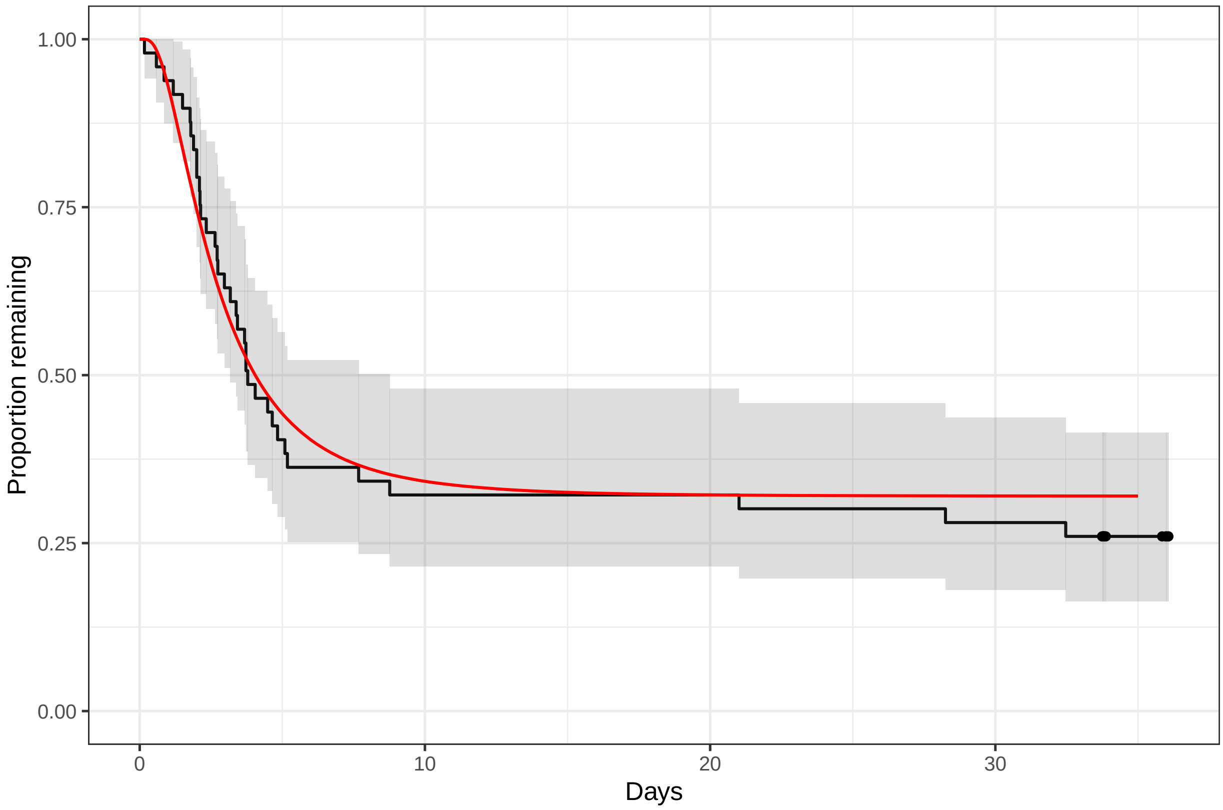

Figure 2: Empirical survival curve (the black step function), with 95% confidence interval shaded. The red smooth curve presents the fitted model.

Under these assumptions, the median time to carcass removal via scavenge is approximately 4 days. In other words, we expect that 50% of carcasses struck by wind turbines at Kaban will be removed by scavengers within 4 days, and 50% to be removed by scavengers after 4 days on the ground.

3.4 Proportion of turbines searched

In the Monte Carlo algorithm, we explicitly simulate the survey design. The proportion of turbines sampled is therefore accounted for in the simulation.

There are 28 total turbines at Kaban Wind Farm. Initially, 15 were selected to be survey, but due to the permit conditions an additional 9 turbines were added within the first year. As such, 24 turbines were surveyed twice every 28 days during the second year period.

3.5 Coverage factor

The coverage factor estimates the probability that, given a carcass falls at a searched turbine, that the carcass falls within the searched area. This contributes to the a term in Section 2.

3.5.1 Fall zone simulation - methods

We generated a carcass fall-zone distribution for the following species classes, given the turbine size at the wind farm:

- Medium birds (used as an archetype for the general bird mortality estimate)
- Microbats (used as an archetype for the general bat mortality estimate)
- Small birds (used as an archetype for the Black-faced Monarch, Fork-tailed Swift, and White-throated Needletail estimates)

The fall-zone distribution is the end result of the simulation method detailed in Hull and Muir (2010). The simulation method is a ballistics model describing avifauna strikes by turbine blades.

3.5.2 Coverage factor calculation - methods

The percentage of the fall zone not covered by the survey area, provides a correction factor in the mortality estimate. Because carcasses that fall outside the searched area have a zero probability of being detected by a survey, the likelihood of landing in this region is essential to understanding the relationship between detections and actual losses.

At Kaban Wind Farm, custom search areas were used. To account for the unique shapes being searched, a technique similar to that in Box 3.4 of International Finance Corporation (2023) is used.

A two-dimensional fall zone distribution is generated from the rotating the one-dimensional output of Hull and Muir (2010). This 2-D distribution is a series of concentric annuli, with the probability density in each annulus, being equal to the density of the corresponding histogram bin in the one-dimensional Hull and Muir (2010) output. The annuli are then spatially intersected with the searched area, and hence the proportion of carcasses falling in searched area (the “coverage factor”) is found.

3.5.3 Simulation inputs

Table 7 displays the dimensions and RPM of the turbines at Kaban Wind Farm while Table 8 shows the bird and bat physical parameters used. These are input into the fall zone simulation.

Turbine specifications were provided by E2M. Bird and bat parameters were sourced from the archetypes in Hull and Muir (2010) (medium and small birds, and bats).

Table 7: Turbine specifications for Kaban Wind Farm.

Rotor diameter (m)	Tower hub height (m)	RPM
162	149	12.1

Table 8: Species size archetype parameters.

Species type	Archetype	Mass (kg)	Min. area (sq m)	Max. area (sq m)
Bat	Gould's Wattled Bat	0.014	0.0028	0.0140
Medium Bird	Raven	0.68	0.0450	0.1000
Small Bird	Silvereye Finch	0.012	0.0013	0.0036

3.5.4 Results

Figure 3 displays the simulation results, given the factors specified above. We display the cumulative density function (CDF) on the y axis versus the distance from turbine (x axis). for each species type. The CDF describes the expected proportion of carcass which fall less than or equal to a certain distance from the turbine. For example, we see that we expect about 78% of microbat carcasses to fall within 60m of the turbine.

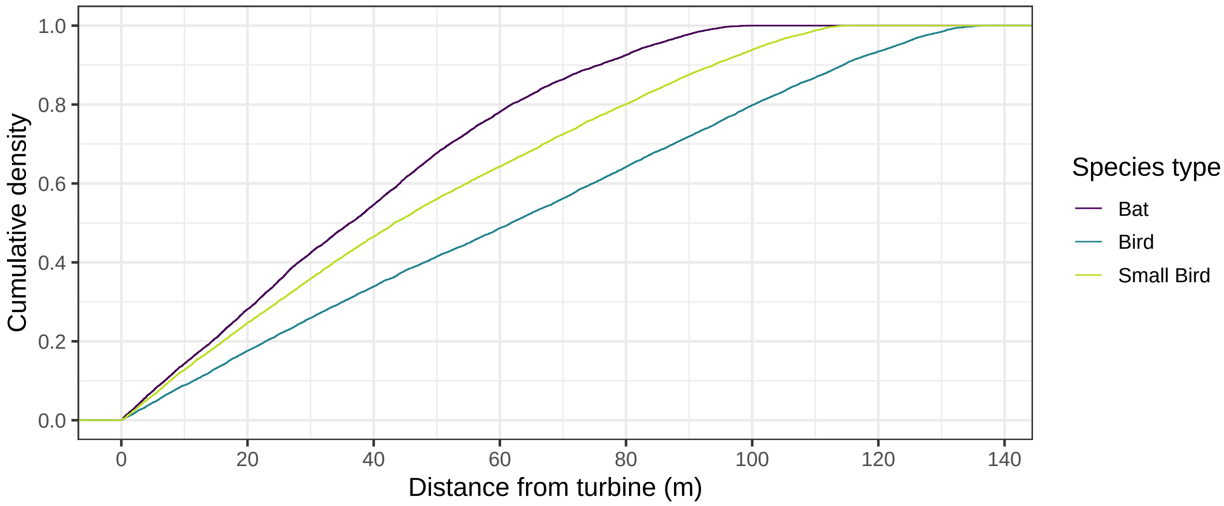

Figure 3: Cumulative distribution function of the fall zone simulation output, for various species classes.

Once the fall zone distribution is calculated, we generate a "coverage factor" for each species type. The coverage factor represents the proportion of carcasses which fall within the searched area.

Figure 4 visualises some of the search areas, and shows the respective coverage factors. For example, when searching for the Small Bird archetype species, turbine 10's search covers 52% of the fall zone. Or, turbine 2's search covers 67% of the fall zone.

Table 9 shows the average coverage factor for each species size class.

Table 9: Average coverage over the survey period, for each species class.

Species type	Average coverage (%)
Bat	74
Medium Bird	53
Small Bird	66

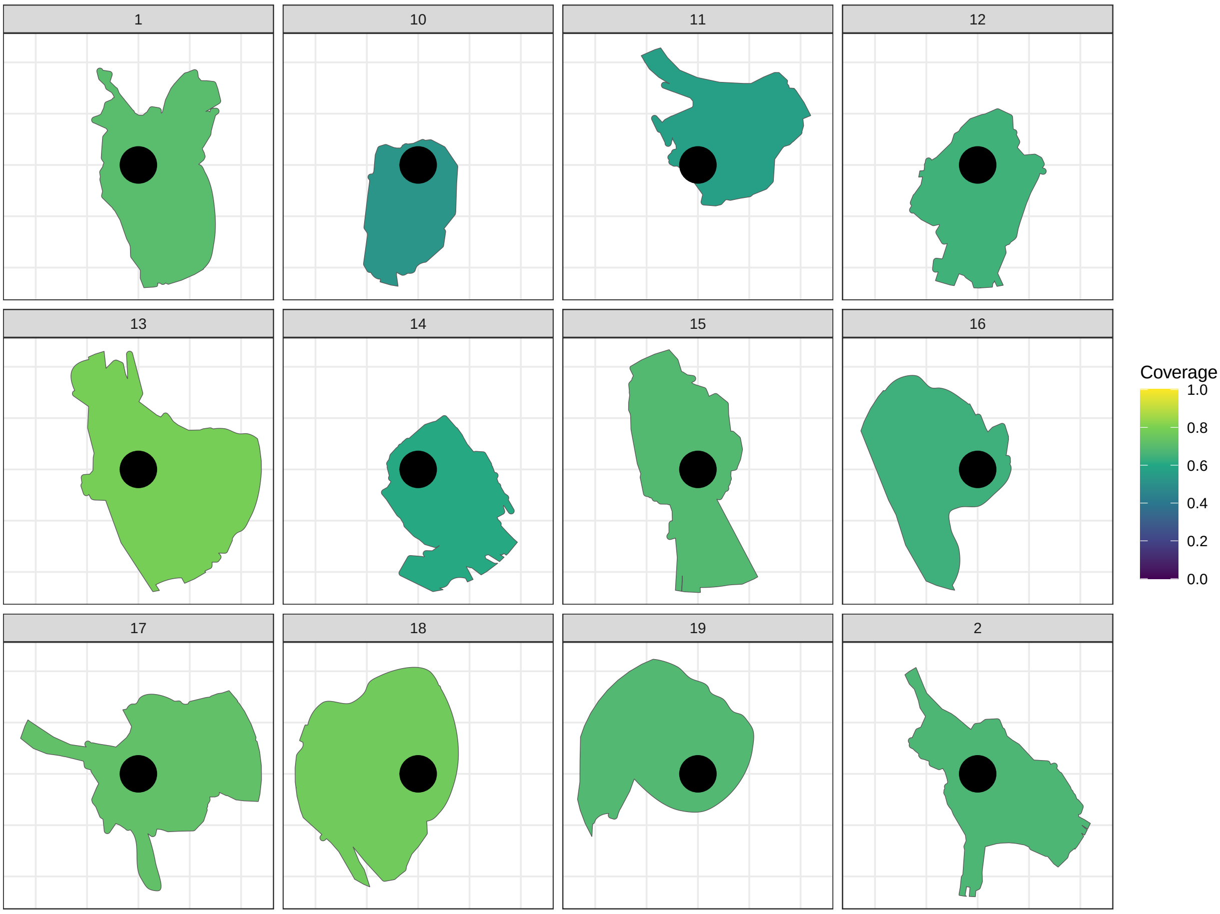

Figure 4: Example - search area shapes and coverage, for various turbines (small birds).

4 Mortality estimate

We undertook general bird and bat estimates, as well as species-specific estimates for Black-faced Monarch, Fork-tailed Swift, and White-throated Needletail. With estimates for scavenge loss, searcher efficiency, and survey coverage, we converted the number of carcasses detected, into an estimate of overall mortality at Kaban Wind Farm from 2023-09-01 to 2024-09-30.

The mortality estimation is done via a Monte Carlo algorithm. We used 15000 simulations, with the survey design simulated each time. Random numbers of virtual mortalities were simulated, along with the scavenge time and searcher efficiency (based on the measured confidence intervals). The proportion of virtual carcasses that were "found" was recorded for each simulation. Finally, those trials that had the same outcome as the reported survey detections were collated, and the initial conditions (i.e. how many true losses there were) reported on.

The model assumptions are listed below:

- There were 28 turbines on site available to strike birds and bats.
- Search frequency for each turbine was taken from a list of actual survey dates (see Table 1 for a summary).
- Mortalities were allowed to occur between 2023-09-01, and 2024-09-30.
- Birds are on-site at all times during this period.
- Bats are on-site at all times during this period.
- Bats and birds that are struck are immediately replaced (i.e. strikes one day do not affect the chance of strikes the next).
- We have used the standard practice of assuming that all carcasses and all feather spots (regardless of size or composition) are attributable to the wind turbines.
- Finds are random and independent, and not clustered with other finds.
- There was equal chance of any turbine being involved in a collision / mortality.
- We took scavenge loss and searcher efficiency rates as outlined above.
- We used the custom model's scavenger shape (Section 3.3.2).
- The coverage factors were taken to be those calculated in Section 3.5.4.

4.1 Bias

The mortality estimation technique gives unbiased estimates for probability-based survey designs. However, the design at Kaban involves progressively adding turbines classed as "high risk" to the survey schedule, if certain key species are detected there. Given this is (potentially) favouring the design towards turbines with higher mortality rates, this may result in a estimate biased high.

4.2 Notes on results

Per turbine per year estimate: Given the progressive commissioning of turbines in the first year of survey, we also present a per turbine per year estimate (along with estimates of total mortality during the analysis period). The per turbine per year estimate is the total mortality, divided by the number of turbine-years at Kaban over that period. Effectively, it can be interpreted as "estimated number of mortalities per turbine, if each turbine was turning for a year". This number is comparable with the per turbine per year estimate in the previous report.

Density: the y-axis of the histograms shows the density. The "density" can be interpreted as the relative likelihood of taking a particular value. For example in Figure 5, a mortality of 250ish is about one-half as likely as a mortality of 350ish.

Percentiles: in tables such as Table 10, we present percentiles of the distribution. A k%-percentile gives the value such that k% of results that have a value less or equal to the k%-percentile. For example, in Table 10, we interpret:

- 50th percentile (325) as "50% of simulations had a value (mortality estimate) of less or equal to 325".
- 90th percentile (360) as "90% of simulations had a value (mortality estimate) of less or equal to 360".

4.3 Bats - overall

During the second year of surveys a total of 105 bats were found during the 569 formal surveys. The resulting (median) estimate of total mortality is 325 bats lost on site over the second year period.

The median mortality per turbine per year, in the second year, is 10.7 bats.

Table 10 and Figure 5 display the percentiles of the distributions, to show the confidence on the mortality estimate.

Based on the detected carcasses, measured detectability, scavenge rate, and survey effort, we expect that there was a total site loss of around 325 bats over the second year period, and are 95% confident that fewer than 367 individuals were lost. We expect the loss per turbine per year is around 10.7 bats, and are 95% confident that fewer than 12.1 bats were lost (on average) per turbine, in this time period.

Table 10: Percentiles of estimated bat losses.

Estimate	0%	50% (median)	90%	95%
Total (second year period)	265.0	325.0	360.0	367.0
Per turbine per year (second year period)	8.8	10.7	11.9	12.1

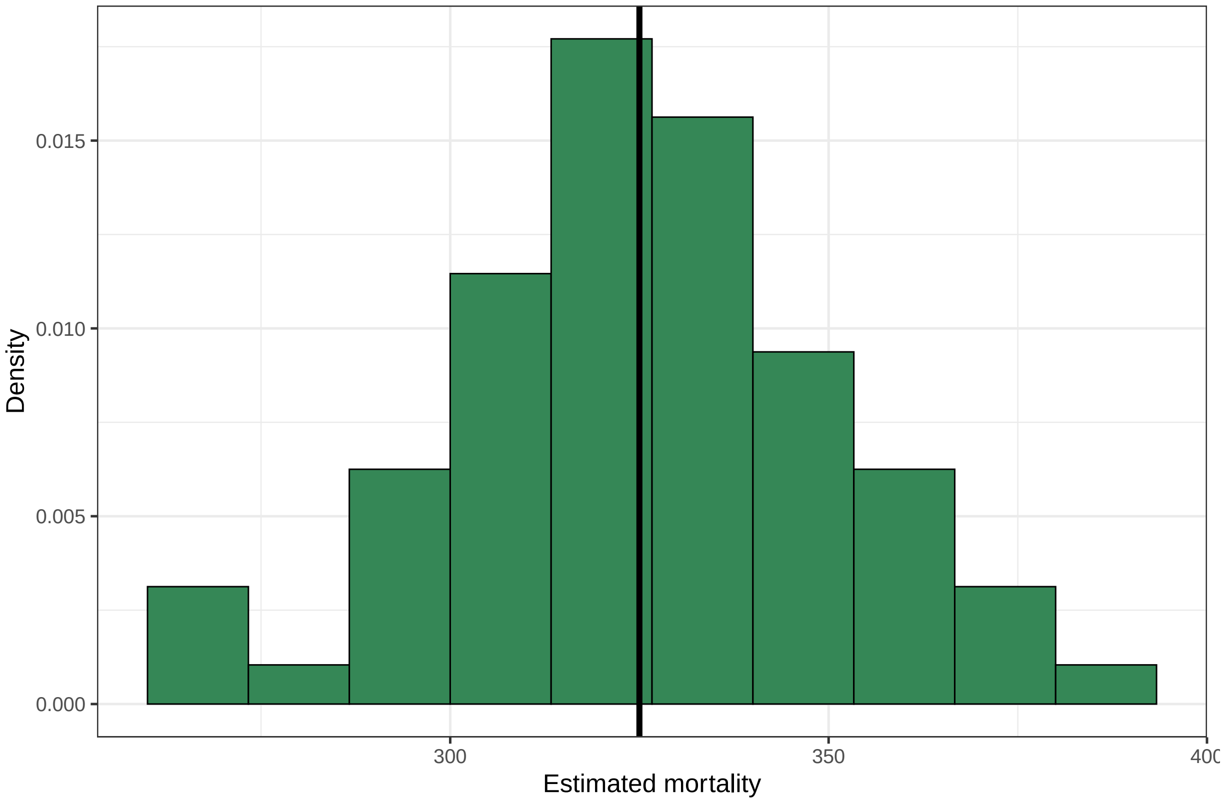

Figure 5: Histogram of the total losses distribution (bats) in the second year period. The black solid line shows the median.

4.4 Birds - overall

During the second year period of surveys a total of 33 birds were found during the 569 formal surveys. The resulting (median) estimate of total mortality is 107 birds lost on site over the second year period.

The median mortality per turbine per year is 3.5, in the second year period.

Table 11 and Figure 6 display the percentiles of the distributions, to show the confidence on the mortality estimate.

Based on the detected carcasses, measured detectability, scavenge rate, and survey effort, we expect that there was a total site loss of around 107 birds over the in the second year period, and are 95% confident that fewer than 136 individuals were lost. We expect the loss per turbine per year is around 3.5 birds, and are 95% confident that fewer than 4.5 birds were lost (on average), per turbine per year, during this time period.

Table 11: Percentiles of estimated bird losses.

Estimate	0%	50% (median)	90%	95%
Total (second year period)	73.0	107.0	126.0	136.0
Per turbine per year	2.4	3.5	4.2	4.5

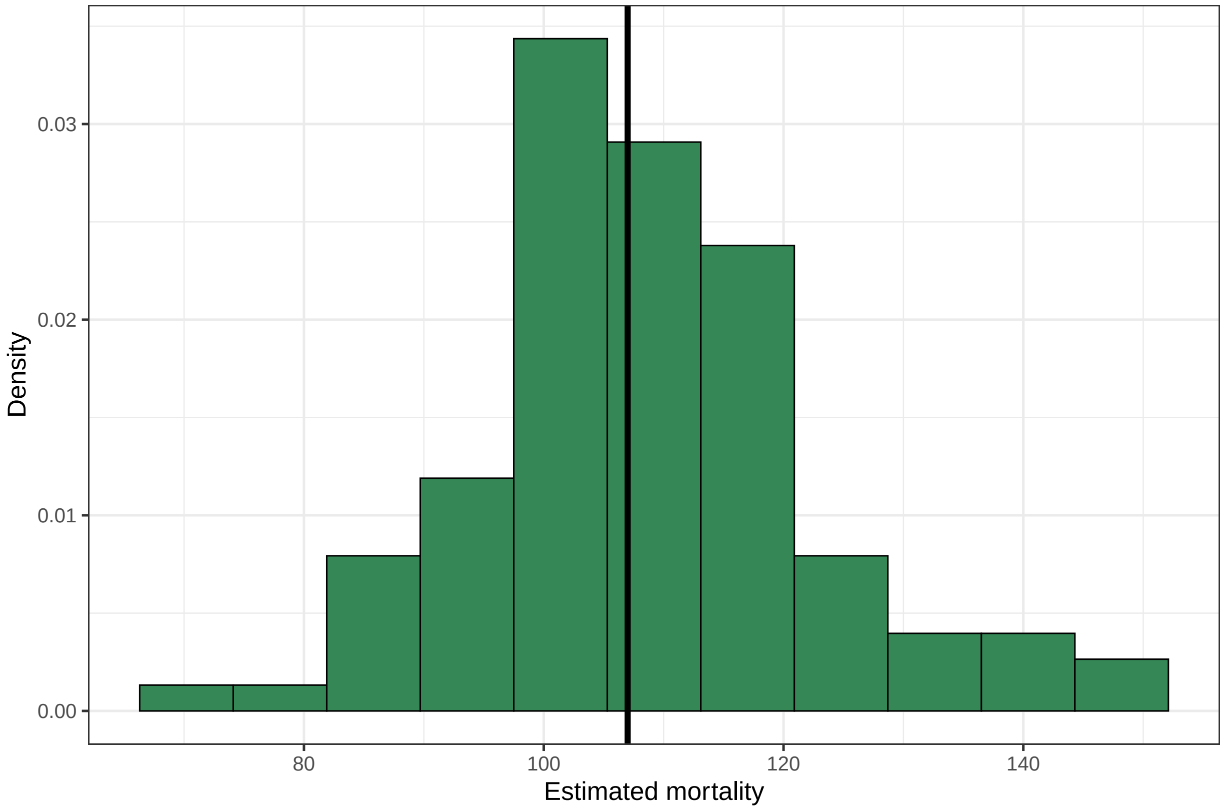

Figure 6: Histogram of the total losses distribution (birds) in the second year period. The black solid line shows the median.

4.5 Single species estimates

We ran species-level estimates on the Black-faced Monarch, Fork-tailed Swift, and White-throated Needletail. Note while these are not the only species of interest at Kaban Wind Farm, these were the only species for which we had tangible evidence of mortality, via either formal or incidental finds (in the second year period).

Again, we provide total (yearly) estimates in Table 12 and Figure 7, and rescaled (per turbine per year) estimates in Table 13.

Table 12: Percentiles of mortalities for species of interest (total losses), in the second year period.

Species	0%	50% (median)	90%	95%
Fork-tailed Swift	1	4	10	12
White-throated Needletail	1	4	10	12
Black-faced Monarch	2	8	15	18

Table 13: Percentiles of mortalities for species of interest (per turbine per year), in the second year period.

Species	0%	50% (median)	90%	95%
Fork-tailed Swift	0.0	0.1	0.3	0.4
White-throated Needletail	0.0	0.1	0.3	0.4
Black-faced Monarch	0.1	0.3	0.5	0.6

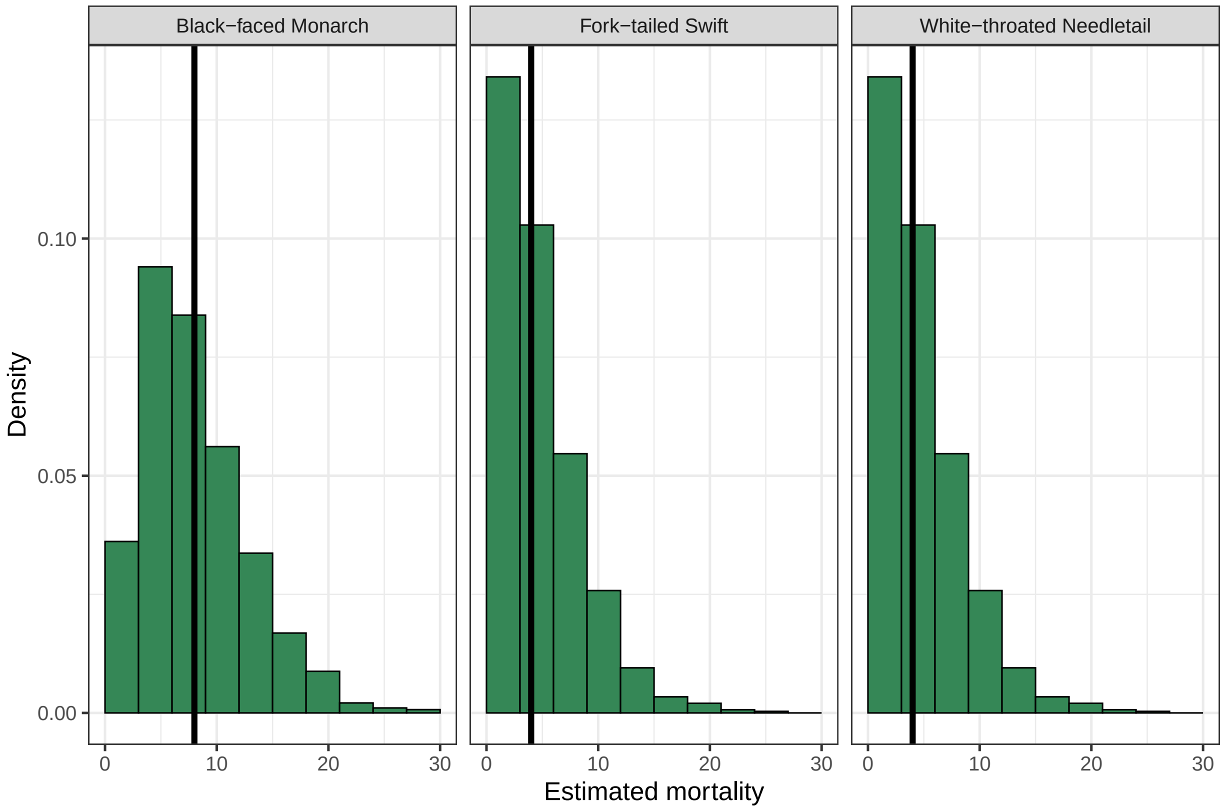

Figure 7: Histogram of the total losses distribution, for species of interest, in the second year period. The black solid line shows the median.

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Appendix J: OAMP - Offset Area Annual Report

Kaban Green Power Hub - Offset Area Annual Report

30 May 2025

Kaban Wind Farm Pty Ltd ACN 637 687 622 as trustee for the Kaban Wind Farm Trust

Level 21/570 George St, Sydney, NSW 2000

Document Management

Rev.	Issue Date	Description	Author (s)	Review	Approved	Signature
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Definitions

Term	Definition
Commencement of the action	Means the first instance of any specified activity associated with the action, including clearing and construction.
Greater glider habitat	All areas of eucalypt forests or woodlands that contain, or have the potential to contain, hollow-bearing trees as described in the Conservation Advice *Petauroides volans* (greater glider) (TSSC, 2016)
Regional Ecosystem	A vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. Regional Ecosystems are described in the Regional Ecosystem Description Database (REDD), produced by the Queensland Herbarium.
Vegetation community	An identified vegetation community (i.e., structure, composition, condition and/or underlying geology) verified from a field survey. Communities may include Regional Ecosystems, remnant vegetation and/or disturbed/novel ecosystems (e.g., parkland, disturbed roadsides etc.).
Offset area	The area which is legally secured as an offset within: • Lot 1 RP735194 • Lot 2 RP735194; and • Lot 32 CWL254.
The project	Kaban Green Power Hub

Abbreviations

Abbreviation	Description
DCCEEW	Department of Climate Change, Energy, the Environment and Water
E2M	E2M Pty Ltd
EOP	EPBC Act Environmental Offsets Policy (Cth)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ha	Hectare
KGPH	Kaban Green Power Hub
LMZ	Land Management Zone defined within the Fire Management Plan
MNES	Matter of National Environmental Significance
MBF	Magnificent Brood Frog
NC Act	*Nature Conservation Act 1992* (QLD)
OAMP	Offset Area Management Plan
RE	Regional Ecosystem

1 Introduction

1.1 Project Background

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust are now at the post-commission stage of the Kaban Green Power Hub (KGPH) wind farm in north Queensland, supplying renewable energy to the national electricity market consisting of 28 turbines as well as ancillary infrastructure (Figure 1). The KPGH is located near the township of Tumoulin, Queensland, within the Tablelands Regional Council Local Government Area. KGPH has been designed to avoid and mitigate impacts on Matters of National Environmental Significance (MNES), however significant residual impacts were considered likely during the approval assessment, on two MNES, including:

- *Pseudophryne covacevichae* (magnificent brood frog, (MBF)); and
- *Petauroides volans* (greater glider) (E2M, 2021).

In accordance with the *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act) *Environmental Offsets Policy* (EOP) compensatory offsets were required for all MNES of which the project will have a significant residual impact. EPBC Act offset liabilities for the greater glider and MBF were met through the establishment of an offset area within:

- Lot 1 on RP735194
- Lot 2 on RP735194; and
- Lot 32 on CWL254.

The total offset area is approximately 307.6 ha in size and consists of seven separate areas (herein referred to collectively as the Offset Area (Figure 2). The ongoing management and monitoring of the Offset Area is detailed in the EPBC Act approved *Kaban Green Power Hub - Offset Area Management Plan (OAMP),* (E2M Pty Ltd, 2021).

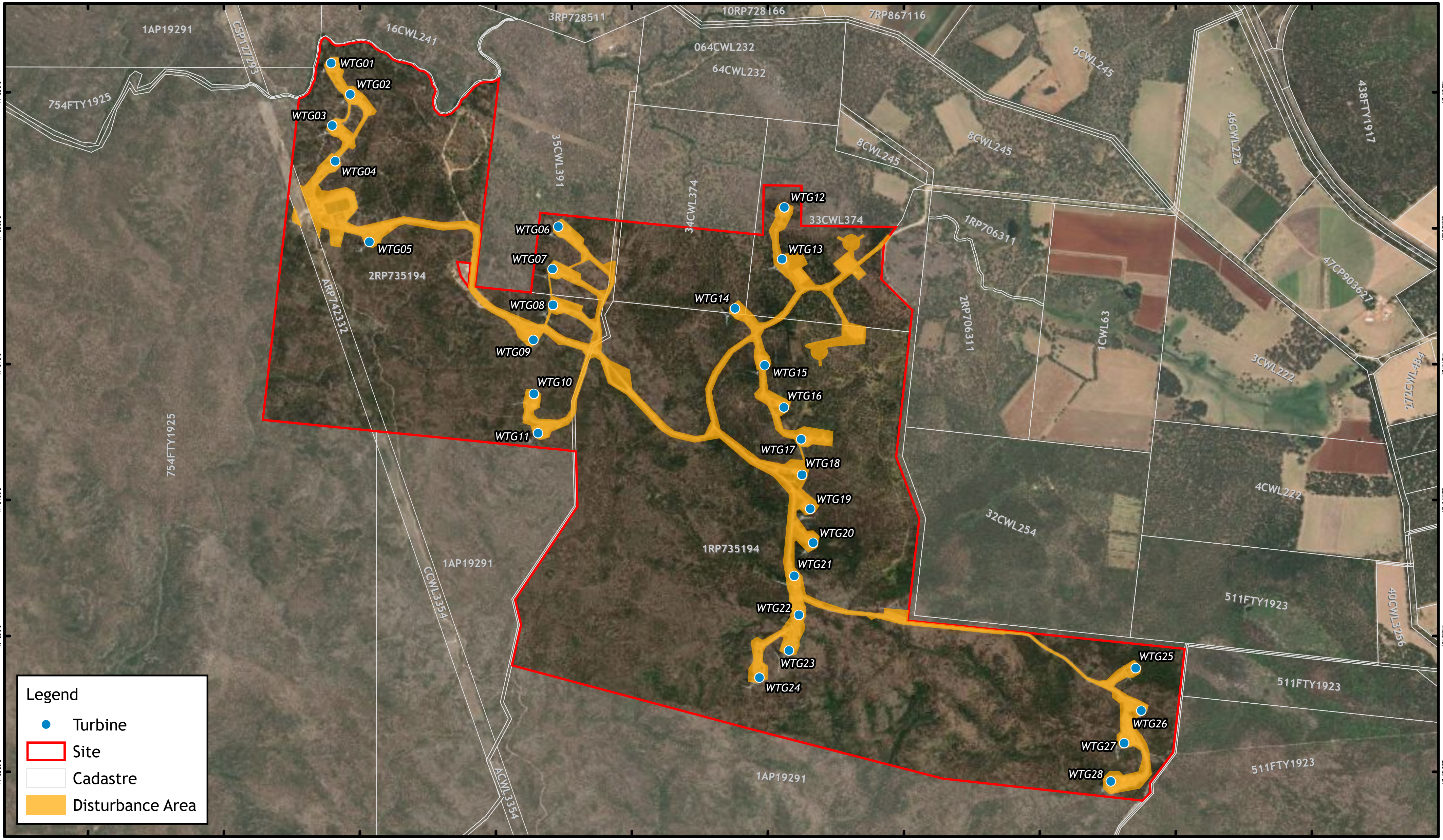
The Offset Area was secured on 30 August 2022 pursuant to EPBC Approval 2018/8289 and the OAMP (E2M, 2021a) from the Queensland Department of Resources, Decision Reference 2022/001512.

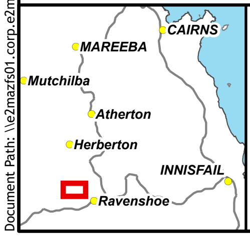
1.2 Scope and Objectives

E2M Pty Ltd (E2M) was engaged by Neoen to conduct the third annual (Year 3) OAMP report from 1 June 2024 to 31 May 2025, in accordance with the OAMP, section 9.1, and the scope of report includes the following:

- EPBC approval number
- lot on plan property description and postal address
- climatic conditions for the year of management
- an overview of the management activities undertaken within the year of management
- results of monitoring events undertaken within the year of management including, where relevant for that year, results associated with:
  - magnificent brood frog surveys
  - greater glider surveys
  - Habitat Quality monitoring / photo monitoring
- schedule for management activities to be undertaken in upcoming year
- risks or threats identified, and corrective actions undertaken; and

- management and monitoring recommendation to be incorporated into the OAMP.





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Kilometres

Coordinate System: GCS GDA 1994

Notes:
Aerial Imagery: © ESRI 2019
Cadastre: © DNRME 2018
Infrastructure: © Neoen 2021

Rev	Description	Drawn	Approved	Date
B	Issued for Use	HM	DJ	27/05/2025
A	Issued for Use	HM	DJ	14/05/2025

e2m

FIGURE 1: PROJECT LOCATION

Offset Area Annual Report
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	B

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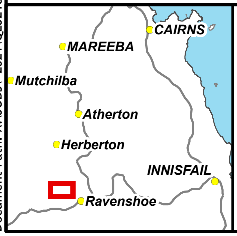

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Kilometres

Coordinate System: GCS GDA 1994

Notes:
Aerial Imagery: © ESRI 2025
Ordered Drainage: © DNRME 2016
Cadastre: © DNRME 2025
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Rev	Description	Drawn	Approved	Date
B	Issued for Review	HM	DJ	14/05/2025
A	Issued for Review	SOH	DJ	11/04/2025

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FIGURE 2: KABAN GREEN POWER HUB - OFFSET AREAS

Offset Area Annual Report
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	B

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1.3 The Offset Area

Seven disjunct areas within three contiguous properties collectively form the Offset Area (Figure 1).

The three properties (formally 1RP735194, 2RP735194 and 32CWL254) are largely characterised by remnant vegetation composed of mixed eucalypt woodlands on metamorphic rock. Properties 1RP735194 and 2RP735194 are both bound by Bluff State Forest to the south and west, with rural properties to the north and east (Figure 1).

Property 32CWL254 is bound by Ravenshoe State Forest to the east and rural properties to the north, south and west (Figure 1). This property also contains an inactive mango orchard in the north-east corner.

The two Regional Ecosystems (REs) and corresponding Assessment Units (AUs) within the Offset Areas are detailed in Table 1.

Table 1: Vegetation communities within the Offset Area

RE	AU	State	Description	Offset Area (ha)
7.12.30a	1	Remnant	*Corymbia citriodora*, *Eucalyptus portuensis*, *C. intermedia*, *Syncarpia glomulifera* woodland to low woodland to open forest with *Callitris intratropica*, *Acacia calyculata* and *Xanthorrhoea johnsonii*. Uplands and highlands, of the moist and dry rainfall zones. Not a Wetland.	146.2
7.8.8a	5	Remnant	*Eucalyptus tereticornis*, *Corymbia intermedia*, *E. reducta*, *Angophora floribunda* tall open forest and tall woodland with *Allocasuarina torulosa*. Uplands and highlands on basalt, of the moist rainfall zone. Not a Wetland.	36.9

2 OAMP – Reporting

2.1 Project postal Address

The Project's postal address is:

Kaban Wind Farm Pty Ltd ACN 637 687 622 as trustee for the Kaban Wind Farm Trust

Level 21 / 570 George Street,

Sydney, NSW 2000

2.2 Climatic Conditions

Annual climatic conditions for year starting 1 June 2024 and ending 31 May 2025 have been collected from the nearest BOM weather station 31200 (BOM 2024), approximately 7 km east of the KGPH. The monthly rainfall totals were marginally higher than long-term mean monthly totals for the months of July, August, March, and May and substantially higher for September, December and February. February 2025 total of 618 mm was more than twice the mean monthly rainfall of 304 mm. Rainfall totals were substantially less in June and October, and somewhat less in November, January and April, see Figure 3.

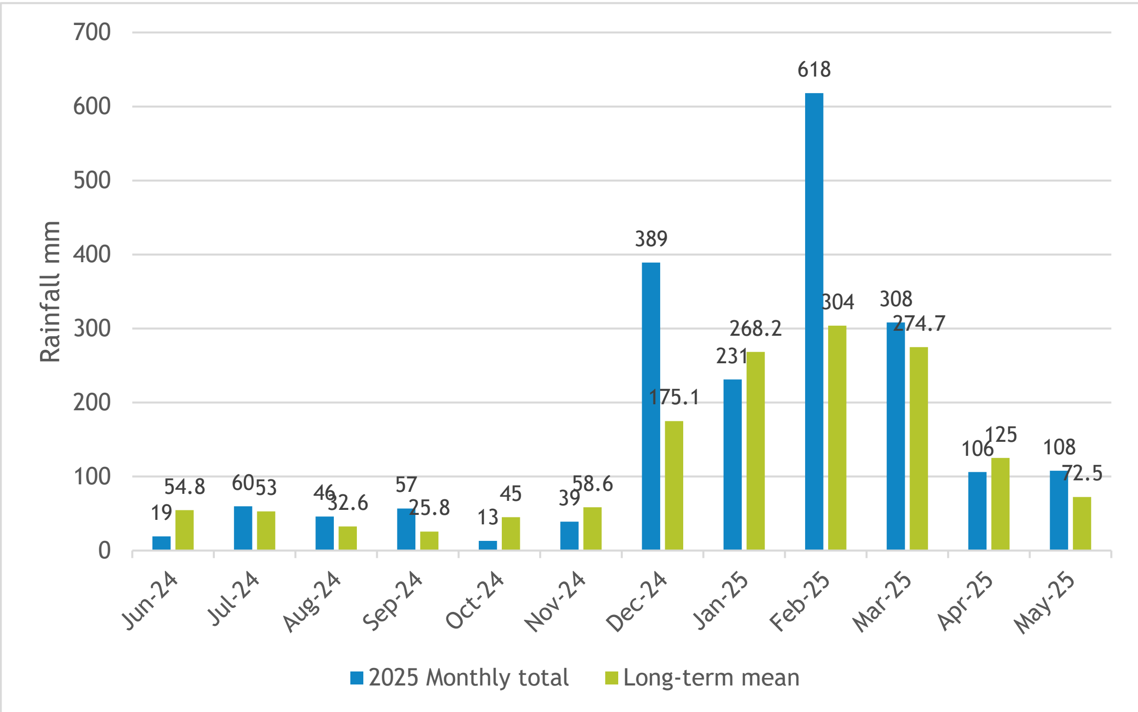

Figure 3: BOM weather station 031200 rainfall data: long-term monthly means and monthly totals ending May 2025

2.3 Overview of Management Activities

The OAMP aims to achieve a conservation gain for magnificent brood frog and greater glider through the long-term securement and improvement of habitat for the species through the active management and protection of the area. Specifically, the OAMP will aim to:

- Ensure the persistence of magnificent brood frog and greater glider within the Offset Area
- Protect the Offset Area from all future clearing
- Prevent the introduction and spread of invasive weeds within the Offset Area
- Protect the area from high-intensity wildfires that may impact site vegetation and species habitat suitability; and
- Improve the ecological condition of the Offset Area through weed management, exclusion of cattle, and implementation of appropriate fire regimes.

2.3.1 Implemented management activities

The following management activities have been performed and summarised in Table 2, for the preservation and conservation gain of the Offset Area. Table 2, also includes activities prior to this inaugural reporting period before securing of the Offset Area. The Offset Area was secured, 30 August 2022.

Table 2: Summary of all management activities in the offset areas.

Activity Type	Date	Description
Pre offset securement and Year 1 Management and Monitoring		
Cattle removed	Mid 2021	All cattle were removed from Offset Area prior to the commencement of action
Weed Monitoring	October 2021	Weed monitoring was performed across the Offset Area.
Cattle-proof fencing inspection	April 2022	Inspection of all boundary fences and internal fences to assess integrity
Weed Treatment	January & February 2022	Significant infestations of *Lantana camara* were treated in Offset Area 5 and Offset Area 2. Other environmentally significant weeds were also treated.
Cattle-proof fencing repairs and modifications	July 2022	Small trees and saplings removed adjacent to fencelines. Repairs to fence carried-out where necessary. Any fence within greater glider habitat had top barb removed and replaced with plain wire. Those limited sections where approval to remove top-barb was denied by adjoining landowner, had white, unenergized, electrical fencing tape stapled to top barbed wire to act as a visual aid for animals.
First Ecological Burn	September 2022	The first ecological burns were performed in Offset Area 5 (Figure 5), where significant fuel loads and environmental weed populations were noted. No other burns were permitted at this time due to safety concerns to construction workers.
Weed Monitoring	November 2022 & March 2023	Weed monitoring was performed across the Offset Areas.
Year 2 Management and Monitoring		

Activity Type	Date	Description
Weed Treatment	June 2023	A significant infestation of giant rat's tail grass *Sporobolous pyamidalis* in Offset Area 2 (Figure 1) was treated along with scattered lantana (*Lantana camara).* All declared and significant environmental weeds identified during monitoring have been treated.
Fire Management Plan	May 2023	A site-wide Fire Management Plan was prepared by professional fire management consultants, Firelands Consultancy, for the preservation of the Offset Area, MNES, cultural heritage values and infrastructure.
Second Ecological Burn	August 2023	Treatment of 5 LMZ's throughout the site.
Weed Monitoring	November 2023	Weed monitoring was performed across the Offset Areas.
Weed Treatment	January to March 2024	10-days treating large weed population within Lot/Plan 32CWL254. Treat priority weeds around cattle-yards adjacent to north-western offset.
Weed treatment within disturbance footprint	March to April 2024	Identification of priority weeds within the disturbance footprint. Treatment commenced in March 24. This will help prevent the spread of weeds into offset areas.
Year 3 Management and Monitoring		
Installation of greater glider nest boxes	July 2024	10 nest boxes installed in suitable trees in Offset Area 2.
Third ecological burn	August 2024	Ecological burn through Offset Area 1. Included adjacent cattle yards to help control the spread of restricted and priority weeds.
Weed monitoring	November 2024	Weed monitoring throughout the disturbance footprint and offset areas.
Weed treatment program	December 2024	Weed treatment program provided to contractors.
Weed treatment - disturbance footprint	December 2024 - January 2025	Treatment of high priority weed infestations throughout the disturbance footprint.
Weed treatment - offset areas	January 2025	Extensive weed treatment in Offset Area 5 and around cattle yards adjacent to Offset Area 1
Weed monitoring	February 2025	Weed monitoring to establish March weed treatment program

Activity Type	Date	Description
Weed treatment - disturbance footprint	March 2025	Eleven days treating weeds in the disturbance footprint. Targeting grader grass and other high priority infestations.
Weed treatment - offset area	March 2025	Continued treatment of weeds in Offset Area 5
Ecological burns	Commissioned for July August 2025	Offset Areas 2, 4 and 5

2.4 Results of Monitoring Events

The following table summarises the Year 2 monitoring activities for:

- Annual magnificent brood frog surveys
- Annual greater glider relative abundance surveys; and
- Habitat quality and photo monitoring.

Table 3: Summary of monitoring events for 2024 to 2025

Survey Type	Date of survey
Annual greater glider relative abundance survey	November 2024
Annual magnificent brood frog relative abundance survey	January 2025
Habitat quality and photo monitoring survey	May 2025

2.4.1 Annual greater glider relative abundance survey results

Table 4 summarises the results of the annual greater glider surveys. Based on these results no impact triggers have been reached. Detailed results are presented in *Greater Glider Monitoring Program Third annual survey 2023*, (E2M Pty Ltd, 2023a).

Table 4: Comparative greater glider records for surveys 2021 to 2024

Transect	Greater glider observations 2021	Greater glider observations 2022	Greater Glider Observations 2023	Greater Glider Observations 2024
T1	1	1	1	0
T2	3	1	2	0
T3	3	3	2	2

2.4.2 Annual magnificent brood frog relative abundance survey results

Figure 4, summarises the results of the annual MBF monitoring data and charts the average minimum number known alive for every ten metres of monitoring transect, from 2021 to 2025 for the On-site Control Sites (within Offset Area), Off-site Control Sites (Control Sites) and Impact Sites. There was no trigger event recorded for any of the five impact sites during this year's abundance survey. However, significant declines have been recorded at off-site control sites 1 and 2. Detailed results are presented in *Magnificent Brood Frog – Fifth Annual Abundance Monitoring Report* (E2M Pty Ltd, 2025).

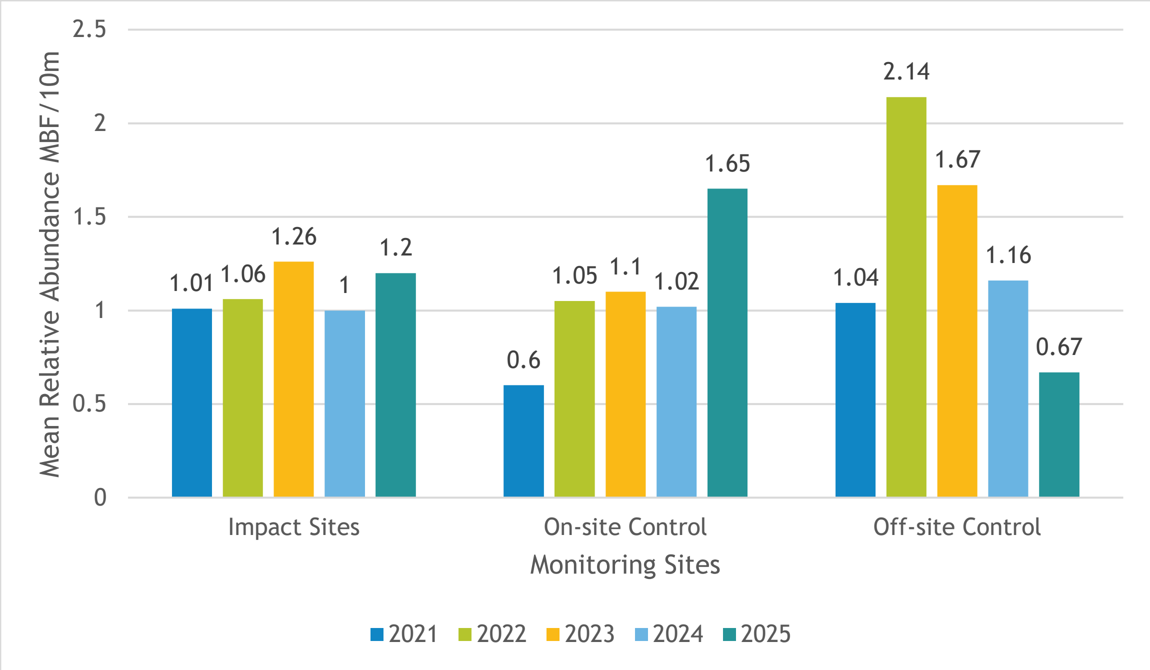

Figure 4: Comparison of average relative abundance (MBF/10 m) between the 2021, 2022, 2023, 2024 and 2025 surveys

2.4.3 Offset area habitat quality and photo monitoring results

Habitat quality monitoring is to be performed every 2 years from the commencement of the action. The May 2025 assessment was the second scheduled monitoring activity since the commencement of the action. The 2025 results are compared to the baseline surveys in Table 5. There has been a minor increase in habitat quality scores for both the greater glider and magnificent brood frog offsets with the scores reflecting overall improvements to habitat quality. Detailed results are presented in *Kaban Green Power Hub - Habitat Quality and Photo Monitoring Year 2*, (E2M Pty Ltd, 2023b). The next monitoring event is scheduled to occur March 2027.

Table 5: Habitat Quality Assessment scores for each MNES

Habitat quality score	Greater glider	Magnificent Brood Frog
2019 Offset Area Management Plan*	8.07	7.99
2023 Habitat Quality Assessment	8.35	8.37
2025 Habitat Quality Assessment	8.46	8.43

2.5 Scheduled Management Activities for 2025 - 2026

Table 6 summarises the planned management activities to be undertaken for the 12-month period ending 31 May 2026.

Table 6: A list of scheduled management activities for the 12-month period ending 31 May 2026.

Activity	Date of Proposed Activities	Description
Fire management	August 2025	This will be the third, site-wide controlled ecological burn as per the fire management plan schedule and the third controlled burn within greater glider habitat located in Lot/Plan 32CLW254.
Annual greater glider relative abundance monitoring	November - December 2025	Annual monitoring of the Offset Area greater glider populations.
Weed management plan	October 2025	Develop a weed management plan for the offset areas.
Weed monitoring	November - December 2025	Continued monitoring of weeds across the offset area and disturbance footprint to assess priority treatment areas.
Weed treatment	December 2025	Treatment to commence after monitoring. Treatment timing dependent on areas and weeds being treated, along with climatic conditions. Focus will be on Lot/Plan 32CLW254 (Offset Area 5) to encourage the re-establishment of native grasses.
Weed monitoring	February 2026	Monitoring for success of earlier weed treatment and establish weed treatment program for March 2025.
Weed treatment	March/April 2026	Treatment of priority weed infestations across disturbance footprint and offset areas.
Annual magnificent brood frog relative abundance monitoring	January – February 2026	Annual monitoring to help gauge the health of the Offset Area magnificent brood frog populations.
Site cattle-proof fence inspection	March 2026	Inspection of site boundary fence to ensure it remains cattle proof.
Site boundary fence maintenance	April – June 2026	Repairs to any damaged fence as required.

2.6 Risks Identified and Corrective Actions Taken

Table 7, identifies the risks identified within the Offset Area, and corrective actions undertaken to help preserve habitat values.

Table 7: Offset area risks identified during management activities and the corrective actions taken.

Risk Identified	Corrective Action	Date of Corrective Action
Controlled burns encroaching MBF habitat	Risk of any fire to magnificent brood frog populations. While this risk was identified during February 2024 it is a very important risk consideration to be mindful of before planning any ecological burns around known MBF populations.	February 2024 - ongoing
High abundance weed infestation within offset area 5	High abundance in weeds were identified in Offset Area 5 during 2022 weed monitoring activities. This area was identified as a priority treatment area, and treatment of weeds commenced in early 2022 followed by controlled burns. Treatment is ongoing and further chemical treatment and controlled burns to be implemented again during the coming reporting season.	Early 2022 - ongoing
Offset area weeds	Continued monitoring and treatment of any restricted or priority weed infestations found within offset areas	Ongoing
Restricted mobility for greater glider	It has been identified that the wide site access roads may impede the mobility of greater glider across the previously contiguous landscape prior to the installation of site roads. Installation of mobility poles to assist the mobility of greater glider across site roads would improve the likelihood of mobility.	TBA

2.7 Management and monitoring recommendations

It is recommended that relative abundance monitoring continue annually for greater glider and MBF with no recommendations to change the monitoring program or schedule. Other recommendations to improve management of offset areas is provided in more detail in the Conclusions.

3 Discussion, conclusion and recommendations

The OAMP is designed as a guideline to preserve and improve habitat values for the greater glider and magnificent brood frog, in association with the Offset Areas secured for the KGPH project. In accordance with the management guidelines, the following activities have been performed to achieve outcomes relevant to the OAMP.

- annual greater glider relative abundance monitoring
- annual magnificent brood frog relative abundance monitoring
- strategic weed monitoring
- strategic weed treatment
- inspections of cattle-proof fencing
- maintenance of cattle-proof fencing
- modifications to cattle-proof fencing
- removal of cattle from all Offset Areas
- strategic ecological burns
- installation of ten (10) greater glider nest boxes
- development of a site-wide Fire Management Plan, and
- habitat quality assessment and photo monitoring.

The 2025 (Year 2) HQA scores indicate that there have been improvements to the Offset Areas for both species. The next HQA survey is scheduled in March 2027. Ongoing weed control, fire management and installation of greater glider mobility poles will see further improvements to offset habitat qualities.

The latest greater glider relative abundance results are lower than previous years but this did not activate any trigger events. The paucity of greater gliders throughout the landscape can make detection difficult over the two nights of survey effort.

MBF abundance is stable for the impact sites, increasing within the on-site control sites but showing significant decline within the off-site control sites. There is a strong indication that MBF abundance is impacted by fire events, whether being controlled or uncontrolled burns.

The impacts of fire on MBF populations demonstrates that, eliminating all fire within the MBF monitoring site creekline habitat is essential in preserving MBF. A fire management plan has been tailored for upcoming 2025 controlled burns to ensure that the known populations are not subjected to fire. A draft MBF management plan has been written and will be finalised before the 2026 control burns, once all fire management considerations have been investigated, and the most appropriate plan can be achieved with the objective of protecting site MBF and greater glider populations.

The continued herbicide treatment of silverleaf and greenleaf desmodium (*Desmodium uncinatum*) is proving extremely effective in decreasing the population within Offset Area 5 on Lot/Plan 32CWL254. A controlled burn is scheduled for August 2025, as a follow-up treatment to the herbicide application in January and March 2025. It is important to maintain effective weed treatment to reduce weed biomass within Offset Area 5 to help protect the large hollow-bearing trees essential for the greater glider. It is recommended that a weed management plan be developed to ensure the effective control of weed infestations within the offset areas.

4 References

DCCEEW. (2022). *Approved Conservation Advice for Petauroides volans (greater glider)*. Department of the Environment. http://www.environment.gov.au/biodiversity/threatened/species/pubs/254-conservation-advice-20160525.pdf

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E2M Pty Ltd. (2023a). *Kaban: Greater glider monitoring program—Third Annual Survey, 2023.* (Abundance Monitoring 3).

E2M Pty Ltd. (2023b). *Kaban Green Power Hub—Habitat Quality and Photo Monitoring Year 2* (p. 30).

E2M Pty Ltd. (2025). *Magnificent Brood Frog—Fifth Annual Abundance Monitoring Survey—January 2025.*

Appendix K: Magnificent brood frog annual relative abundance report

Magnificent Brood Frog - Fifth Annual Abundance Monitoring Survey

January 2025

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust

L21/570 George Street, Sydney NSW 2000

Document Management

Rev.	Date	Issue	Author	Approved By	Signature	Issued for External Review Date	External Reviewer
A	30/01/2025	For internal review	Kaylee Pitt	Dean Jones		31/01/2025	Paul Suter
0	26/02/2025	For Use	Dean Jones	Dean Jones		NA	

Document Reference: X:\JOBS\~2021\QEJ21046\DELIVERABLES\5.CY25\13. CY25 - OAMP MBF Annual Survey and Microhabitat Assessment JAN25\REV0\MBF Monitoring Program_Fifth Annual Report_Rev0.docx

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Definitions

Term	Definitions
Anthropogenic Impacts	Human-induced changes to the environment, such as land-clearing, construction, or changes to drainage patterns, that may affect MBF populations.
EPBC Approval Holder	Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust
Disturbance footprint	The area approved to be impacted by the Project
Disturbance intercept	The point along a drainage line where the disturbance area intersects intact magnificent brood frog habitat (MBF)
Fire Scar Mapping	Spatial data visualizing areas impacted by fire events, sourced from datasets.
Hydrocarbons	Petroleum-based or synthetic hydrocarbons (e.g., oil, diesel)
Habitat	Low stream order drainage lines occupied by MBF
Monitoring site / transect	Eleven survey sites, each consisting of a 200m transect, were established for ongoing monitoring.
Sedimentation	The deposition and accumulation of sediment in a body of water
The Project	Kaban Green Power Hub (KGPH) constructed and operated by Neoen Australia Pty Ltd
The Project Site	The site where the Project is situated, comprising 1,347 ha of freehold land across five lots.
Threatened species	Species listed as extinct (EX), extinct in the wild (XW), critically endangered (CE), endangered (E), vulnerable (V) or conservation dependent (CD) under the *Environmental Protection and Biodiversity Conservation Act 1999*, or extinct in the wild (PE), Endangered, Vulnerable or Near Threatened (EVNT) under the *Nature Conservation Act 1992*.
Trigger Analysis	A process of evaluating annual MBF abundance estimates against predefined thresholds (triggers) to determine if Project-related impacts are affecting MBP abundance.
Trigger Event	A predefined threshold in the FMP that, if exceeded (e.g., a significant decline in MBF abundance), requires further investigation and possible intervention.
Controlled Burns or Prescribed Burns	Fire management practices conducted to reduce fuel loads and help mitigate potential impacts on MBF habitat within the Project Site.

Abbreviations

Abbreviation	Description
DAWE	Department of Agriculture, Water and the Environment
DNRME	Department of Natural Resources, Mines and Energy
E2M	E2M Pty Ltd
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FMP	Fauna Management Plan
KGPH	Kaban Green Power Hub
MBF	Magnificent Brood Frog
MKA	Minimum Known Alive
NATA	National Association Testing Authorities
Neoen	Neoen Australia Pty Ltd
NEPM	*National Environmental Protection (Assessment of Site Contamination) Measure 1999*
PMP	Photo Monitoring Point

1 Introduction

1.1 Project overview

The Kaban Green Power Hub (KGPH) (hereafter 'the Project') is a wind farm located approximately 6 km north of Ravenshoe on the Atherton Tablelands (see Figure 1). It consists of 28 turbines owned by Kaban Wind Farm Pty Ltd (as trustee for the Kaban Wind Farm Trust) and operated by Neoen Australia Pty Ltd, that were fully operational in August 2023.

The Project was referred under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2018, based on a suite of technical reports. These were later supplemented by a series of environmental management plans before receiving approval by the Department of Agriculture, Water and the Environment (DAWE) in April 2020 (EPBC Number 2018/8289). Variations to the conditions were approved by DAWE in August 2020 and again in August 2022.

The Project approval (EPNC 2018/8289) was granted on the condition that a *Fauna Management Plan* (FMP) be implemented (Part A, Condition 2). The FMP (E2M, 2021a) includes the requirement for a *Magnificent Brood Frog* (MBF) *Monitoring Program*, which mandates annual monitoring throughout the construction and operational phase. In accordance with the FMP, a baseline monitoring survey for the MBF was conducted by E2M Pty Ltd (E2M) during the 2020/21 wet season (1-7 February 2021), prior to the commencement of construction for the KGPH (e2m, 2021b). Subsequence monitoring surveys were conducted as follows:

- **Second survey:** Completed during the 2021/22 wet season (mid-January 2022) after construction commenced (E2M, 2022).
- **Third survey:** Conducted during the 2022/23 wet season (mid-to-late January 2023) (E2M Pty Ltd, 2023). Bulk construction activities were completed at this point in time.
- **Fourth survey:** Conducted during the 2023/24 wet season (16-23 January 2024).

This report presents the findings of the fifth annual monitoring survey, conducted during the 2024/25 wet season (9-16 January 2025).

During the January 2025 survey period, field assessments were also completed for magnificent brood frog (MBF) annual microhabitat and disturbance intercept monitoring. The results of these additional assessments can be found in the following documents:

- *Magnificent Brood Frog Annual Microhabitat and Disturbance Intercept Monitoring Report—January 2025*, (E2M Pty Ltd, 2025)

1.2 Scope and objectives

E2M was commissioned by Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust to conduct MBF monitoring surveys during the current (2024/25) wet season to identify and assess potential Project impacts on MBF abundance at the KGPH, in accordance with the FMP and the *Revised Magnificent Brood Frog Monitoring Program – Construction Phase only* (E2M, 2021). The scope of works for this monitoring event included:

1. Targeted MBF surveys to document MBF abundance across all eleven established monitoring sites
2. Surveys to determine the relative abundance of cane toad at each MBF monitoring site
3. Comparison of MBF survey results against reportable triggers, as detailed in the FMP and the *Revised Magnificent Brood Frog Monitoring Program – Construction Phase only* (E2M, 2021), and

4. Providing recommendations for any mitigation or management measures to improve conditions for MBF on site.

Additional information on MBF habitat quality monitoring at all eleven sites can be found in the *Magnificent Brood Frog – Annual Microhabitat and Disturbance Intercept Photo Monitoring Report* – January 2025(E2M Pty Ltd, 2025). Information in these reports includes:

- The results of habitat monitoring across all eleven MBF monitoring sites and 5 disturbance intercept sites including
  - sedimentation
  - erosion
  - hydrocarbons, and;
  - any other project or non-project related influences impacting MBF populations such as weeds and evidence of fire.
- The results of photo monitoring.

Data from MBF abundance surveys, habitat monitoring, and MBF photo monitoring surveys will be used to identify Project impacts on the MBF population at KGHP, as well as assess the effectiveness of applicable mitigation and management measures detailed in the FMP.

1.3 Project site description

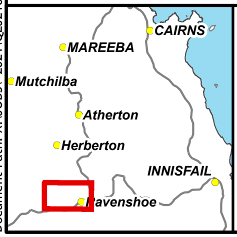
The Project is situated on 1,347 ha of freehold land, made up of five lots[1]. The disturbance footprint within the Project Site spans 129 ha and is primarily characterized by remnant Eucalypt woodland on basalt and granite rocky outcrops, hills and gullies. This area, along with its surroundings, provides crucial habitat for a variety of threatened flora and fauna species, including MBF.

Prior to the construction of the KGPH, the remnant vegetation was largely contiguous across the Project Site, with clearing limited to access tracks, a residential dwelling, and a small timber mill. Historically, the site supported a significant military presence, including a camp and a weapons training area. In recent years, parts of the site have been used for livestock grazing.

The Project Site contains several slow-flowing first and second-order streams and drainages, many of which provide habitat for MBF. The vegetation along these ephemeral streams and drainages consist of eucalypt woodland and open forest, with a ground layer dominated by native grasses, primarily *Themeda triandra*.

The Project Site shares boundaries with several protected areas, including Ravenshoe State Forest, as illustrated in Figure 1.

[1] Lot 1 on RP734194, Lot 2 on RP735194, Lot 33 on CWL374, Lot 35 on CWL391, Lot 34 on CWL374 and a section of location road reserves



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Kilometres

Coordinate System: GCS GDA 1994

Notes:
Aerial Imagery: © ESRI 2025
Disturbance Footprint: © Neoen 2021
Protected Areas: © DES 2025

Rev	Description	Drawn	Approved	Date
0	Issued for Use	GO	KP	28/01/2025
A	Issued for Review	GO	DJ	23/02/2024

e2m

FIGURE 1: PROJECT LOCATION

Magnificent Brood Frog Monitoring Program
Fifth Annual Monitoring Report
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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2 Methods

2.1 Survey timing and conditions

It is important that MBF abundance surveys be completed during seasonally appropriate times. Survey guidelines prescribed within the *Magnificent Brood Frog Monitoring Program* (E2M, 2021) suggest a minimum of 100 mm over a five-day period prior to survey, or when rainfall events offer favourable breeding conditions or are likely to trigger calling by the MBF.

2.2 Monitoring sites

The fifth annual MBF monitoring survey was conducted in accordance with the methods prescribed in Section 6.3 of the FMP (E2M, 2021a;). There are a total of eleven monitoring sites described as:

- Impact sites – five (5) survey sites located directly adjacent (<10 m) or intersected by the disturbance footprint in areas of MBF habitat where the species is known to occur. These sites will determine whether the Project is impacting the abundance of MBF within the site.
- On-site Control sites – three (3) survey sites located within the offset areas (minimum of 100 m from disturbance) in MBF habitat where the species is known to occur. These sites will act as an on-site control as they are unlikely to be impacted directly by the Project.
- Off-site Control sites – three (3) survey sites located within nearby National Parks and State Forests in suitable MBF habitat where the species is known to occur, and anthropogenic impacts are minimal. These sites will act as an additional level of control and assist in determining if changes in MBF abundance at Impact sites are caused by project-related impacts or due to non-project related factors (e.g. climatic variation).

MBF surveys were conducted along a 200 m long (± 5 m) transect on a stream or drainage line known to support breeding MBF, except for Off-site Control 2, where the transect has been shortened to 136 m due to a lack of suitable habitat further downstream. The MBF monitoring site locations were the same as those surveyed in the first annual (baseline) monitoring survey conducted in January 2021.

The location of the eleven MBF monitoring sites is shown in Figure 2.

2.3 MBF target survey method

In accordance with federal survey guidelines (DEE, 2019) and the Fauna Management Plan FMP (E2M, 2021), surveys targeting MBF were conducted at night under conditions conducive to detecting calling individuals. During the surveys, monitoring transects were traversed slowly, with observers actively listening for calling MBFs. To quantify the number of calling individuals along each transect, the location of each calling MBF was marked using a fluorescent flag, which was placed loosely in the grass near the source of the call (see Plate 1).

Each monitoring site was surveyed on two separate nights, with surveys conducted at different times between 7:00 pm and 10:15 pm. This approach was designed to capture temporal variations in MBF calling activity, which can fluctuate due to daily, and day-to-day changes in weather conditions.

Plate 1: Fluorescent flags placed near to each MBF location.

2.4 Trigger Analysis

Pursuant to the FMP and the *Magnificent Brood Frog Monitoring Program* (E2M, 2021), annual MBF abundance estimates are assessed against the following triggers:

1. a 30% reduction in the average relative abundance of magnificent brood frogs across all impact sites between two consecutive monitoring events (i.e., over a one-year period), with no comparable reduction in brood frog abundance at control sites over the same period; and/or
2. a 50% reduction in the relative abundance of magnificent brood frogs at an individual impact site between two consecutive monitoring events (i.e., over a one-year period), with no comparable reduction in brood frog abundance at control sites over the same period; and/or
3. a continued 10% reduction (10% per year over five years) in the relative abundance of magnificent brood frogs across all impact sites, with no comparable reduction in brood frog abundance at control sites over the same period.

2.5 Microhabitat assessment method

In accordance with the prescribed methods in Table 10 of the FMP, a minimum of two Photo Monitoring Points (PMPs) were surveyed at each of the eleven monitoring sites. Each site is assessed for visible signs of erosion, sedimentation, hydrocarbons and any other changes in habitat that may impact the MBF. The results of these findings are presented in a separate report, (E2M Pty Ltd, 2025).

2.6 Disturbance footprint photo monitoring method

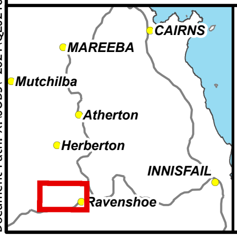
During construction there was requirement to monitor the disturbance intercept to measure any actual or potential impacts on MBF habitat, from civil works project activities. This was required at all five impact sites. While there is no formal requirement to continue disturbance intercept monitoring post-construction, a rapid assessment is performed as part of a due diligence exercise to ensure best practise to protect the MBF are maintained. The results of these surveys are presented in the Magnificent Brood Frog Microhabitat and Disturbance Intercept Photo Monitoring Report (see (E2M Pty Ltd, 2025)).

2.7 Cane Toad Monitoring

The FMP ((E2M, 2021) recommends maintaining low cane toad densities across the Project Site. Cane toad density is monitored at each of the eleven MBF monitoring sites during the MBF surveys. Observers record the number of cane toads encountered during each of the two survey nights. This report presents the highest number of cane toads recorded on each night and compares these findings to density data from previous years.

2.8 MBF response to fire

From observations of controlled and uncontrolled fire events it is now clear that fires passing through MBF habitat have a high potential of impacting individuals and are a key threatening process to be mindful of. The finding of fire impacts were reported in last year's annual abundance report, (E2M Pty Ltd, 2024). As such, any observations of fire activity within the 11 monitoring sites will be noted and assessed against relative abundance observations to measure the impacts of fire.



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Scale 1:70,000 (A4)

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Kilometres

Coordinate System: GCS GDA 1994

Notes:
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0	Issued for Use	GO	KP	31/01/2025
A	Issued for Review	GO	DJ	23/02/2024

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FIGURE 2: MAGNIFICENT BROOD FROG MONITORING SITES

Magnificent Brood Frog Monitoring Program
Fifth Annual Monitoring Report
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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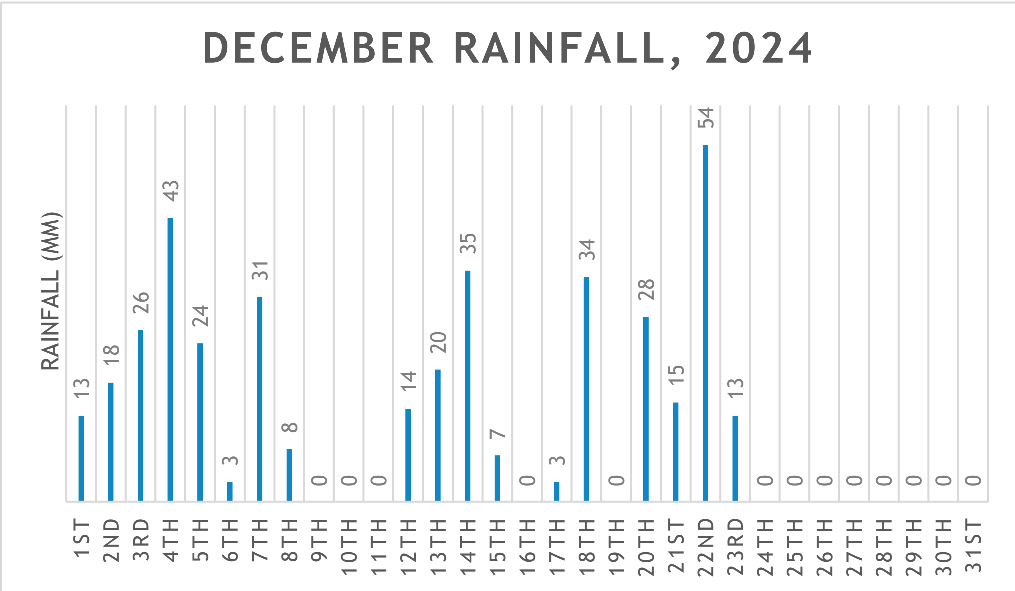
3 Results

3.1 Survey Timing and Climatic Conditions

The fifth annual MBF monitoring survey was conducted during the 2024/25 wet season (from 9-16 January 2025) by two suitably qualified ecologists, Dean Jones and Wise Lum. Weather conditions during the eight-day survey period was suitable for detection of MBF with significant rain falling prior to, and during surveys. During the month of December 2024 there was a total of 389 mm recorded, followed by 32mm during the seven days prior to the survey. During the survey period, an additional 24mm of rainfall occurred (see data from the nearby BOM station in Figure 3). Night-time temperatures during surveys ranged from 19.5˚C to 22˚C and humidity levels were high and wind levels low.



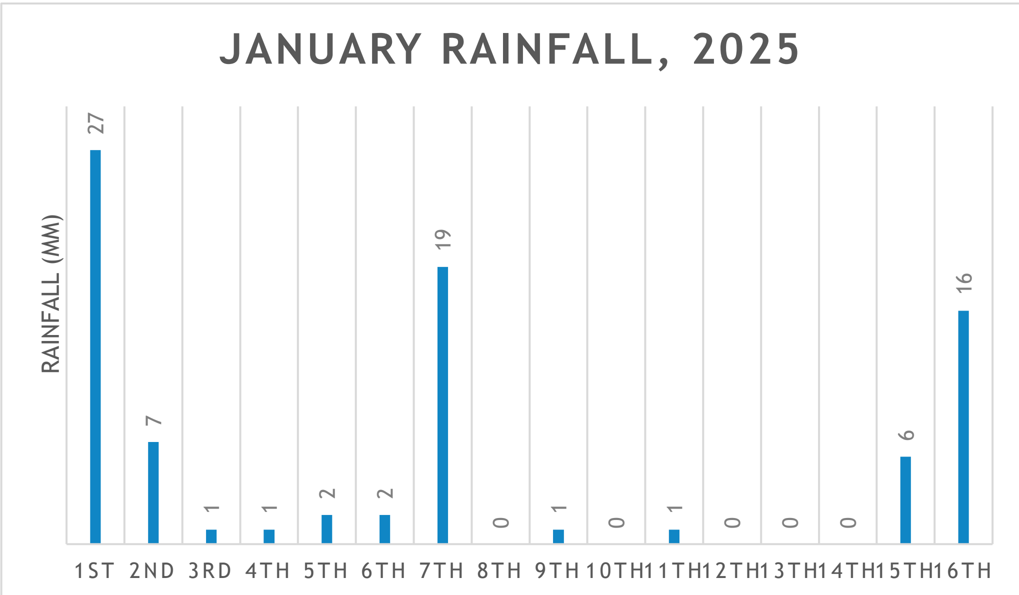


Figure 3: BoM Station 031200; Rainfall recorded during December 2024 and 7 days prior to and during the January 2025 survey.

3.2 Survey Effort

Surveys for MBF relative abundance were successfully conducted at all 11 monitoring sites under conditions suitable for the detection of the species. Microhabitat assessments (E2M Pty Ltd, 2025) were conducted concurrently with MBF abundance surveys at all 11 monitoring sites. A rapid assessment at the disturbance intercept was also completed at each of the 5 impact monitoring sites (E2M Pty Ltd, 2025).

3.3 MBF Relative Abundance

During the January 2025 monitoring survey, MBF were recorded at all eleven monitoring sites on both the first and second night of survey, with a minimum total of 261 MBF (sum of the minimum number of individuals known alive across all sites) detected. The relative abundance of MBF recorded at each site, expressed as the minimum known alive (MKA) per 10m of stream transect, is detailed in **Error! Reference source not found.**

Table 1: Relative abundance and Minimum Known Alive (MNKA) of MBF recorded across all sites for the 2025 survey.

	2025 MBF Records		Minimum Number MBF	Transect Length	Relative Abundance (MBF/10m)*
Monitoring Site	Night 1	Night 2	2025	(m)	2025
Impact Site 1	27	43	43	207	2.08
Impact Site 2	34	38	38	200	1.9
Impact Site 3	17	17	17	204	0.83
Impact Site 4	4	4	4	202	0.2
Impact Site 5	20	20	20	201	1.0
On-Site Control 1	31	20	31	200	1.55
On-Site Control 2	47	52	52	203	2.56
On-Site Control 3	17	13	17	199	0.85
Off-Site Control 1	3	3	3	200	0.15
Off-Site Control 2	2	3	3	136	0.22
Off-Site Control 3	25	33	33	202	1.63

*Relative abundance (MBF/10m) calculated by taking the minimum number of MBF individuals known to be present at a monitoring site and dividing it by the length of the transect, then multiplied by 10 m.

Average relative abundance estimates the control and impact groups, for all years of monitoring, are compared in Figure 4. Data presented show an increase in the average abundance of MBF within the Impact sites, comparing the latest results (1.2) to those recorded in 2021 (1.01). There has been a significant increase in abundance for the On-site control sites, with an average abundance in 2021 of 0.6, compared to current estimate of 1.65. A significant decrease in average abundance for the Off-site control sites has occurred with average numbers falling from a high of 2.14 in 2022 to the current average of 0.67 frogs per 10 metres.

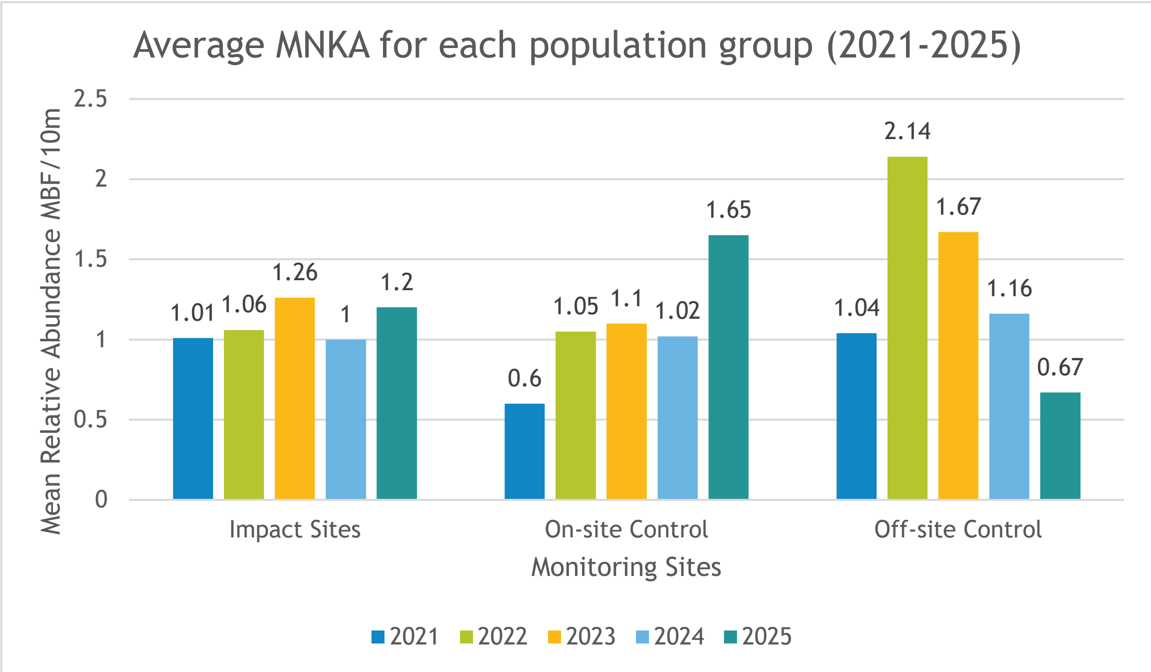


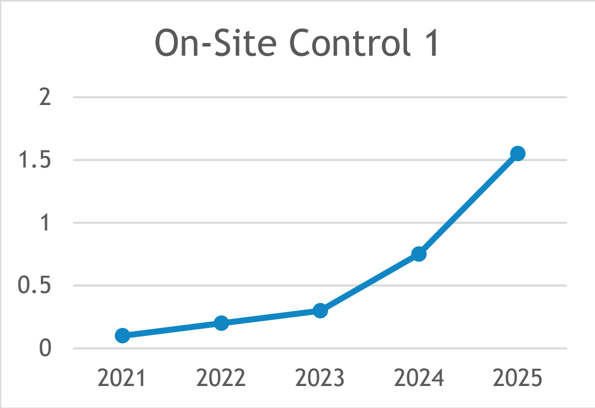
Figure 4: Comparison of average relative abundance (MBF/10 m), for control or impact sites, between the 2021, 2022, 2023, 2024 and 2025 surveys.

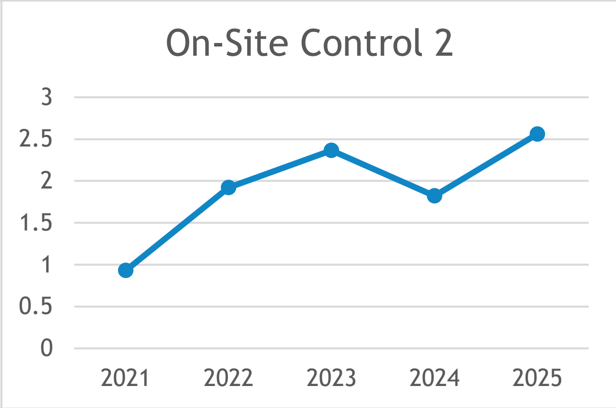
Figure 5, represents the population trend lines for each monitoring site. The details of these trends and possible driving forces behind them are discussed in more detail in section 3.7.

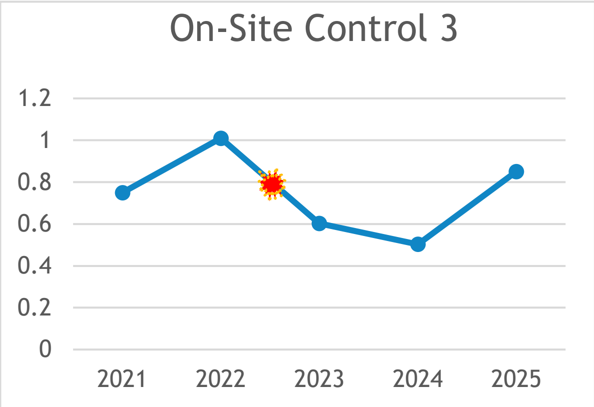
Figure 5: MBF population trends for each monitoring site

Impact Sites: The red and orange symbol ( ) indicates a fire event impacting the site

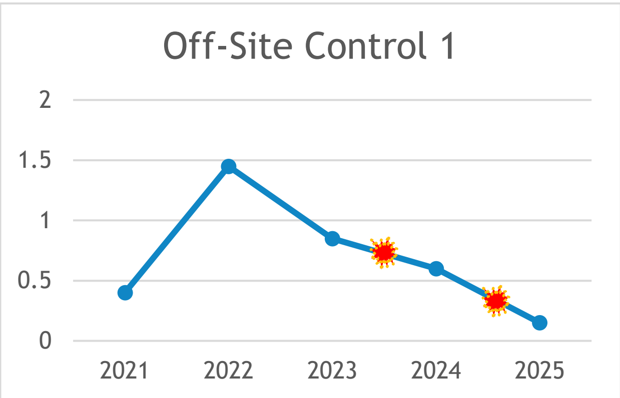
On-site control sites

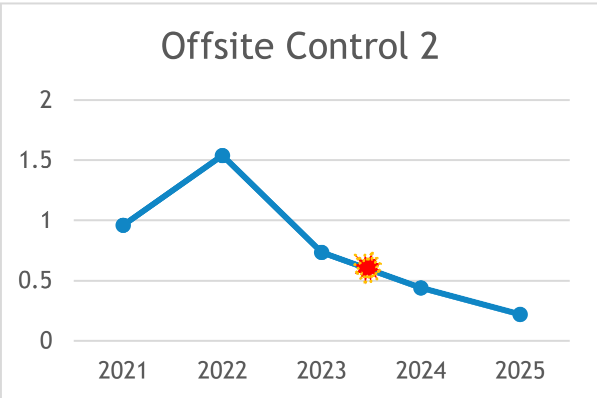


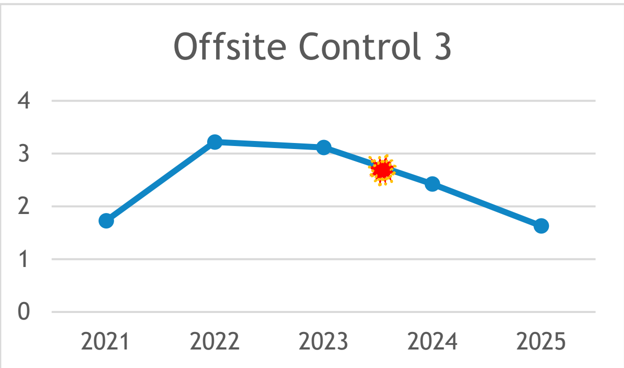




Off-site control sites







3.4 Trigger Assessment

Trigger values for changes in MBF abundance were calculated as per section 2.3 of the *Revised Magnificent Brood Frog Monitoring Program*. Triggers are assessed against the following criteria.

1. a 30% reduction in the average relative abundance of magnificent brood frogs across all impact sites between two consecutive monitoring events (i.e., over a one-year period), with no comparable reduction in brood frog abundance at control sites over the same period; and/or
2. a 50% reduction in the relative abundance of magnificent brood frogs at an individual impact site between two consecutive monitoring events (i.e., over a one-year period), with no comparable reduction in brood frog abundance at control sites over the same period; and/or
3. a continued 10% reduction (10% per year over five years) in the relative abundance of magnificent brood frogs across all impact sites, with no comparable reduction in brood frog abundance at control sites over the same period.

3.4.1 30% decrease in average abundance over 2-years.

The average change in MBF abundance has increased for the Impact Sites (plus 20.2%) and increased for the On-site Control Sites (plus 61.2%) over the last two surveys. Therefore, no trigger events activated for these groups.

In comparison the average MBF abundance at Off-Site Control Sites has decreased by 42.4%, thereby exceeding the 30% decrease trigger value (See Table 3). However, control sites are not assessed for trigger events, they are only used to compare against the impact sites to monitor for seasonal trends and other stochastic events. This decrease demonstrates that non-project affected sites are being impacted by natural or other anthropogenic events, such as controlled and uncontrolled fires.

3.4.2 50% decrease in relative abundance between 2-years for individual site.

While relative abundance of MBF at most sites was higher compared to 2024 (See Tables 1 and 3), the abundance at Off-Site Control 1 and Off-Site Control 2 exceeded the 50% decrease trigger value with respective decreases of 75% and 50.1%. Off-Site Control 1 decreased from an abundance of 0.60 in 2024 to 0.15 in 2025, and Off-Site Control 2 decreased from 0.44 to 0.221. Other sites reporting a significant decrease in MBF abundance, but not activating a trigger were, Off-Site Control 3 (-32.8%) and Impact Site 4 (-19.2%).

3.4.3 Continued 10% reduction in relative abundance over 5-years across all impact sites.

There have been no impact sites with a continued reduction in relative abundance over 5 consecutive years, Table 2.

Table 2: MBF minimum number known alive and relative abundance values for all sites and years, with trigger event assessment.

Monitoring site	Transect length (m)	Minimum number MBF					Relative abundance (MBF/10m)*				
		2021	2022	2023	2024	2025	2021	2022	2023	2024	2025
Impact Site 1	207	11	25	30	38	43	0.53	1.21	1.45	1.84	2.08
Impact Site 2	200	22	19	31	25	38	1.10	0.95	1.55	1.25	1.9
Impact Site 3	204	29	39	33	19	17	1.42	1.91	1.62	0.93	0.83
Impact Site 4	202	n/a	6	24	5	4	n/a	0.30	1.19	0.25	0.2
Impact Site 5	201	n/a	18	10	15	20	n/a	0.89	0.50	0.75	1.0
On-site Control 1	200	2	4	6	15	31	0.10	0.20	0.30	0.75	1.55
On-site Control 2	203	19	39	48	37	52	0.93	1.92	2.36	1.82	2.56
On-site Control 3	199	15	20	12	10	17	0.75	1.01	0.60	0.50	0.85
Off-site Control 1	200	8	29	17	12	3	0.40	1.45	0.85	0.60	0.15
Off-site Control 2	136	13	21	10	6	3	0.96	1.54	0.74	0.44	0.221
Off-site Control 3	202	35	65	63	49	33	1.73	3.22	3.12	2.43	1.63

Green shading indicates an increase from the previous year, amber is decrease but within acceptable levels and red text indicates a decrease from the previous year and trigger exceedance.

Table 3: Trigger analysis comparing the mean relative abundance of MBF in 2024 and 2025 for each site grouping. A trigger is identified if the average relative abundance between consecutive annual monitoring events is reduced by more than 30%. Triggers are highlighted in red.

Site groupings	2024 - Average Relative Abundance (/10m)	2025 - Average Relative Abundance (/10m)	Trigger %	Calculated Difference (%)
Impact Sites	1.00	1.20	-30	20.2
Onsite Control	1.03	1.65	-30	61.6
Offsite Control	1.16	0.67	-30	-42.4
All Controls	1.09	1.16	-30	6.4

Table 4: Trigger analysis comparing the relative abundance of MBF in 2024 and 2025 for each site. A trigger is identified if the relative abundance between consecutive annual monitoring events is reduced by more than 50%. Triggers are highlighted red.

Sites	2024 - Relative Abundance (/10m)	2025 - Relative Abundance (/10m)	Trigger %	Calculated Difference (%)
Impact Site 1	1.84	2.08	-50	13.3
Impact Site 2	1.25	1.90	-50	52.0
Impact Site 3	0.93	0.83	-50	-10.9
Impact Site 4	0.25	0.20	-50	-19.2
Impact Site 5	0.75	0.20	-50	34.0
Onsite Control 1	0.75	1.55	-50	106.7
Onsite Control 2	1.82	2.56	-50	40.5
Onsite Control 3	0.50	0.85	-50	69.2
Offsite Control 1	0.6	0.15	-50	-75.00
Offsite Control 2	0.44	0.22	-50	-50.1
Offsite Control 3	2.43	1.63	-50	-32.8

3.5 Cane toads

Cane toads were observed at nine of the eleven monitoring sites surveyed, as detailed Figure 4(below). Numbers of cane toad recorded at each site were generally low; however, cane toads were observed at higher abundance along vehicular access tracks and around flooded depressions elsewhere within the Project Site.

Table 5: Comparison of minimum number of cane toads observed from the 2022, 2023 and 2024 surveys

Monitoring site	Minimum number of cane toads			
	2022	2023	2024	2025
Impact Site 1	2	1	1	1
Impact Site 2	1	1	0	2
Impact Site 3	1	1	4	1
Impact Site 4	0	1	2	0
Impact Site 5	2	0	4	1
On-site Control 1	2	0	0	0
On-site Control 2	0	0	1	2
On-site Control 3	2	2	3	4
Off-site Control 1	2	0	4	1
Off-site Control 2	2	2	1	1
Off-site Control 3	3	3	5	1

3.6 MBF breeding activity

With the Project Site and surrounds receiving significant rain throughout December 2024 and good January rains, conditions on site during surveys were suitable for breeding with most creek and pools containing water. From the frog calling activity observed, and occasional roaming frog (Plate 2) plus the many tadpoles noted, during nocturnal surveys, indicated active breeding. No MBF brood clutches were recorded but active searches for eggs are not part of the monitoring protocol and active searches are not recommended to help minimise any survey impacts on frogs or their eggs.

Plate 2: MBF found walking freely in the moist grass

3.7 Impacts of Fire

Sentinel fire scar mapping showing the extent of fire within the Project Site and wider surrounds, from January 2017 through to September 2024, is presented in Figure 6 and Figure 7. The fire spatial layers in this figure, shows evidence of recent fires at Impact Sites 3 and 4 (in 2023) and also Impact Site 5 (in 2022). Field observations also indicate fire at On-site Control 3 during 2022. Fire at off-site control sites 1,2 and 3 during 2023, wildfire confirmed by Queensland Parks and Wildlife Service (QPWS), at Off-site control 1 during November 2024.

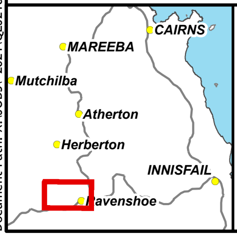
QPWS stated that there were no controlled fires in 2024 at Off-site Control sites 2 and 3 during 2024. Further information from local fire authorities has been requested to determine the likelihood of fires occurring within the off-site controls and when they occurred.

As shown in Table 6, all sites impacted by fires in 2022, 2023 and 2024 show a significant decrease in MBF abundance (from -22 to -79.2%) in the year following fire.

Table 6: Comparison of incidence of fire and subsequent changes to MBF abundance in the following breeding season. Orange cells indicate significant fire event during the previous year, prior to abundance survey. Yellow indicates that there are on-ground signs that a low intensity fire may have impacted the site in the months prior to the survey. Further information from local fire authority has been requested for those coloured yellow. Abundance declines between 10 and 20% are light amber, declines between 20 and 50% are amber and declines >50% are purple.

Site	% change 2021-2022	FIRE 2022	% change 2022-2023	FIRE 2023	% change 2023-2024	FIRE 2024	% change 2024-2025
Impact Site 1	128.3		19.8		26.7		13.3
Impact Site 2	-13.6		63.2		-19.4		52.0
Impact Site 3	34.5		-15.3		-42.4		-10.9
Impact Site 4	n/a[#]		296.0		-79.2		-19.2
Impact Site 5	n/a[#]		-44.1		50.0		34.0
On-site Control 1	100.0		50.0		150.0		106.7
On-site Control 2	106.5		23.2		-22.9		40.5
On-site Control 3	34.7		-40.3		-16.7		69.2
Off-site Control 1	262.5		-41.4		-29.4		-75.0
Off-site Control 2	60.4		-52.3		-40.0		-50.1
Off-site Control 3	86.1		-3.1		-22.2		-32.8

[#] Impact sites 4 and 5 were not assessed as part of 2021 surveys.



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Coordinate System: GCS GDA 1994

Notes:
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FIGURE 6: ANNUAL FIRE SCAR MAPPING 2017 - 2024

Magnificent Brood Frog Monitoring Program
Fifth Annual Monitoring Report
Kaban Green Power Hub

Map Number	Job Number	Rev
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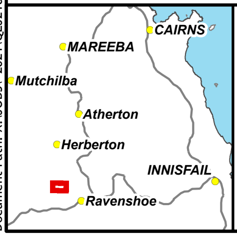

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FIGURE 7A: ANNUAL FIRE SCAR MAPPING 2017 - 2024

Magnificent Brood Frog Monitoring Program
Fifth Annual Monitoring Report
Kaban Green Power Hub

Map Number	Job Number	Rev
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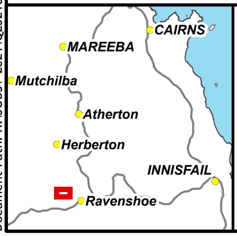

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FIGURE 7B: ANNUAL FIRE SCAR MAPPING 2017 - 2024

Magnificent Brood Frog Monitoring Program
Fifth Annual Monitoring Report
Kaban Green Power Hub

Map Number	Job Number	Rev
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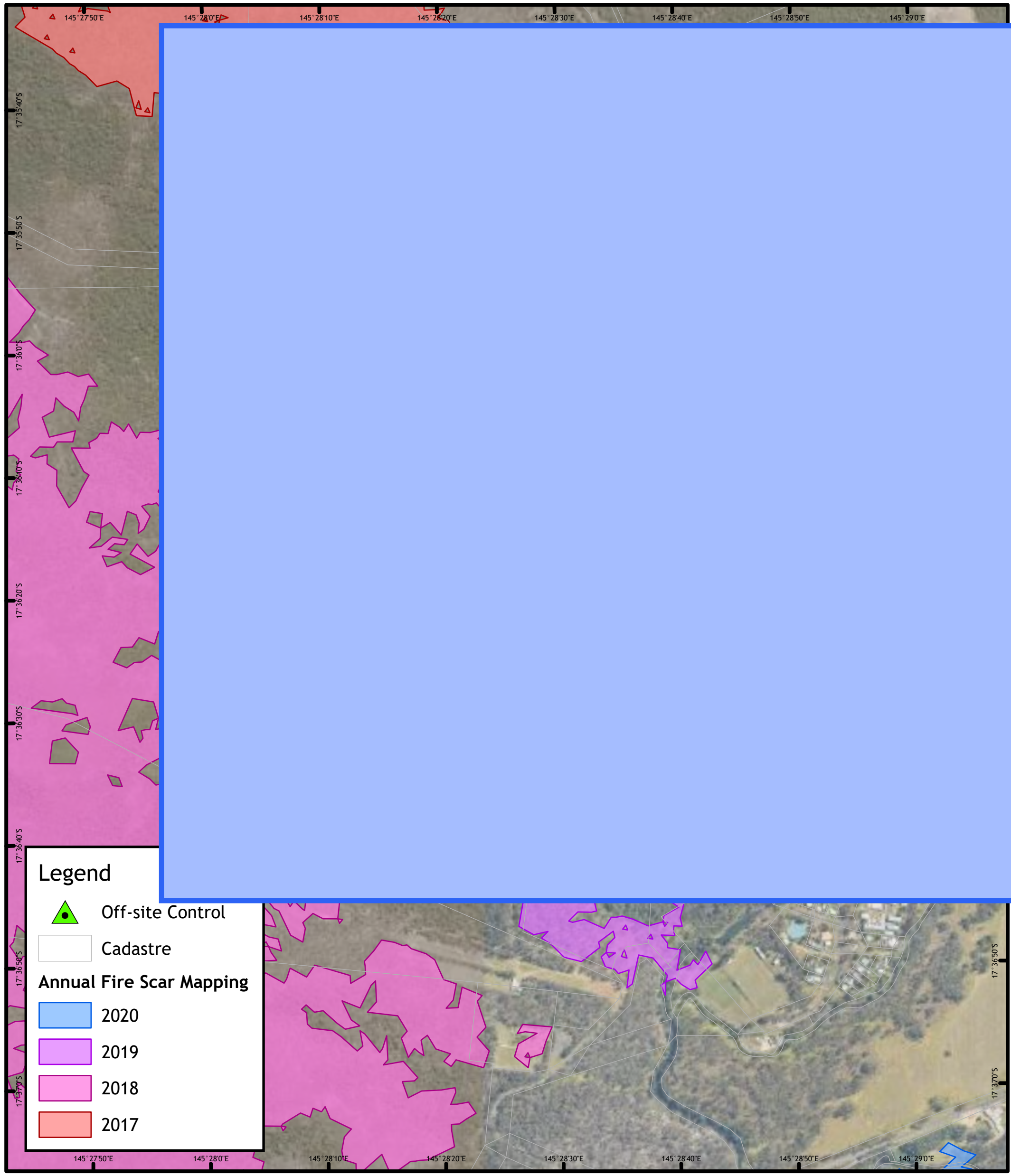

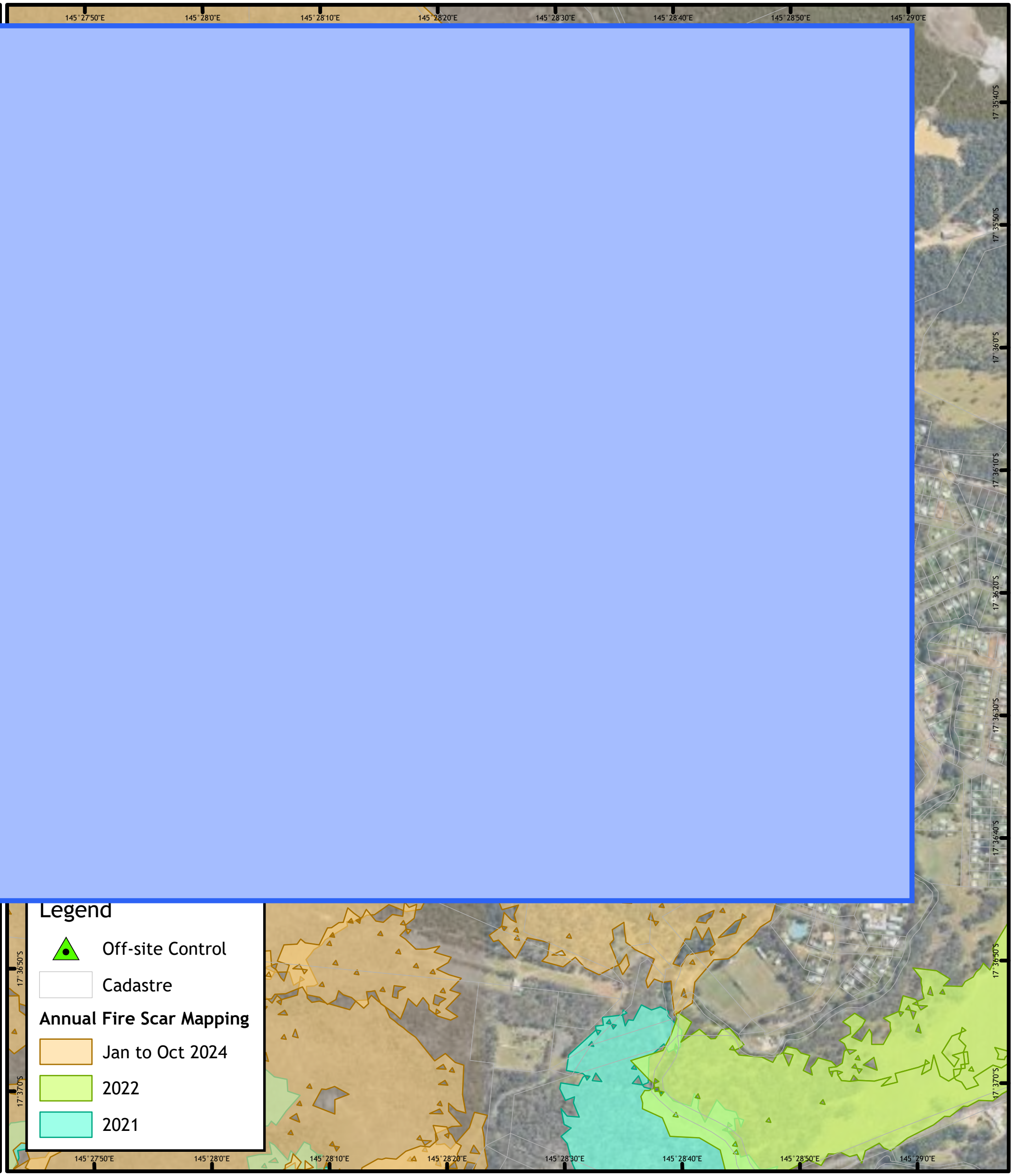

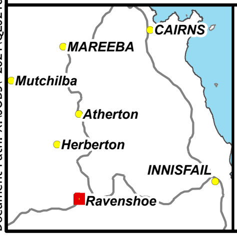

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A	Issued for Review	GO	DJ	12/02/2024

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FIGURE 7C: ANNUAL FIRE SCAR MAPPING 2017 - 2024

Magnificent Brood Frog Monitoring Program
Fifth Annual Monitoring Report
Kaban Green Power Hub

Map Number	Job Number	Rev
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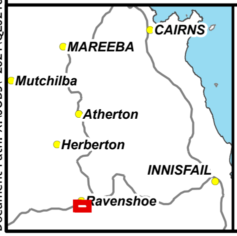

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FIGURE 7D: ANNUAL FIRE SCAR MAPPING 2017 - 2024

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Fifth Annual Monitoring Report
Kaban Green Power Hub

Map Number	Job Number	Rev
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4 Summary, Conclusions and Recommendations

The fifth annual monitoring survey of the Magnificent Brood Frog Monitoring Program was conducted from 9- 16 January 2025. With the Project Site and surrounds receiving significant rain before and good rains during survey (BOM, 2024 & 2025), weather conditions over this period were ideal for detection of MBF with mild humid and calm nights with occasional showers.

Surveys during January 2025 recorded a minimum total of 261 individuals, with MBF present at all eleven monitoring sites (Table 2). Most monitoring sites surveyed in January 2025 exhibited an increase in relative MBF abundance when compared to 2024. However, there were moderate declines at Impact Sites 3 and 4, likely recovering from the fires in 2023. Abundance trendlines relative to fire events indicate that there is a 2-year lag before populations show signs of recovery. Despite these declines within the impact sites, there were no triggers activated from the results of this years monitoring events.

Significant decrease in MBF abundance were observed across all off-site control sites. There was clear evidence of recent fire at Off-site Control 1. Over the last fours years MBF numbers have dropped from 29 to 17 to 12 and currently 3, at Off-site Control 1. Evidence of consecutive fires at this site suggesting the cause of these declines. All sites with known or evidence of fires have had significant declines in MBF relative abundance. All sites that show no signs of fire over the last five years have increased significantly. On-site Control 1 has increased from 2 to 31, On-site Control 2 has increased from 19 to 52 and Impact Site 1 has increased from 11 to 43.

Both the decline in numbers after fire and the significant increase in numbers in the absence of fire, strongly suggests that fire is a key threatening process. As such, it is highly recommended that careful consideration and planning is given to the management of fire in relation to the Project MBF populations.

Cane toad abundance remains relatively low for all sites. While current detection methods do not allow for accurate abundance estimates they will provide some measure of cane toad population dynamics over the long term. Though there has been a notable increase in cane toad densities on access roads across the site, cane toads do not appear to be encroaching on or significantly impacting MBF habitat and, as such, do not appear pose a significant threat to MBF at present.

Comparing the results of MBF surveys and MBF habitat monitoring over the past five years, there is little evidence to suggest that wind farm construction activities have impacted negatively upon MBF populations within the Project Site. While fires are the biggest threatening process there is also some concerns with change in waterflow conditions at Impact Sites 1, 3 and possibly 5. Floodways are being considered to help redirect some waterflows at Impact Sites 1 and 3, and further investigation with changed and possible increased waterflows at Impact Site 5 is recommended.

Please, refer to the annual microhabitat and disturbance intercept report ((E2M Pty Ltd, 2025) for further details on the assessment of MBF habitat and recommendations for improvement between the project interface and MBF populations.

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Appendix L: Magnificent brood frog annual microhabitat assessment report

Magnificent Brood Frog Annual Microhabitat Photo Monitoring Report

January 2025

The Trustee for the Kaban Wind Farm Trust

Level 21/570 George Street, Sydney, NSW 2000

Document Management

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A	30/01/2025	Internal Review	Kaylee Pitt	Dean Jones		31/01/2025	Paul Suter
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Document Reference: X:\JOBS\~2021\QEJ21046\DELIVERABLES\5.CY25\13. CY25 - OAMP MBF Annual Survey and Microhabitat Assessment JAN25\MIcrohabitat Assessment\REV0\QEJ21046_Annual_Microhabitat_PMP_Report_January_2025_Rev0.docx

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Definitions

Term	Definitions
Anthropogenic Impacts	Human-induced changes to the environment, such as land-clearing, construction, or changes to drainage patterns, that may affect MBF populations.
EPBC Approval Holder	Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust
Disturbance footprint	The area approved to be impacted by the Project
Disturbance intercept	The point along a MBF creek line where the disturbance area intersects intact magnificent brood frog habitat (MBF)
Fire Scar Mapping	Spatial data visualizing areas impacted by fire events, sourced from datasets.
Hydrocarbons	Petroleum-based or synthetic hydrocarbons (e.g., oil, diesel)
Habitat	Low stream order drainage lines occupied by MBF
Monitoring site / transect	Eleven survey sites, each consisting of a 200m transect, were established for ongoing monitoring.
Sedimentation	The deposition and accumulation of sediment in a water drainage feature, creek bed or water pool.
The Project	Kaban Green Power Hub (KGPH) constructed and operated by Neoen Australia Pty Ltd
The Project Site	The site where the Project is situated, comprising 1,347 ha of freehold land across five lots.
Threatened species	Species listed as extinct (EX), extinct in the wild (XW), critically endangered (CE), endangered (E), vulnerable (V) or conservation dependent (CD) under the *Environmental Protection and Biodiversity Conservation Act 1999*, or extinct in the wild (PE), Endangered, Vulnerable or Near Threatened (EVNT) under the *Nature Conservation Act 1992*.
Controlled Burns or Prescribed Burns	Fire management practices conducted to reduce fuel loads and help mitigate potential impacts on MBF habitat within the Project Site.
Uncontrolled Burns	Any uncontrolled fire events not prescribed or part of project management activities.

Abbreviations

Abbreviation	Description
E2M	E2M Pty Ltd
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FMP	Fauna Management Plan
KGPH	Kaban Green Power Hub
MBF	Magnificent Brood Frog
Neoen	Neoen Australia Pty Ltd
PMP	Photo Monitoring Point

1 Introduction

E2M was commissioned by Neoen Australia Pty Ltd (Neoen) to conduct Magnificent Brood Frog (MBF) microhabitat assessment photo monitoring pursuant to EPBC approval 2018/8289. Conditions of the monitoring are detailed in the *Kaban Green Power Hub – Fauna Management Plan* (E2M, 2021a). This report includes the microhabitat assessment of all eleven monitoring sites. There are 5 on-site impact sites, 3 on-site control sites and 3 off-site control sites. A rapid assessment of the disturbance intercept at Impact Sites was also conducted.

The results of the photo monitoring surveys for impact sites 1, 2 and 3 are compared with the *Magnificent Brood Frog Monitoring Program - Baseline Survey* (E2M, 2021b) (baseline survey) which was conducted from the 1 to 7 February 2021 prior to the commencement of construction. Impact Sites 4 and 5 are compared to their inaugural observations taken during the second annual survey, *Magnificent Brood Frog Monitoring Program – Second Annual Monitoring Report* (E2M, 2022). Comparisons with these baseline surveys allow an assessment of potential impacts to the watercourses and associated magnificent brood frog (MBF) habitat resulting from project activities.

Supporting documents: During the January 2025 survey period, assessments were also completed for magnificent brood frog annual relative abundance and disturbance intercept monitoring. The details of these E2M Pty Ltd supporting surveys can be found respectively in the Magnificent Brood Frog - Fifth Annual Abundance Monitoring Report (E2M Pty Ltd, 2024).

2 Methods

The microhabitat photo monitoring survey was undertaken between 9-16 January 2025. In accordance with the prescribed method in the *Fauna Management Plan* (FMP) (E2M, 2021a) and revised MBF monitoring program, a minimum of two PMPs were surveyed at each of the 11 monitoring sites, including five impact sites, three on-site control sites and three off-site control sites (see Figure 1).

Each photo monitoring point (PMP) was situated at a ponded area along the watercourse considered to be suitable MBF habitat. The assessment at each PMP includes:

- One spot photograph taken looking vertically down at the pond from approximately 1 m above the water surface (covering an approximate area of 1x1 m) to capture the pond / seep and surrounding habitat features including;
  - visual evidence of sedimentation; and
  - visual evidence of hydrocarbon contamination (e.g. rainbow sheen on surface)
- One surface photograph taken just above the water surface looking across the surface of the water to capture the potential presence of hydrocarbon sheen
- One upstream photograph taken from approximately 1.5 m above the water surface and directed upstream (photograph includes the PMP for locational context), and
- One downstream photograph taken from approximately 1.5 m above the water surface and directed downstream (photograph includes the PMP for locational context).

Furthermore, additional assessment data recorded at each PMP included:

- observation of tadpoles or cane toads
- observation of macroinvertebrates,
- brief description of the microhabitat, and

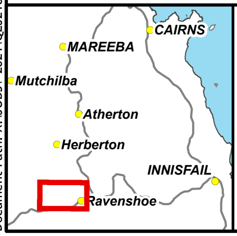
- any other threatening processes, such as fire or disturbance from grazing or pest animals.

Additional photos and/or assessment data was taken or recorded to provide context or evidence of the status of the monitoring site (e.g. observed active threatening processes).

A rapid assessment of the disturbance intercept was also undertaken and details of any project related threatening processes were noted along with advice on appropriate remedial activities.

Local climatic conditions were also noted prior to and during the survey. These are presented in the results section.

Note: While in-stream erosion has not been included in the recommended monitoring program it was included within this report due to its potential negative impact on MBF habitat quality.



N

Scale 1:70,000 (A4)

0 1 2 3

Kilometres

Coordinate System: GCS GDA 1994

Notes:
Aerial Imagery: © ESRI 2025
Disturbance Footprint: © Neoen 2021
Protected Areas: © DES 2023

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Rev	**Description**	**Drawn**	**Approved**	**Date**

e2m

FIGURE 1: MICROHABITAT PHOTO MONITORING POINTS

MBF Monthly Microhabitat Photo Monitoring report - January 2024
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

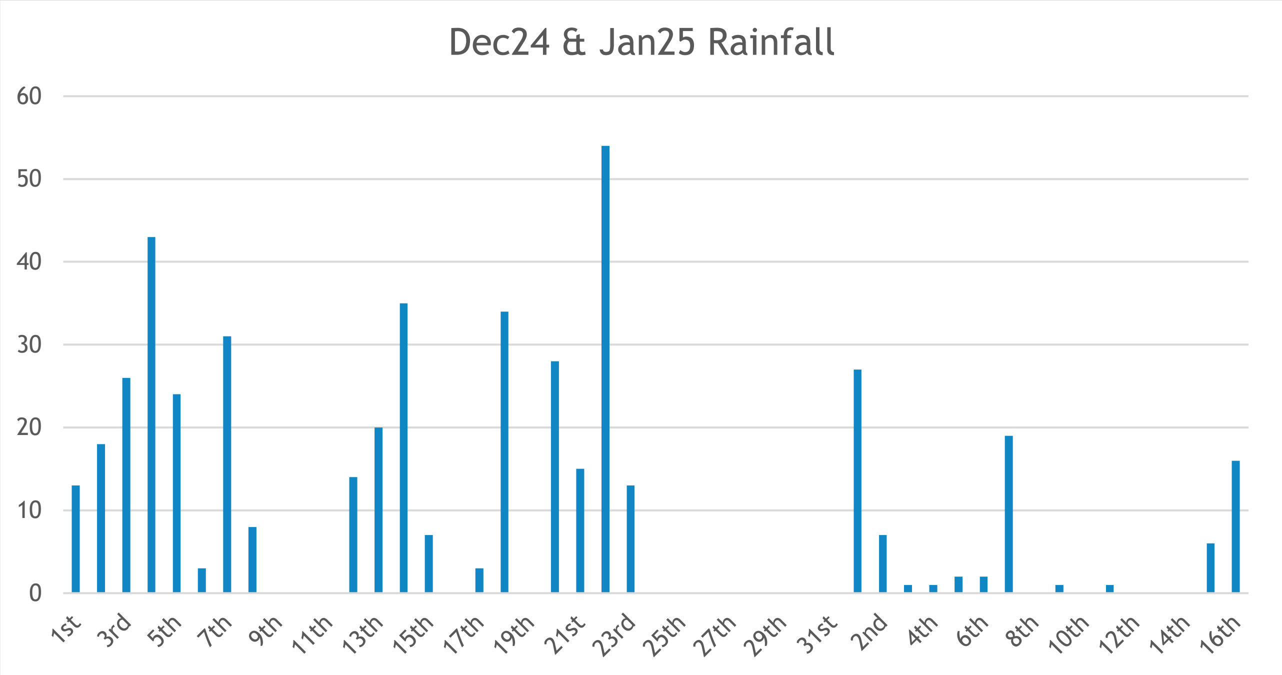
Document Path: X:\JOBS\~2021\QEJ21046\GIS\WORKING\PRO\QEJ21046\QEJ21046_MBF.aprx

3 Results

3.1 Climatic conditions

The fifth annual MBF abundance, microhabitat and disturbance intercept monitoring surveys was conducted during the wet season (9-16 January 2025) by two qualified fauna ecologists. The weather conditions during the seven-day period were suitable for amphibian activity. Prior to the survey there was a total of 416 mm recorded during December 2024 and early January 2025, BOM Station 31200, see Figure 3. Night-time temperatures, during survey, ranged between 19.5˚C and 22˚C, humidity was high and wind was light.

Figure 2. BoM Station 031200: Rainfall recorded 7 days prior to, and during survey.



3.2 Microhabitat site observations

Twenty-four microhabitat PMPs within 11 sites were re-surveyed on 9 and 16 January 2025. All habitat assessment results are detailed in Table 1 and discussed below. All habitat quality photographs are presented in Appendix A (impact sites) and Appendix B & C (all six control sites).

Macroinvertebrates were observed at 18 of the 24 PMP's, including ten of the 12 impact site PMP's. Tadpoles were observed at 10 of the 24 PMP's, including six of the 12 impact site PMP's. Water was present at all PMP locations, ranging from 1 to 40 cm in depth with varying turbidity levels. Water depth in some pools was lower than those recorded last year due to several drier days leading up to the survey.

3.2.1 Impact Site 1

A small amount of sedimentation was observed at the downstream PMP location. Water was observed at all PMP locations. The water was clear at upstream and midstream site, however turbidity was slightly higher at the downstream site from low to moderate (Plate 1). In-stream erosion continues to increase at the downstream site indicating that waterflows are significant during sustained or significant rainfall events.

A Upstream

B Midstream

C Downstream

Plate 1: Impact Site 1, Upstream (A), Midstream (B) and Downstream (C) PMP, comparison between January 2021 (left) and January 2025 (right) surveys.

Table 1 : PMP habitat assessment results

Monitoring site	PMP	Location	Sedimentation	Erosion	Hydrocarbons	Macroinvertebrates	Tadpoles	Pool Depth	Waterflow	Impacted by fire in last 12 months
Impact Site 1	Upstream		No	No	No	Yes	No	5	Nil	No
	Midstream		No	No	No	No	No	25	Nil	No
	Downstream		Yes	No	No	Yes	No	20	Nil	No
Impact Site 2	Upstream		No	No	No	No	No	5	Very Low	No
	Downstream		No	No	No	No	No	5	Very Low	No
Impact Site 3	Upstream		No	Yes	No	No	No	15	Low	Yes
	Downstream		No	Yes	No	No	No	5	Low	Yes
Impact Site 4	Upstream		No	No	No	Yes	No	18	Very Low	Yes
	Downstream		No	No	No	No	No	5	Very Low	Yes
Impact Site 5	Upstream		No	Yes	No	No	No	15	Nil	No

Monitoring site	PMP	Location	Sedimentation	Erosion	Hydrocarbons	Macroinvertebrates	Tadpoles	Pool Depth	Waterflow	Impacted by fire in last 12 months
	Upstream (feeder creek)		No	No	No	Yes	No	2	Nil	No
	Downstream		No	Yes	No	No	No	23	Nil	No
On-site Control 1	Upstream		No	No	No	No	No	40	Very Low	No
	Downstream		No	No	No	No	No	40	Very Low	No
On-site Control 2	Upstream		No	No	No	No	No	12	Nil	No
	Downstream		No	No	No	No	No	20	Nil	No
On-site Control 3	Upstream		No	No	No	No	No	15	Nil	No
	Downstream		No	No	No	No	No	15	Very Low	No
Off-site Control 1	Upstream		No	No	No	No	No	15	Nil	Yes
	Downstream		No	No	No	No	No	20	Nil	Yes
Off-site Control 2	Upstream		No	No	No	No	No	8	Low	Possibly[1]

Monitoring site	PMP	Location	Sedimentation	Erosion	Hydrocarbons	Macroinvertebrates	Tadpoles	Pool Depth	Waterflow	Impacted by fire in last 12 months
	Downstream		No	No	No	No	No	15	Low	Possibly[1]
Off-site Control 3	Upstream		No	No	No	No	No	30	Moderate	Possibly[1]
	Downstream		No	No	No	No	No	40	Moderate	Possibly[1]

1. On-ground evidence and the sparse ground cover in some areas indicates that these sites have been impacted by fire in 2024.

3.2.2 Impact Site 2

No sedimentation was observed at both PMP locations which is consistent with the findings from previous surveys, (Plate 2). There was no erosion or any other observations indicating degradation of the MBF habitat.

A Upstream


B Downstream


Plate 2: Impact Site 2, Upstream (A) and Downstream (B) PMP, comparison between January 2021 (left) and January 2024 (right) surveys

3.2.3 Impact Site 3

Some instream sedimentation consisting of fine silts as observed at the upstream PMP location. Pool water depth has increased, due to erosion, at the upstream PMP location compared to the previous survey but remained the same at the downstream PMP location. However, there was bank erosion noted at the downstream and upstream monitoring sites. Turbidity was low to moderate at both PMP locations. In-creek erosion present during the previous survey at both PMP locations continues, (Plate 3). There is a higher discharge of water at this site compared to pre-construction waterflows and subsequently notable erosion within the creek. There was evidence of fire impacting the creekline, please refer to section 3.3.

A Upstream

B Downstream

Plate 3: Impact Site 3, Upstream (A) and Downstream (B) PMP, comparison between January 2021 (left) and January 2025 (right) surveys

3.2.4 Impact Site 4

Both PMP locations recorded no in-stream sedimentation or erosion, (Plate 4). The upper portion of the creekline was significantly impacted by fire during last years (2023) controlled burns, please refer to section 3.3.

A Upstream

B Downstream

Plate 4: Impact Site 4, Upstream (A) and Downstream (B) PMP, comparison between January 2022 (left) and January 2025 (right) surveys

3.2.5 Impact Site 5

3.2.5.1 Main disturbance intercept

No sedimentation was observed at any of the PMP locations which is consistent with the findings of the January 2022 survey, (Plate 5). Some additional erosion was noted at both monitoring sites. The groundcover has continued to improve following the uncontrolled bushfire occurring in November 2022, refer to section 3.3.

A Upstream


B Downstream


Plate 5: Impact Site 5, Upstream (A) and Downstream (B) PMP, comparison between January 2022 (left) and January 2025 (right) surveys

3.2.5.2 Feeder Creek intercept

Grass groundcover has recovered from the November 2022 uncontrolled fires, see section 3.3. Erosion, sedimentation, and hydrocarbons were not recorded at this PMP, (Plate 6). There was only a small pool of water visible at the time of monitoring but this pool had re-filled days later after moderate rainfalls. This creek is within a small catchment and waterflows and pools are highly susceptible to change based on rainfall events.

Plate 6: Impact Site 5 (15 m from Feeder Creek disturbance intercept) comparison between April 2022 (left) and January 2025 (right) surveys

3.2.6 On-site Control Site 1

No instream sedimentation was observed which is consistent with the January 2021 survey. Turbidity levels have remained low (Plate 7). There was no evidence of fire impacting this site.

A Upstream

B Downstream

Plate 7. On-site control site 1, Upstream (A) and Downstream (B) PMP, comparison between January 2021 (left) and January 2025 (right) surveys

3.2.7 On-site Control Site 2

As in the January 2021 survey, sedimentation and erosion was not observed at this site. Moderately turbid water with a high water flow was recorded at this PMP location Plate 8). No fires have impacted this site.

A Upstream

B Downstream

Plate 8. On-site control site 2, Upstream (A) and Downstream (B) PMP, comparison between January 2021 (left) and January 2025 (right) surveys

3.2.8 On-site Control Site 3

No instream sedimentation or erosion was recorded during the January 2025 survey. (Plate 9). Visually, ground cover and biomass is back to those levels prior to the uncontrolled 2022 fires, refer to section 3.3. There is good cover along the entire riparian zone.

A Upstream

B Downstream

Plate 9. On-site control site 3, Upstream (A) and Downstream (B) PMP, comparison between January 2021 (left) and January 2025 (right) surveys

3.2.9 Off-site Control Site 1

There was no obvious erosion or sedimentation. Water levels in the creek and ponds was relatively low due to some dryer days prior to the survey (Plate 10). There was obvious signs of fire in recent months (October 2024[1]) The latest fire appears to be a high intensity uncontrolled fire and has significantly reduced the groundcover within and surrounding the creekline, refer to section 3.3.

A Upstream

Plate 10: Off-site control site 1, Upstream (A) and Downstream (B) PMP, comparison between January 2021 (left) and January 2025 (right) surveys

[1] As confirmed by local Rural Fire Brigade chief.

3.2.10 Off-site Control Site 2

No in-stream sediments, erosion or hydrocarbons were noted in either monitoring sites. Water flows were low and pools had moderate amounts of water. Grass cover was sparse in areas indicating possible fires in late 2024, refer to section 3.3.

A Upstream

B Downstream

Plate 11: Off-site control site 2, Upstream (A) and Downstream (B) PMP, comparison between January 2021 (left) and January 2025 (right) surveys

3.2.11 Off-site Control Site 3

moderate turbidity was observed at both PMP locations during the current survey compared to low turbidity observed previously. However, during the current survey significantly greater waterflow was present (Plate 12). No evidence of erosion was recorded at either PMP. Recent fire has significantly reduced the groundcover surrounding the creekline, refer to section 3.3.

A Upstream

B Downstream

Plate 12: Off-site Control Site 3 (upstream PMP) comparison between January 2021 (left) and January 2025 (right) surveys

3.3 Impacts of Fire

Other influence impacting the microhabitat of the MBF have been fire. This section provides further details of fires that have impacted the sites over the last three years. Table 2 provides information on those sites impacted by fires and the approximate dates over the last 2-years.

Table 2. Sites which have been impacted by fire over the last five years and approximate dates are included.

SITE	Fire & Date 2020	Fire & Date 2021	Fire & Date 2022	Fire & Date 2023	Fire & Date 2024
Impact Site 1	None	None	None	None	None
Impact Site 2	None	None	None	None	None
Impact Site 3	None	None	None	August 2023[2]	None
Impact Site 4	Unsure[5]	None	None	August 2023[2]	None
Impact Site 5	Unsure[5]	None	Nov 2022[1]	None	None
On-site Control Site 1	None	None	None	None	None
On-site Control Site 2	None	None	None	None	None
On-site Control Site 3	None	None	Nov 2022[1]	None	None
Off-site Control Site 1	Unlikely[4]	Unlikely[4]	None	Late 2023[3]	Oct 2024[3]
Off-site Control Site 2	Unlikely[4]	None	None	Late 2023[3]	None
Off-site Control Site 3	Unlikely[4]	None	None	Late 2023[3]	None

1. Uncontrolled fire starting off-site during November 2022.
2. Controlled low-intensity fire from scheduled burns during August 2023.
3. Cause of fires unknown. Fires occurred during late 2023.
4. Photographic evidence and site descriptions suggest no fires.
5. These sites were not assessed until early 2022.

Some representative Images depicting the changes to each site resulting from fire can be viewed in Plates 13 to 19. Those sites impacted in fire typically resulted in a significant decline in creek ground cover.

3.3.1 Fire - Impact Site 3

There was a significant decline in groundcover in the top portion of the MBF habitat. Approximately 80% of cover was removed from the seepage zone prior to the proper creekline. Plate 13, depicts the extensive loss of cover after the August 2023 controlled burns. Approximately 50% of cover has returned to the site but it still lacks clumps of moist leaf litter that the frogs like to brood amongst. Prior to the fire there was a large proportion of MBF within this impacted seepage zone.

February 2022, before burn

September 2023, one month after burn

January 2024, 4 months after burn

January 2025

Plate 13 Impact Site 3, Impacts of the August 2023 controlled burns as demonstrated by the September 2023 image. Cover beginning to return several months later and January 2025 indicating that much of the groundcover biomass has returned.

3.3.2 Fire - Impact Site 4

During the August 2023 controlled burn there was a significant decline in groundcover in the top portion of the MBF habitat. Nearly all cover was impacted within the seepage zone prior above creekline. Plate 14, September 2023 image depicts the extensive loss of cover after the August 2023 controlled burns. Prior to the fire, February 2022, a large proportion of the MBF population was recorded within the impacted seepage zone. Observations from the latest survey, January 2025, recorded that most of the ground cover has returned to levels prior to the fire but MBF abundance remains low.

February 2022, before burn

September 2023, one month after burn

January 2024, 4 months after burn

January 2025

Plate 14 Impact Site 4, Extensive fire damage within the seep zone, September 2023. Cover showing good signs of returning by January 2024 and furthermore in January 2025.

3.3.3 Fire - Impact Site 5

Impact Site 5 was disturbed by uncontrolled fire during November 2022. There was a significant decline in groundcover in the top portion of the MBF habitat as depicted in Plate 15. Two months after the fire, approximately 30% of groundcover had returned. By January 2024, 15 months after the fire event, 90 % of ground cover had returned, although groundcover biomass was less than before the fire event. Observations from the January 2025 survey indicate that most of the ground cover and biomass is comparable to those prior to the 2022 fires.

January 2022, before burn

December 2022, one month after burn

January 2023, 2 months after burn

January 2024, 14 months after burn

January 2025, 26 months after fire.

Plate 15 Impact Site 5, December 2022 is one month post fire. Some groundcover had returned by January 2023 and continues to improve through to January 2025.

3.3.4 Fire – On-site Control Site 3

There was a significant decline in groundcover in the top portion of the MBF habitat and along most of the creekline. Approximately 80% of cover was removed from the seepage zone. Plate 16, depicts the extensive loss of cover after the November 2022 uncontrolled burns. January 2025 survey indicates that most cover has returned to the site along with grass and leaf litter biomass. Annual MBF abundance report indicates that frog numbers have increased.

February 2022, before burn

December 2022, one month after burn

January 2024, 14 months after burn

January 2025

Plate 16 On-site Control Site 3, Impacts of the August 2023 controlled burns as demonstrated by the September 2023 image. Cover beginning to return several months later and continues improving through to January 2025.

3.3.5 Fire – Off-site Control Site 1

There was a significant decline in groundcover along most of the creekline. Approximately 70% of cover was removed throughout the creekline during the late 2023 fire, Plate 17. Again, in October 2024 a high intensity fire removed at least 80% of groundcover throughout the creekline.

January 2022, before burn

January 2023, before burn

January 2024, several months after burn

January 2025, 4 months after fire.

Plate 17 Off-site Control Site 1, Impacts of the late 2023 fires as demonstrated by the poor ground cover in January 2024 image. While the January 2025 image doesn't capture the poor ground cover, another high-intensity fire destroyed much of the ground layer during October 2024.

3.3.6 Fire – Off-site Control Site 2

There was a significant decline in groundcover along most of the creekline during the late 2023 fire. Approximately 70% of cover was removed throughout. Plate 18, depicts the changes over time. Approximately 40% of cover had returned since the late 2023 fires. The January 2025 image indicates that there was a fire during late 2024. Grass and leaf biomass are much lower than that observed prior to the fires.

January 2022, before burn

January 2023, before burn

January 2024, several months after burn

January 2025

Plate 18 Off-site Control Site 2, Impacts of the late 2023 fires as demonstrated by the January 2024 image. January 2025 image indicates another fire may have gone through the site during late 2024.

3.3.7 Fire – Off-site Control Site 3

There was a significant decline in groundcover along most of the lower two-thirds of the creekline. Approximately 70% of cover was removed during the 2023 fires. Plate 19, The lack of groundcover observed during the January 2025 survey and fresh fire scars, suggest there was another fire during late 2024.The grass and leaf biomass is significantly lower than that observed prior to the fires.

January 2022, before fire

January 2023, before fire

January 2024, several months after burn

January 2025

Plate 19 Off-site Control Site 3, Impacts of the late 2023 fires as demonstrated by the January 2024 image. January 2025 image and the sparse ground cover indicates another fire may have gone through the site during late 2024

3.4 Supporting reports

Pursuant to the EPBC approval conditions and Magnificent Brood Frog Monitoring program, (E2M, 2021a) the following MBF relative abundance survey was completed concurrently with the microhabitat survey

- Magnificent Brood Frog Monitoring Program—Fifth Annual Abundance Monitoring Report – January 2025, (E2M Pty Ltd, 2025).

The annual relative abundance report and this annual microhabitat report provide a detailed examination of the MBF microhabitat and how it may play an integral part population dynamics within the different MBF populations being monitored.

3.5 Disturbance Intercept Surveys

Surveys were completed concurrently with microhabitat surveys at all impact sites within the disturbance intercept. That is, where the project interface has a direct or potential impact on downstream MBF populations. These sites were regularly monitored during the construction phase. This is not a post-construction requirement but as due diligence and best interest for the MBF populations, a rapid assessment annually, will be maintained until any outstanding remedial activities and rehabilitation objectives have been closed. The outcomes of the rapid disturbance intercept assessment are presented below.

3.5.1 Disturbance Intercept - Impact Site 1

Concentrated water flows at the culvert discharge point are still obvious. This is creating ongoing erosion within the downstream section of the MBF habitat. While there was evidence of erosion, at the culvert outlet prior to construction, additional waterflow is directed from roadside drainage to the discharge point post construction activities. The MBF population above the disturbance intercept is rapidly increasing and the increased waterflows downstream are possibly preventing the establishment MBF below the disturbance intercept.

There is a lack of groundcover within the disturbance footprint on the northern side of the road. Some sheet and minor gully erosion is still evident.

Plate 20. Rehabilitation adjacent to disturbance intercept at Impact Site 1 needs improved ground cover.

3.5.2 Disturbance Intercept - Impact Site 2

While the MBF habitat downstream of the disturbance footprint is showing no negative impacts from the project there is some sedimentation building-up within the sediment trap, Plate 21. Rehabilitation along the roadside offers good cover and species diversity with minimal weeds. Rehabilitation is expected to continue improving through this wet season.

Plate 21: Sediments building up within the large sediment trap at Impact Site 2

3.5.3 Disturbance Intercept - Impact Site 3

The most obvious concern is the increased waterflows at the discharge into the MBF habitat. This has caused some in-creek erosion. Increased waterflows are a consequence of altered waterflow dynamics. Water previously flowing westward from the road between WTG19 and WTG 21 is now captured by roadside drainage and directed into the MBF habitat.

Rehabilitation along the western side of the access track has improved with adequate ground cover and species diversity. There are a significant number of priority weeds along the eastern side of the roadside verge between WTG20 and the disturbance intercept.

3.5.4 Disturbance Intercept - Impact Site 4

Waterflow dynamics, from visual observations, appear to have not changed since project disturbance. Ground cover and species richness have improved considerably over the last 12 months within the surrounding disturbance.

3.5.5 Disturbance Intercept - Impact Site 5

Rehabilitation is excellent within the adjacent disturbance footprint, with minimal weeds observed. While waterflows appear to be unaffected by the project civil works at the Feeder Creek intercept there appears to be an increase in waterflow at the disturbance intercept for the Main Creek resulting in some erosion within the creek. It is not clear why watershed and waterflows have changed.

4 Discussion and recommendations

The January 2025 annual microhabitat photo monitoring survey was completed between 9 and 16 January 2025. There was good MBF breeding rainfalls prior to and during the survey.

Impact Site 1

Habitat conditions have not changed for the Upstream and Midstream monitoring sites compared to baseline results. The MBF habitat above the disturbance area is in excellent condition. The Downstream site continues to experience some levels of erosion at the discharge point. As previously discussed, there was historical erosion at this point resulting from changed flows generated by the original farm access road. However, there would be some benefit in adding a culvert/floodway uphill along the access road to divert water shed from the road and upper catchment, to mitigate the impacts of concentrated waterflows at the discharge point. Further improvements to rehabilitation within the disturbance footprint adjacent to the creek would help mitigate sediment and erosion.

Impact Site 2

The habitat within Impact Site 2 is in excellent condition. There are no visible signs of MBF habitat being impacted by project activities. Some sediment is building up within the sediment trap at the disturbance intercept and would benefit from maintenance during the 2025 dry season.

Impact Site 3

The ground cover, post the 2023 fires, has largely returned within the MBF habitat.

While there is excellent sediment and erosion controls within the disturbance footprint there remains increased waterflows from the increased catchment, directing concentrated waterflows to the creek. The increased flows are causing some erosion within the MBF habitat. As previously discussed, waterflows could be reduced by the addition of a culvert/floodway uphill along the main access track, diverting a significant amount of water westward away from Impact Site 3. While population numbers are similar to the previous abundance survey, (E2M Pty Ltd, 2024), there are concerns that numbers may decrease resulting from the increased waterflow into this system.

Impact Site 4

There is no evidence of erosion or sedimentation within this site as a result of wind farm activities. While ground cover has largely returned at this site after the 2023 controlled burn MBF relative abundance remains low as discussed in the 2025 annual relative abundance report, (E2M Pty Ltd, 2025).

Impact Site 5

Ground cover within the riparian zone has almost returned to those levels prior to the uncontrolled fire in November 2022. There is no evidence of sedimentation within this system, but erosion is evident in some sections of the creek. Further desktop and/or field investigation is advised to determine if waterflows from the disturbance footprint into the creek have been altered.

General notes

There is no sign of flora or fauna pest impacts at any of the monitoring sites within the wind farm site. Previously, On-site Control Site 3 was noted as having some feral pig damage. There was no evidence of feral pigs throughout the entire wind farm site.

Further impacts from fire events has been discussed within the 2025 annual MBF relative abundance report (E2M Pty Ltd, 2025), along with recommendations to mitigate these impacts.

5 References

E2M. (2021a). *Kaban Green Power Hub – Fauna Management Plan* (Revision 9).

E2M. (2021b). *Magnificent Brood Frog Monitoring Program—Baseline Survey*.

E2M. (2022). *Magnificent Brood Frog Monitoring Program—Second Annual Monitoring Report*.

E2M Pty Ltd. (2024). *Magnificent Brood Frog—Fourth Annual Abundance Monitoring*.

E2M Pty Ltd. (2025). *Magnificent Brood Frog—Fifth Annual Abundance Monitoring Survey—January 2025*.

Appendix A Impact sites habitat photos

A.1 Impact Site 1 – Upstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.2 Impact Site 1 – Midstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.3 Impact Site 1 – Downstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.4 Impact Site 2 – Upstream

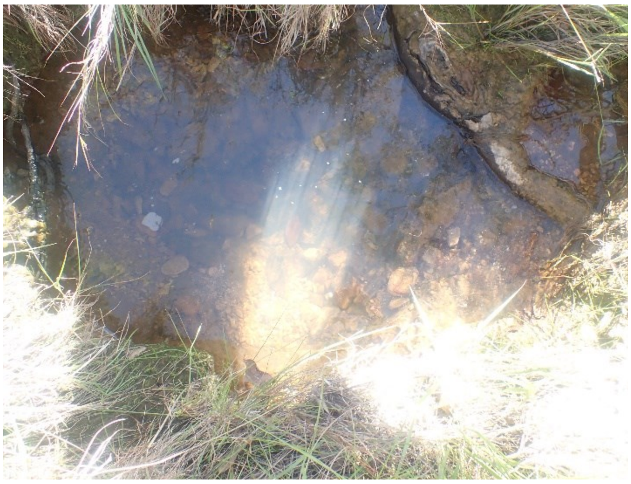

Pond context photograph


Surface photo


Upstream photograph


Downstream photograph

A.5 Impact Site 2 – Downstream



Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.6 Impact Site 3 – Upstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.7 Impact Site 3 – Downstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.8 Impact Site 4 – Upstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.9 Impact Site 4 – Downstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.10 Impact Site 5 – Upstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.11 Impact Site 5 – Upstream (feeder creek)

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

A.12 Impact Site 5 – Downstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

Appendix B On-site control sites habitat photos

B.1 On-site Control 1 – Upstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

B.2 On-site Control 1 – Downstream

Pond context photograph

Surface photo

Upstream photograph

Downstream photograph

B.3 On-site Control 2 – Upstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

B.4 On-site Control 2 – Downstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

B.5 On-site Control 3 – Upstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

B.6 On-site Control 3 – Downstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

Appendix C Off-site control sites habitat photos

C.2 Off-site Control 1 – Upstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

C.3 Off-site Control 1 – Downstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

C.4 Off-site Control 2 – Upstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

C.5 Off-site Control 2 – Downstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

C.6 Off-site Control 3 – Upstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

C.7 Off-site Control 3 – Downstream

Pond context photograph

Surface photograph

Upstream photograph

Downstream photograph

Appendix M: Greater glider annual abundance report

Greater Glider Monitoring Program - Fourth Annual Survey, November 2024

Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust

Level 21, 570 George Street, Sydney NSW 2000

Document Management

Rev.	Issue Date	Description	Author (s)	Approved	Signature	External Review
A	19/11/2024	Issue For Review	Laura Dee	Dean Jones		Paul Suter (Neoen)
0	20/11/2024	Issue For Use	Laura Dee	Dean Jones		

Document Reference: X:\JOBS\~2021\QEJ21046\DELIVERABLES\4. FY25 Jul-Dec\2. Greater Glider Monitoring-OAMP_OCT24\GG Monitoring Nov 24\QEJ21046_GreaterGlider_2024_MonitoringReport_Rev0.docx

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Definitions

Term	Definition
Approval Conditions	The conditions pursuant to the EPBC Act Approval (EPBC2018/8289)
Greater glider	In the context of this report, we refer to the northern greater glider species, *Petauroides minor*.
Habitat	Greater glider habitat is characterised by connected eucalypt forests and woodlands containing large trees >30cm, for foraging
Kaban Wind Farm Pty Ltd	Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust
The Project	The Kaban Green Power Hub
The Kaban site	The areas of Lot 1 on RP735194, Lot 33 on CWL374, Lot 35 on CWL391, Lot 2 on RP735194 and Lot 34 on CWL374 which contain turbines.
Threatened species	Extinct (EX), extinct in the wild (XW), critically endangered (CE), endangered I, vulnerable (V) or conservation dependent (CD) under the *Environmental Protection and Biodiversity Conservation Act 1999* or extinct in the wild (PE), Endangered, Vulnerable or Near Threatened (EVNT) under the *Nature Conservation Act 1992*.

Abbreviations

Term	Definition
DAWE	Department of Agriculture, Water and the Environment
E2M	E2M Pty Ltd
EOP	Environmental Offsets Policy
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
Ha	Hectare
KPGH	Kaban Green Power Hub
MNES	Matters of National Environmental Significance
OAMP	Offset Area Management Plan
RE	Regional Ecosystem

1 Introduction

1.1 Project Overview

The Kaban Green Power Hub (KGPH), developed by Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm Trust (Kaban Wind Farm Pty Ltd), received *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval in April 2020 (EPBC 2018/8289). The KGPH (also referred to as 'the Project') is a fully operational wind farm consisting of 28 turbines as well as ancillary infrastructure including a substation, temporary and permanent meteorology masts, compounds/facilities, laydown areas, access tracks and underground cabling.

The Project was designed to avoid and mitigate impacts on Matters of National Environmental Significance (MNES), however, the KGPH will have significant residual impact on 61.2 ha of greater glider (northern) (*Petauroides minor*) (greater glider), herein referred to as greater glider, habitat (E2M, 2019). In accordance with the EPBC Act Environmental Offsets Policy (EOP) and the Commonwealth Department of Agriculture, Water and the Environment (DAWE) Approval Conditions, compensatory offsets are required.

A suitable Offset Area encompassing approximately 307.6 ha of greater glider habitat was identified adjacent to, but outside of the Project disturbance footprint (Figure 1). The habitat is managed according to the recommendations detailed in the Offset Area Management Plan (OAMP) (E2M Pty Ltd, 2021).

To monitor and guide effectiveness of the OAMP over time, greater glider monitoring surveys are conducted within the Offset Area annually for the first five years and then once every five years thereafter for the life of the offset.

1.2 Scope and Objectives

E2M was commissioned by Kaban Wind Farm Pty Ltd to conduct the fourth annual survey (2024) for the Greater Glider Monitoring Program within the Offset Area. The objective of the survey is to monitor for the continued presence of the greater glider over time. The scope of the survey includes:

- Targeted greater glider surveys within three established transects and other incidental finds within the Offset Area in accordance with Commonwealth and State Survey methodology; and
- The baseline dataset and the dataset of future monitoring surveys will be used to guide the effectiveness of the OAMP and ensure ongoing compliance with the Approval Conditions.

1.3 Site Description

Seven disjunct areas within three contiguous properties collectively from the Offset Area (Figure 2).

The three properties (formally 1RP735194, 2RP735194 and 32WL254) are largely characterised by remnant vegetation composed of mixed eucalypt woodlands on metamorphic rock. Properties 1RP735194 and 2RP735194 are both bound by Bluff State Forest to the south and west, with rural properties to the north and east (Figure 2). Property 32CWL254 is bound by Ravenshoe State Forest to the east and rural properties to the north, south and west (Figure 2). This property also contains a small (0.65 ha) abandoned mango orchard in the north-east corner.

1.4 Improvements to Offset Areas

Since the first year of offset establishment, several important steps to improve greater glider habitat, within and adjacent to offset areas, have been conducted. These are:

- Installation of ten (10) greater glider nest boxes in Offset Area 2, Figure 2
- Removal of cattle from all offset areas
- Annual weed monitoring and active weed treatment program
- Replacing the top barbed wire with barbless wire for all internal fences and most boundary fences
- Development of a project Fire Management Plan to ensure timely ecological burns are conducted; and
- Controlled ecological burns in offset areas, performed in 2022,2023 and 2024.

1.5 Survey Limitations

The Kaban Green Power Hub project is situated on historic military training grounds containing unexploded ordinance. As such, all survey effort was conducted from pre-existing tracks due to the risk of potential interaction with unexploded ordinance away from tacks.

Figure 1: Project Location

Figure 2 Offset Areas Locations

2 Methods

2.1 Targeted Greater Glider Survey

Spotlight surveys are a standard method used to survey nocturnal arboreal fauna, including greater gliders (DSEWPaC, 2011). In accordance with the methods prescribed by approved OAMP (E2M Pty Ltd, 2021), three spotlighting transects, with a minimum length of 500 m, were established within the Offset Area (Figure 2). These transects are 'permanent transects' to be surveyed at each annual monitoring event.

Three permanent survey transects were established based on the:

- Results of previous Offset Area survey
- Habitat suitability and representation of Offset Areas
- Spatial positioning (i.e. spread across the different Offset Areas)
- Permanent access tracks with year-round access; and
- Sites that have been examined for or have no history of unexploded ordinance.

Each permanent transect was surveyed over two consecutive nights on the 1st and 2nd of November 2024 commencing thirty minutes after sunset. Each transect was surveyed for a minimum of 60 person minutes. Incidental greater glider observations were also made off transect within the Offset Area. The length of each permanent transect surveyed is listed below:

- Transect 1: 1238 m
- Transect 2: 1737 m; and
- Transect 3: 1802 m.

2.2 Impact Triggers

Section 7.5.2.1 of the OAMP ((E2M Pty Ltd, 2021) provides details of triggers for corrective actions concerning greater glider monitoring, including:

- The absence of the species across all monitoring sites in a single monitoring event; and/or
- The absence of the species at a single monitoring site for three consecutive years

On the completion of the survey, an assessment against each trigger will be undertaken and presented in the results section.

Figure 3 Greater glider monitoring sites

3 Field results

3.1 Survey Conditions

The Greater Glider Monitoring Program – Fourth Annual Survey was conducted during the early wet season (1st – 2nd of November) by two Suitably Qualified Ecologists. The weather conditions during the two-night survey were optimal. Temperatures during the day ranged between 25°C and 31°C, with night temperatures between 13°C and 18°C. A total of 31 mm rain fell within the eight weeks prior to the survey, recorded by the Ravenshoe Alert station (031200).

3.2 Greater Glider Observations

Two greater gliders (Image 1). were observed within Transect 3(Figure 4)., while Transects 1 and 2 recorded zero greater gliders across the 2 survey nights.

Image 1 Greater gliders recorded during survey

The two greater glider observations were recorded together in a large *Syncarpia glomulifera* tree. All data including the dates, times, coordinates, transect length and tree species for each individual was recorded and can be found in Table 1. A comparative table for the 2021, 2022, 2023 and 2024 season greater glider monitoring results has been including in Table 2.

Table 1: 2024 Greater Glider spotlighting records

Transect	Date and Time of record	Number of individuals	Coordinates	Tree species
T3	2/11/2024 19:45	1		*Syncarpia glomulifera*
T3	2/11/2024 19:45	1		*Syncarpia glomulifera*

Table 2: Comparative Greater Glider records for surveys 2021, 2022, 2023 and 2024

Transect	Greater Glider observations 2021	Greater Glider observations 2022	Greater Glider observations 2023	Greater Glider observations 2024
T1	1	1	1	0
T2	3	1	2	0
T3	3	3	2	2

3.3 Impact triggers

An assessment against the triggers, detailed in the OAMP, was performed and the results are detailed in Table 3.

Table 3: Assessment against impact triggers

Trigger Item	Result
1. The absence of the species across all monitoring sites in a single monitoring event	**No trigger**: The species was recorded within one monitoring site.
2. The absence of the species at a single monitoring site for three consecutive years	**No trigger:** All sites recorded the presence of greater glider over the last three years.

Figure 4 Greater glider records

4 Discussion and Conclusion

The purpose of these surveys is to monitor the ongoing presence and/or absence of greater gliders within the offset areas and to measure the results against the impact trigger items detailed within the OAMP and perform corrective actions, if necessary. Greater gliders were observed in all three permanent spotlighting transects during the 2021, 2022 and 2023 surveys. However, for the first time transects T1 and T2 had no greater glider records during this survey.

While no greater gliders were observed within T1 and T2 during the 2024 survey, no impact triggers were activated and no corrective actions needed. However, ongoing management of the offset should be continued to assist in improving greater glider habitat within the Offset Areas.

It is unclear why two transects recorded zero greater glider during the latest survey, however, it is not surprising as greater glider abundance is typically low and the paucity of these animals can make detection difficult. A general note was also made of the dry landscape and the extended dry period preceding the survey. Greater gliders rely on maintaining body fluids and nutriment through the consumption of leaves containing adequate moisture and protein levels,(Kavanagh & Lambert, 1990) and (Wagner et al., 2020). As such, greater gliders maybe preferentially feeding, away from transect lines, on eucalypts containing higher levels of leaf moisture and/or protein, limiting the opportunity for detection.

5 References

DSEWPaC. (2011). *Survey guidelines for Australia's threatened mammals*. Department of Sustainability, Environment, Water, Population and Communities (SEWPaC). https://www.awe.gov.au/sites/default/files/documents/survey-guidelines-mammals.pdf

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Wagner, B., Baker, P., Stewart, S., Lumsden, L., Nelson, J., Cripps, J., Durkin, L., Scroggie, M., & Nitschke, C. (2020). Climate change drives habitat contraction of a nocturnal arboreal marsupial at its physiological limits. *Ecosphere*, *11*(10), 1–22.

Appendix N: Offset area weed management report

30 April 2025

ATTN: Paul Suter
Kaban Wind Farm Pty Ltd as trustee for the Kaban Wind Farm
Level21/570 George Street
Sydney
NSW 2000

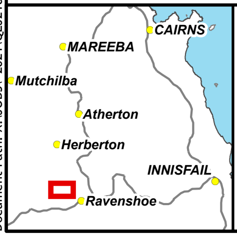
Dear Paul,

KABAN GREEN POWER HUB: OFFSET AREA WEED MANAGEMENT UPDATE – APRIL 2025

This letter report provides details of the latest weed management program within the offset areas as required by the Offset Area Management Plan (E2M Pty Ltd, 2021). The latest weed treatment program took place during December 2024 through to March 2025 and focused on treating environmental weeds within offset areas to reduce overall abundance and mitigate the environmental risks to the threatened species habitats within. Threatened species identified during the Environmental Impact Statement requiring offsets were the magnificent brood frog and the greater glider. The offset areas for these species are identified in Figure 1.

As identified in Figure 1 there are seven (7) disjunct offset areas requiring management actions as stipulated within the Offset Area Management Plan (E2M Pty Ltd, 2021). One of these management actions is ongoing weed management to remove priority weeds[1] and regulated weeds[2] for the ongoing improvement of the offset area habitat quality. Weed treatment within the offset areas commenced during the 2022 wet season and treatments have been completed every year since. The weed treatment program has included several treatment techniques including foliar herbicides, basal herbicides, manual pulling and utilising controlled burns for weed reduction. Herbicide treatment typically occurs during the wet season when weeds are actively growing maximising kill efficiencies and minimising the likelihood of seed production. Controlled burns occur during the most appropriate times from June through to August by ecological burn specialists, Firelands Consultancy Pty Ltd.

[1] Priority weeds: in the context of this report priority weeds are those weeds which pose a threat to the habitat quality features for those threatened species identified on-site.
[2] Regulated weeds: are those recognized by the local, state and federal government that require management strategies to prevent the spread of these species.



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Kilometres

Coordinate System: GCS GDA 1994

Notes:
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Rev	Description	Drawn	Approved	Date
0	Issued for Use	DL	DJ	22/05/2025
A	Issued for Review	HM	DJ	14/05/2025

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FIGURE 1: KABAN GREEN POWER HUB - OFFSET AREAS

Offset Area Annual Report
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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1. 2024 to 2025 Offset Area Weed Treatment Program

Two priority areas were identified for weed treatment during this wet season, within two offset areas. These were:

- The cattle yards adjacent and to the east of Offset Area 1; and
- The north-eastern corner of Offset Area 5.

Cattle yards adjacent to Offset Area 1

The cattle yards and the cleared surrounds were identified as a significant source of priority and regulated weeds. This infestation contains high densities of the regulated giant rat's tail grass (*Sporobulus pyramidalis*) and grader grass (*Themeda quadrivalvis*) a priority weed. The proximity of this weed population to farm tracks leading into the adjacent offset areas pose a significant risk of further spread of weeds by vehicles and animals traversing through this infestation. This area of high-density weeds occupies approximately one (1) hectare, see Figure 2.

Weed treatment commenced in March 2024 by herbicide treatment along the cattle yard access tracks prior to contractor vehicles accessing the site for controlled burn activities. The controlled burns within this weed infestation took place during August 2024 and included the adjacent Offset Area 1. Following the controlled burn, and during the weed growing season, herbicide was applied to any reshooting or newly growing weeds, in and around the cattle yards. Herbicide treatment occurred during January 2025. Plate 1 series depicts the weed infestation in and around the cattle yards taken from February 2024 through to the latest weed treatment during January 2025.

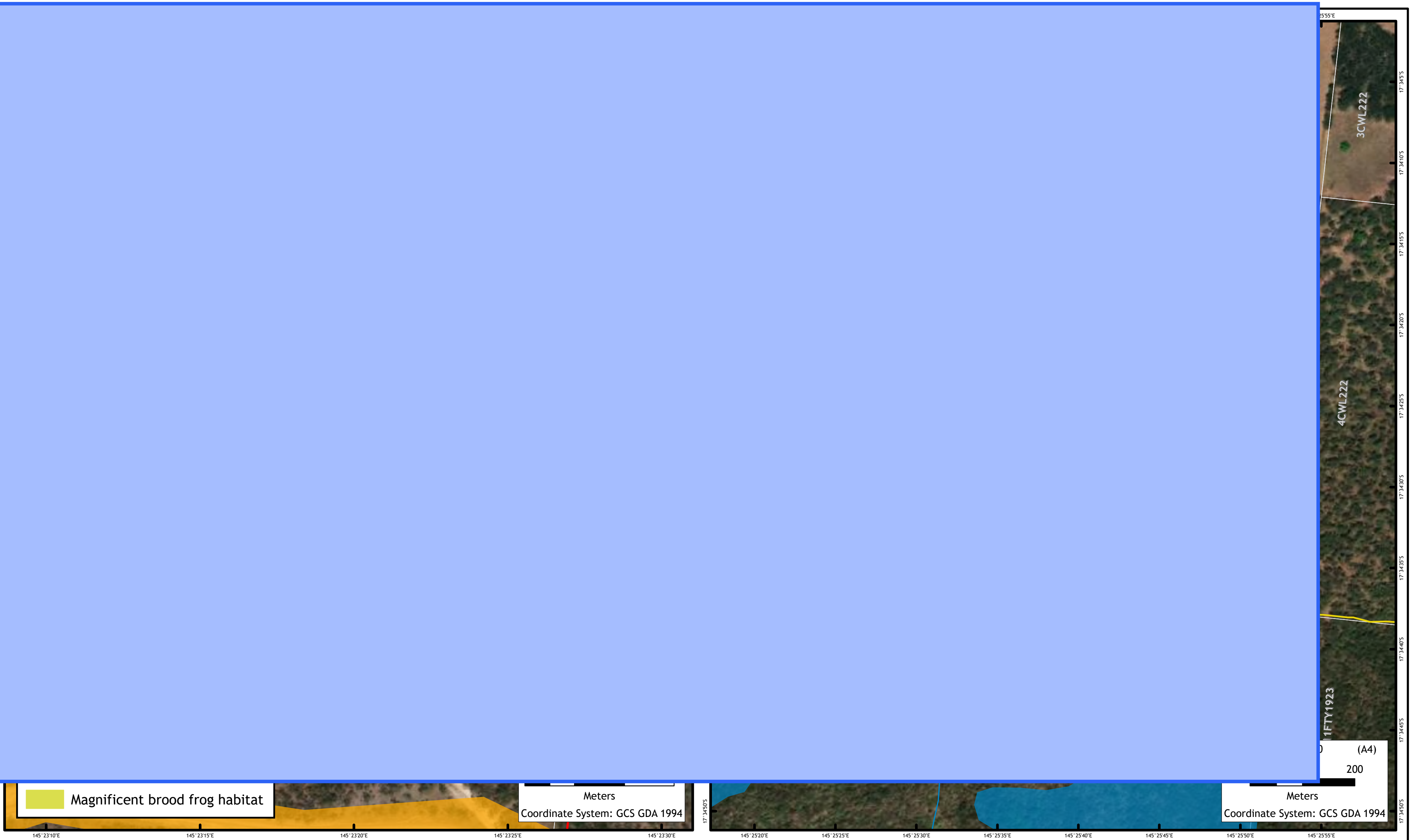
February 2024: Significant weed infestation in and around cattle yard.

May 2024: Weed biomass along track was significantly reduced from herbicide treatment prior to August 2024 controlled burns.

August 2024: Firelands Consultancy controlled burns. Southern side of yards

February 2025: Weed biomass has been significantly reduced after the August 2024 controlled burns and herbicide treatment in January 2025

Plate 1: Images of cattle yard weed infestation treatment over time.



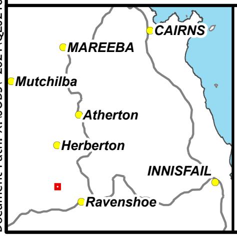


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FIGURE 2: LOCATION OF OFFSET AREA WEED TREATMENT - 2024 TO 2025

Offset Area Weed Management Update
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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Offset Area 5 weed treatment campaign 2024 to 2025

Offset Area 5 was treated with herbicide on seven different days during January to March 2025. While weed biomass has been significantly reduced by controlled burns and several herbicide treatments since 2022, there remains significant weed infestations that will require ongoing weed treatment. The latest weed treatment trails are provided in Figure 2, and a list of the more dominant weeds, treated and remaining, within Offset Area 5 are detailed in Table 1.

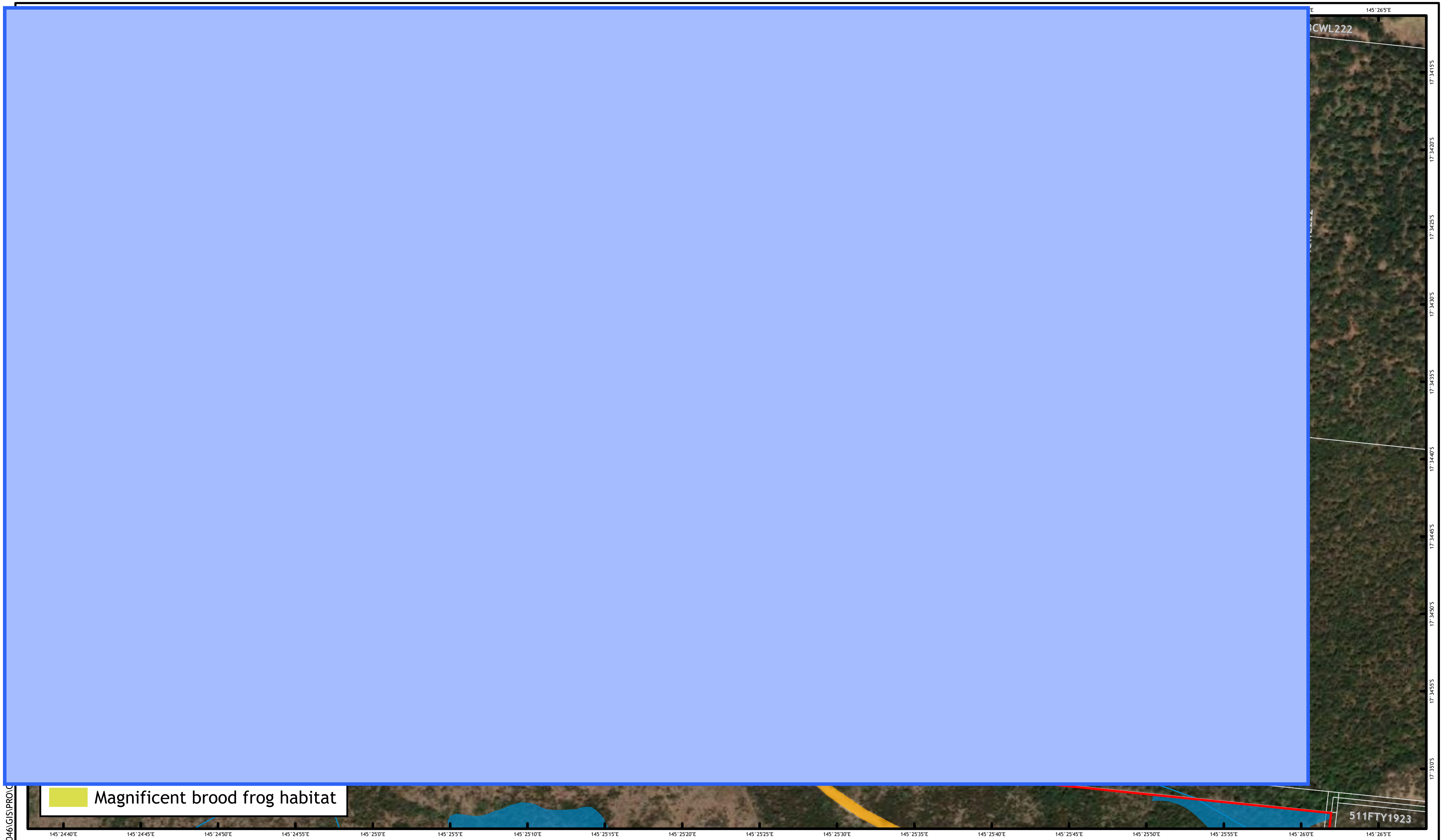
Table 1: List of weed species present and treated within Offset Area 5 during 2025

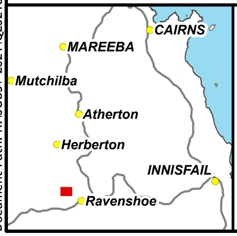
Common name	Species name	Biosecurity classification
Blue billygoat weed	*Ageratum houstonianum*	NA
Cobbler's peg	*Bidens pilosa*	NA
Devil's fig	*Solanum torvum*	NA
Greenleaf desmodium	*Desmodium intortum*	NA
Giant rat's tail grass	*Sporobolus pyramidalis*	1
Lantana	*Lantana camara*	1, 2
Salvia (Cat's piss)	*Salvia sp.*	NA
Signal grass	*Urochloa decumbens*	NA
Silverleaf desmodium	*Desmodium uncinatum*	NA
Tall fleabane	*Conyza sumatrensis*	NA
Tobacco bush	*Solanum mauritianum*	NA

1. Listed as Restricted under the Nature Conservation Act 1999.
2. Weed of national significance, prescribed by the Australian Government

Sites for monitoring the ongoing success of weed treatment

Five sites were chosen within offset area 5 for the long-term monitoring of weed control, see Figure 3. These monitoring sites were installed to help establish what combination of treatments will be the most effective in reducing weed biomass and cover but promote the re-establishment of native shrubs, forbs and grasses. It is anticipated that herbicide treatment, followed by low intensity controlled burns, will help reduce weed infestations and allow native forbs and grasses to repopulate. Each survey site is marked centrally with a steel post within a 20 x 20 metre monitoring quadrant. Native and weed species composition are recorded along with percent ground cover occupied by the two plant groups. Images of each site were recorded from the central post in a north, south, east and west direction. Images are provided in Appendix A along with tabulated observations for each site.





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0	Issued for Use	DL	DJ	22/05/2025
A	Issued for Review	PR	DJ	29/04/2025

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FIGURE 3: OFFSET AREA 5 WEED SURVEY POINTS

Offset Area Weed Management Update
Kaban Green Power Hub

Map Number	Job Number	Rev
1 of 1	QEJ21046	0

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Recommendations

It is recommended that the following practises be maintained to manage, the existing and any future weed infestations, within the offset areas.

- Continue to monitor and map any observations of priority weeds[3] throughout all offset areas.
- Prioritise the treatment of weed infestations that present the most significant threats to the site and threatened species habitat.
- Use a combination of weed control management strategies during the most appropriate times to maximise weed treatment success.
- Utilise survey monitoring points to track the success of weed treatment programs and to help establish what combination of treatments are most effective.

Kind Regards,

Dean Jones
Principal ecologist

[3] Priority weeds: are any weeds declared by local, state and federal agencies along with any weeds that present a significant risk to threatened species habitat.

Appendix A Weed Monitoring Site Images

A.2 Survey Point 1

North

South

East

West

Survey Date	6 March 2025	
Co-ordinates	-17.57282	145.42771
Total percent groundcover	Percent weed cover	Percent native cover
90	95	5
	Weed species	Native species
	Desmodium uncinatum, *Conyza sumatrensis* *Urochloa decumbens* *Lanatana camara* *Bidens pilosa* *Salvia sp.* *Solanum torvum*	*Imperata sp.* *Pteridium esculentum* *Mnesithea rottboellioides*

	Solanum mauritianum *Desmodium intortum* *Stylothanthes scabra* *Ageratum houstonianum*	

A.3 Survey Point 2

North

South

East

West

Survey Date	6 March 2025	
Co-ordinates	-17.57276	145.42709
Total percent groundcover	Percent weed cover	Percent native cover
90	95	5
	Weed species	Native species
	Conyza sumatrensis *Urochloa decumbens* *Lanatana camara* *Bidens pilosa* *Salvia sp.* *Solanum torvum* *Solanum mauritianum* *Desmodium intortum* *Desmodium uncinartum* *Stylothanthes scabra*	*Imperata sp.* *Mnesithea rottboellioides*

	Ageratum houstonianum	

A.4 Survey Point 3

North

South

East

West

Survey Date	6 March 2025	
Co-ordinates	[redacted]	
Total percent groundcover	Percent weed cover	Percent native cover
30	15	85
	Weed species	Native species
	Urochloa decumbens (dom) *Conyza sumatrensis* *Lanatana camara* *Bidens pilosa* *Salvia sp.* *Solanum torvum* *Solanum mauritianum* *Desmodium intortum* *Desmodium uncinartum* *Stylothanthes scabra*	*Imperata sp.* *Mnesithea rottboellioides* *Pteridium esculentum* *Eustrephus sp.*

	Ageratum houstonianum	

A.5 Survey Point 4

North

South

East

West

Survey Date	6 March 2025	
Co-ordinates	[redacted]	
Total percent groundcover	Percent weed cover	Percent native cover
80	90	10
	Weed species	Native species
	Urochloa decumbens *Conyza sumatrensis* *Lanatana camara* *Bidens pilosa* *Salvia sp.* *Solanum torvum* *Solanum mauritianum* *Desmodium intortum* *Desmodium uncinartum* *Stylothanthes scabra*	*Imperata sp.* *Mnesithea rottboellioides* *Lomandra sp.*

	Ageratum houstonianum	

A.6 Survey Point 5

North

South

East

West

Survey Date	6 March 2025	
Co-ordinates		
Total percent groundcover	Percent weed cover	Percent native cover
50	30	70
	Weed species	Native species
	Urochloa decumbens (70%) *Desmodium intortum (7%)* *Desmodium uncinartum (7%)* *Stylothanthes scabra (1%)* *Conyza sumatrensis (0.5%)* *Ageratum houstonianum (0.5%)*	*Imperata sp. (75%)* *Mnesithea rottboellioides (10%)* *Pteridium esculentum (1%)* *4 grass spp. (14%)*

Appendix O: Offset area ecological burn reports

S28 – A OPERATIONAL POST BURN REPORT

BURN NAME	**LMZ 01**	**Lot/Plan/s No.** (all approvals obtained) ☒ Yes	2/RP735194
Burn No.	LMZ 01		
Location	Kaban Green Power Hub	**Road Segment No.**	
LGA	Tablelands Regional	**Proposed Timing**	June – Sept 2024
Date burn started	31/08/2024	**Time**	08:45
Date burn/s deemed out	03/09/2024	**Time**	13:00
Permit #	F506578	**Complexity**	CR – 2 (74)

Incident Controller	Francis Hines	Fireland
	Name	Position

SITUATION – OUTCOMES

Area to be treated	32 ha	Percentage aim	<30% at landscape level.	Last fire	Unknown
Actual treated area	32 ha	Percentage achieved	<30% at landscape level. >90% coverage within unit.	Severity class	Moderate

MISSION – OUTCOMES

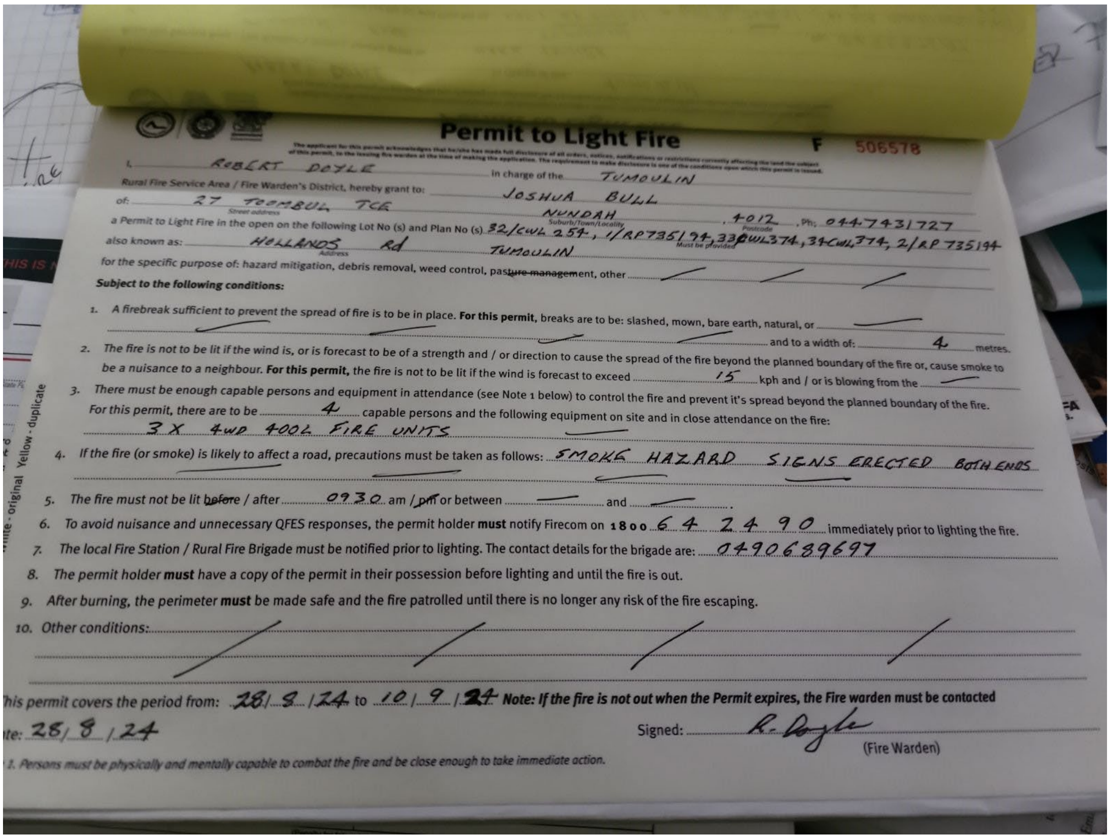
Aim & Objectives (Outline the general intent of the proposed burn and the specific objectives. Consider fuel load, fuel structure & mosaic effect)	• To reduce the likelihood of high-intensity wildfires that may impact site vegetation and species habitat suitability. • Improve the ecological condition of offset areas through implementation of appropriate fire regimes. • Implement Low to Moderate intensity planned burns with <30% coverage (at a landscape level).
Outcomes (Outline if the objectives were met, if not why not)	Objectives met. Desired coverage achieved at a landscape level through operational programming.
List recommendations (For burn area, may include fire trail works)	Access track W08 along the southern boundary of this burn needs to be repaired and maintained as trafficable on an ongoing basis as per the recommendations contained in the Landscape Fire Management Plan (April 2023). Condition of track W08 caused significant delays during burn implementation. Coupled with the late timing of this year's burn program likely contributed to the spot over that occurred during implementation.

EXECUTION – DETAILS				
Weather observations	Refer to: • Appendix 1 for weather forecast information. • Appendix 2 for weather observation data.			
Comments (List any weather conditions that significantly impacted operations)	Overall site conditions were at the drier end of desired conditions. As a result burn coverage and fuel consumption was high.			
	Fire danger index	7	Estimated KBDI	67
Ignition used (Describe the ignition)	☒ On ground ignition ☐ Aerial Ignition Hand ignition undertaken using predominately backing fire.			
Implementation overview	• Backing fire used throughout the unit. • Southern edge along Track W08 ignited whilst there was residual moisture from overnight dew. • Fire allowed to back downhill through the unit to the north. • Some internal lighting undertaken. • A small spot over occurred on the western side of the burn. It was contained by crews at 35m x 20m.			
Implementation details	**31/08/2024** 07:30 - crews back on site. 07:45 - briefed crews. 08:00 - updated Firecom. 08:05 - updated Neoen and Vestas. 08:45 - commenced ignition in the southwestern corner at 5q. Crew working west along Track W08. Progressing very slowly due to poor condition of track. 09:30 - second crew commenced ignition at the western end of Track W08 at 1x and worked eastwards. 11:00 - completed ignition along southern boundary. Fire backing downhill towards Evelyn creek on the northern boundary. 12:15 - ignition complete along western boundary. 12:30 - spot over occurred between WTG 01 and 02. 13:00 - spot over contained at 35m x 20m. Contained within existing cleared areas. 13:30 - edge secured on spot over, blacking out. 13:38 - notified Neoen and Vestas of spot over via SMS. 15:00 - spot over blacked out. Entire burn edge secured. 17:30 - crews departed site. 17:38 - updated Neoen and Vestas. **01/09/2024** 07:40 - crews back onsite. 08:10 - crews briefed, commenced checking previous burns. 08:25 - updated Firecom. 09:00 - previous burned checked and secure. Burn was checked several times a day over the following days before being deemed safe at 13:00 on 03/09/2024.			

ADMINISTRATION	
Complaints ☒ **No Issues**	Nil.
Infrastructure damage ☒ **No Issues**	Nil.
Impact on road network ☒ **No Issues**	Nil.
Impact on community ☒ **No Issues**	Nil.
Impact on direct residents or stakeholders ☒ **No Issues**	Nil
Other (Include any other comments)	Nil.

SAFETY	
JSEA / Briefing	Refer to Appendix 3 – for Daily Site Briefing.
Any incidents	A small spot over (30m x 25m) occurred on the western boundary of the unit between WTG 01 and WTG 02 (at Point 1aa on Operational Map). Fire was rapidly attacked by crews and contained within the existing cleared area. The was no damage to any assets or infrastructure as a result of the spot over. Refer to Photos section. Contributing factors to the spot over were likely to be: 1. Condition of Track W08 causing significant delays in securing the southern edge of the burn. This then in turn delayed ignition along the western boundary. Conditions (temperature, humidity and wind speed) were at their peak when the spot over occurred. 2. The ember that caused the spot over likely originated from the windrowed timber left over from site clearing works. There are a significant number of windrows located on the site and they will continue to impact operational delivery until such time as they are all burnt. 3. This year's burn program was later than previous years, as a result site conditions were drier with higher levels of grass curing. Conditions throughout the week became increasingly drier with poorer overnight humidity recovery. 4. The sequencing of burns in the Operational Plan meant that the spot over occurred

PERMIT TO LIGHT FIRE



Permit to Light Fire F 506578

I, ROBERT DOYLE in charge of the TUMOULIN Rural Fire Service Area / Fire Warden's District, hereby grant to: JOSHUA BULL

of: 27 TOOMBUL TCE (Street address) NUNDAH (Suburb/Town/Locality), 4012 (Postcode), Ph: 0447431727

a Permit to Light Fire in the open on the following Lot No (s) and Plan No (s) 32/CWL 254, 1/RP735194, 33CWL374, 34CWL374, 2/RP 735194 (Must be provided)

also known as: HOLLANDS Rd TUMOULIN (Address)

for the specific purpose of: hazard mitigation, debris removal, weed control, pas~~ture managem~~ent, other

Subject to the following conditions:

1. A firebreak sufficient to prevent the spread of fire is to be in place. **For this permit,** breaks are to be: slashed, mown, bare earth, natural, or and to a width of: 4 metres.
2. The fire is not to be lit if the wind is, or is forecast to be of a strength and / or direction to cause the spread of the fire beyond the planned boundary of the fire or, cause smoke to be a nuisance to a neighbour. **For this permit,** the fire is not to be lit if the wind is forecast to exceed 15 kph and / or is blowing from the
3. There must be enough capable persons and equipment in attendance (see Note 1 below) to control the fire and prevent it's spread beyond the planned boundary of the fire. For this permit, there are to be 4 capable persons and the following equipment on site and in close attendance on the fire: 3 X 4WD 400L FIRE UNITS
4. If the fire (or smoke) is likely to affect a road, precautions must be taken as follows: SMOKE HAZARD SIGNS ERECTED BOTH ENDS
5. The fire must not be lit ~~before~~ / after 0930 am / ~~pm~~ or between and .
6. To avoid nuisance and unnecessary QFES responses, the permit holder **must** notify Firecom on 1800 64 24 90 immediately prior to lighting the fire.
7. The local Fire Station / Rural Fire Brigade must be notified prior to lighting. The contact details for the brigade are: 0490689697
8. The permit holder **must** have a copy of the permit in their possession before lighting and until the fire is out.
9. After burning, the perimeter **must** be made safe and the fire patrolled until there is no longer any risk of the fire escaping.
10. Other conditions:

This permit covers the period from: 28/8/24 to 10/9/24 **Note: If the fire is not out when the Permit expires, the Fire warden must be contacted**

Date: 28/8/24 Signed: R. Doyle (Fire Warden)

1. Persons must be physically and mentally capable to combat the fire and be close enough to take immediate action.

OPERATIONAL MAP

LMZ 01

8/5/2024

1:6,000

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Maxar

Kaban_Cultural	Kaban_Site_polygons	Burn Plan Area	Standard Roads Tracks Trails	High Resolution 30cm Imagery
Kaban_Extent	Tower site	Standard Point Assets	Standard Lineal Assets	Citations
Kaban_Offsets	Operational Burn Points	Access Control	World Imagery	1.2m Resolution Metadata
Greater Glider Offset	Location Reference	Water	Low Resolution 15m Imagery	
Magnificent Brood Frog Offset	Staging Area	Built Asset	High Resolution 60cm Imagery	

PHOTOS

FIRELAND CONSULTANCY

PHOTOS

PHOTOS

PHOTOS – SPOT OVER

Looking from WTG 01 south towards WTG 02

Looking from WTG 02 north towards WTG 01

APPENDIX 1 – WEATHER FORECAST INFORMATION

Forecast location: Kaban

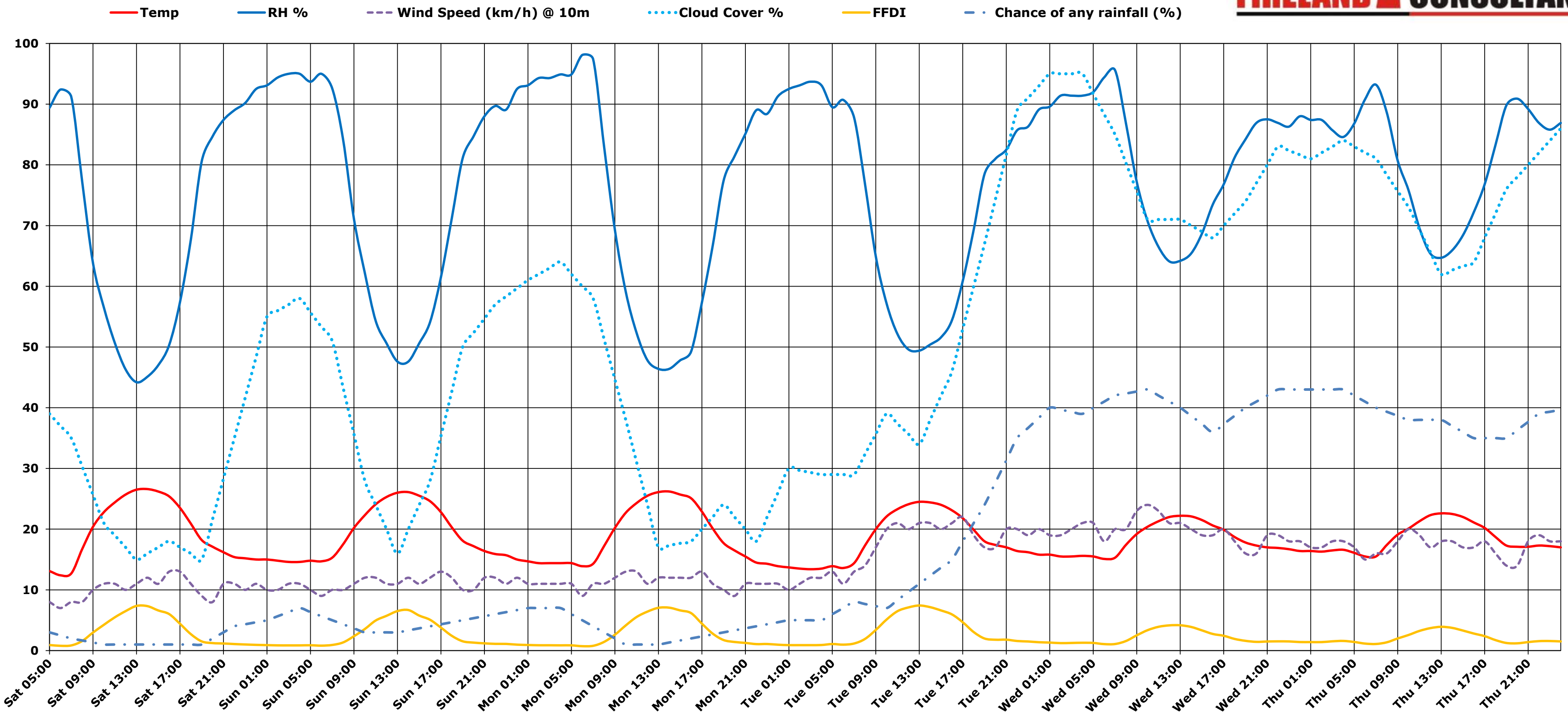
Forecast start: Saturday, 31 August 2024

Forecast end: Thursday, 5 September 2024

KBDI: 67

DF: 9

6 Day Lookahead - Temp, RH, WS, Cloud Cover and FFDI



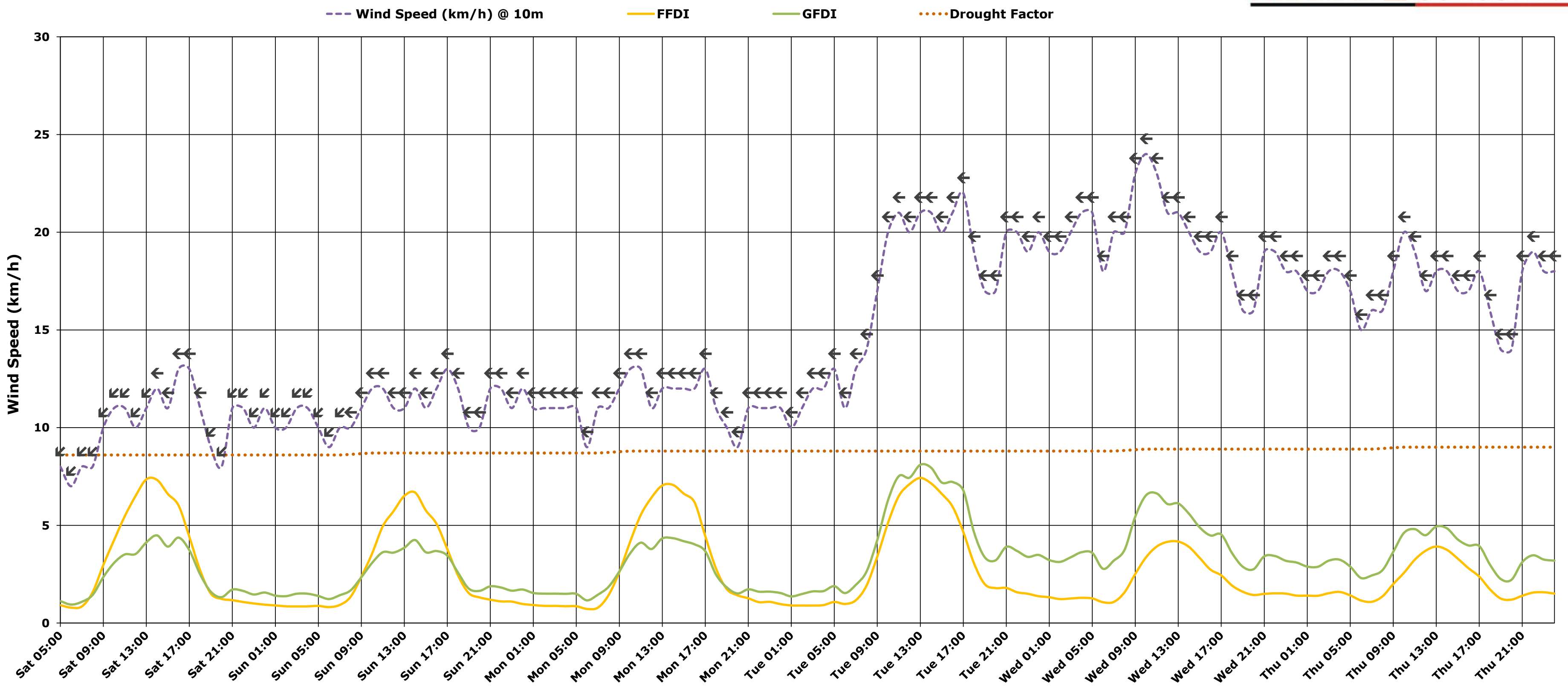
Time and Date forecast data published: 05:28 on Saturday, 31 August 2024

Forecast Location: -17.57, 145.40

Forecast location: Kaban
Forecast start: Saturday, 31 August 2024
Forecast end: Thursday, 5 September 2024

KBDI: 67
DF: 9

6 Day Lookahead - Surface Wind Speed and Direction, FFDI, GFDI & DF



Note: Wind Direction has been simplified to the 8 major Cardinal points for display purposes.

GFDI is calculated using a user entered Grass Curing Value of: 100

Time and Date forecast data published: 05:28 on Saturday, 31 August 2024

Forecast Location: -17.57, 145.40

Forecast location: Kaban

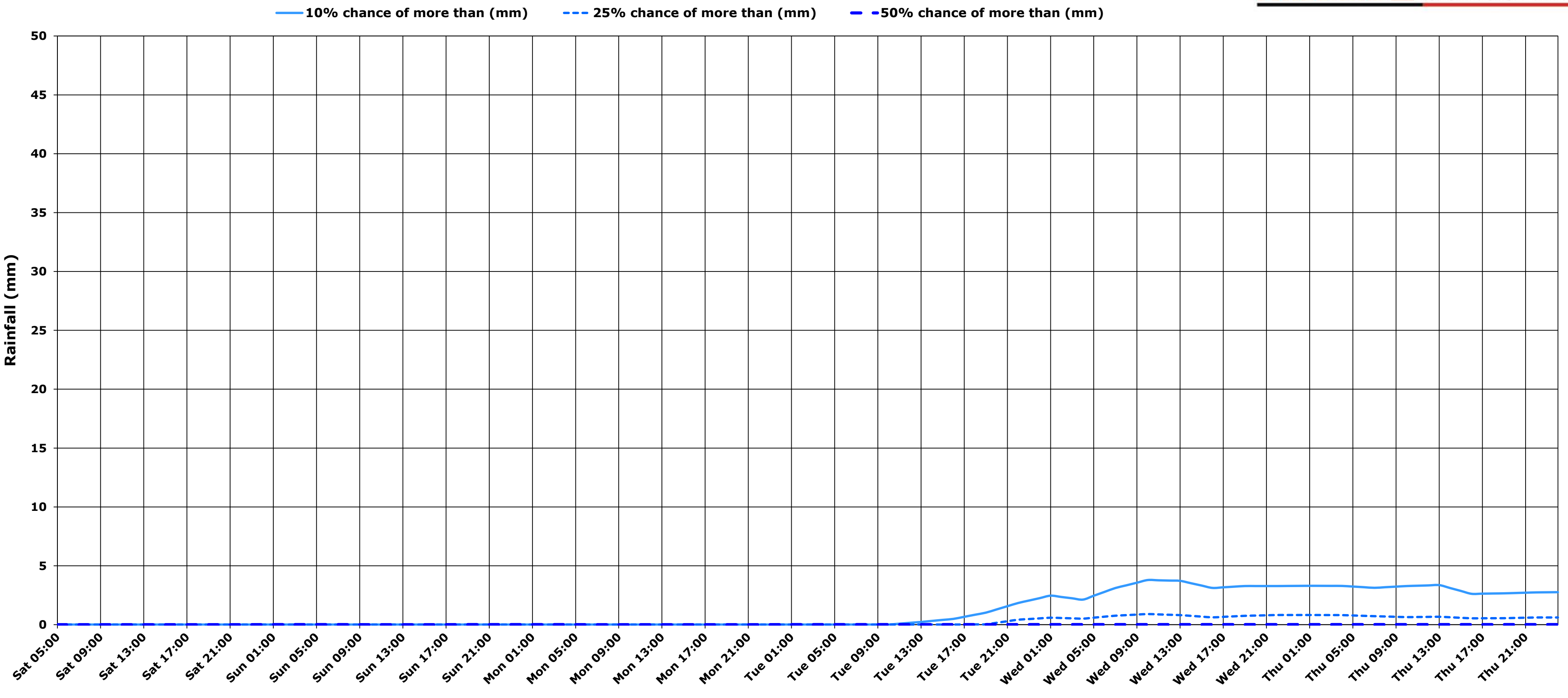
Forecast start: Saturday, 31 August 2024

Forecast end: Thursday, 5 September 2024

KBDI: 67

DF: 9

6 Day Lookahead - % Chance of more than XXmm of rainfall

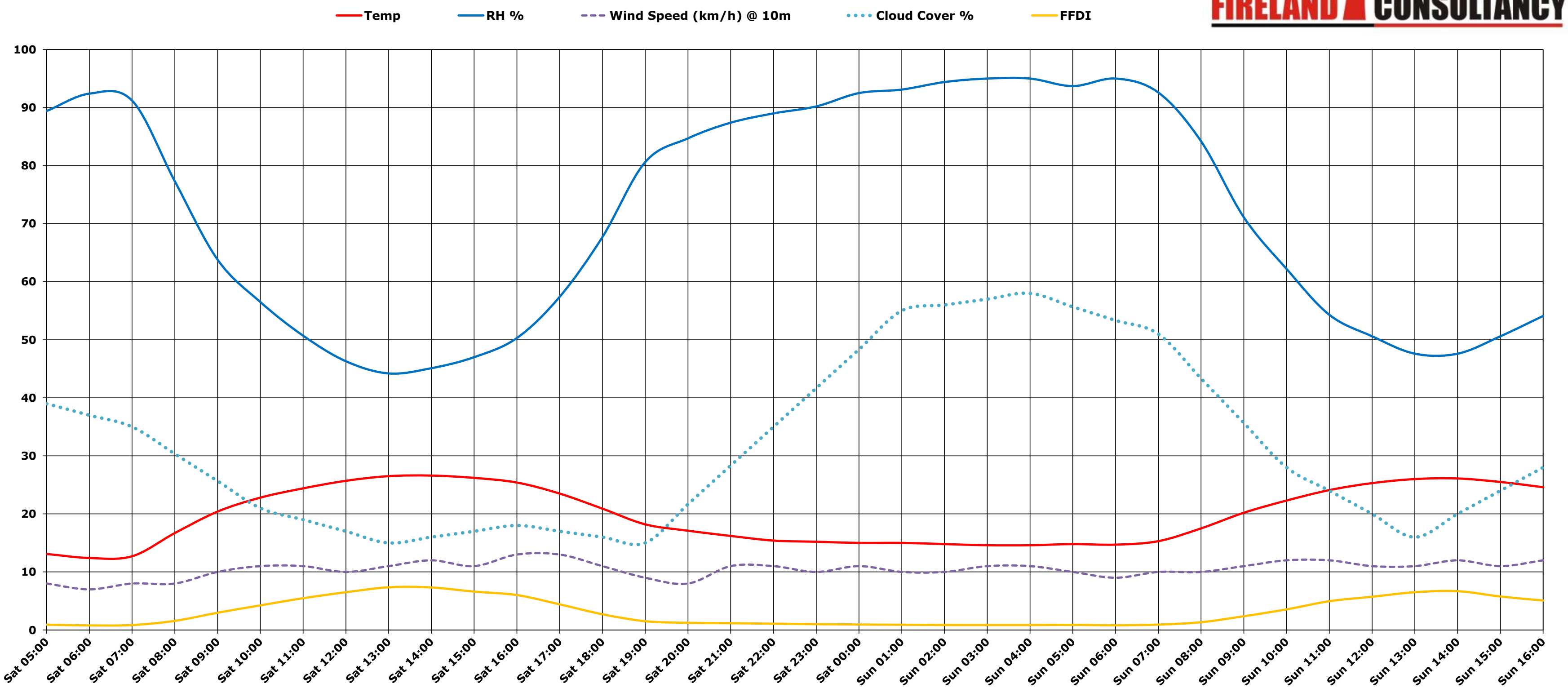


Time and Date forecast data published: 05:28 on Saturday, 31 August 2024

Forecast Location: -17.57, 145.40

Forecast Location:	**Kaban**	**KBDI:**	**67**
Forecast start:	**Saturday, 31 August 2024**	**DF:**	**9**
Forecast end:	**Sunday, 1 September 2024**		

36 Hour Forecast - Temp, RH, WS, Cloud Cover and FFDI



Time and Date forecast data published: **5:28 AM** **on** **Saturday, 31 August 2024**

Some data on this app. is sourced from the **Bureau of Meteorology**. Click here for details.

Forecast Location: -17.57, 145.40

Forecast Location: Kaban

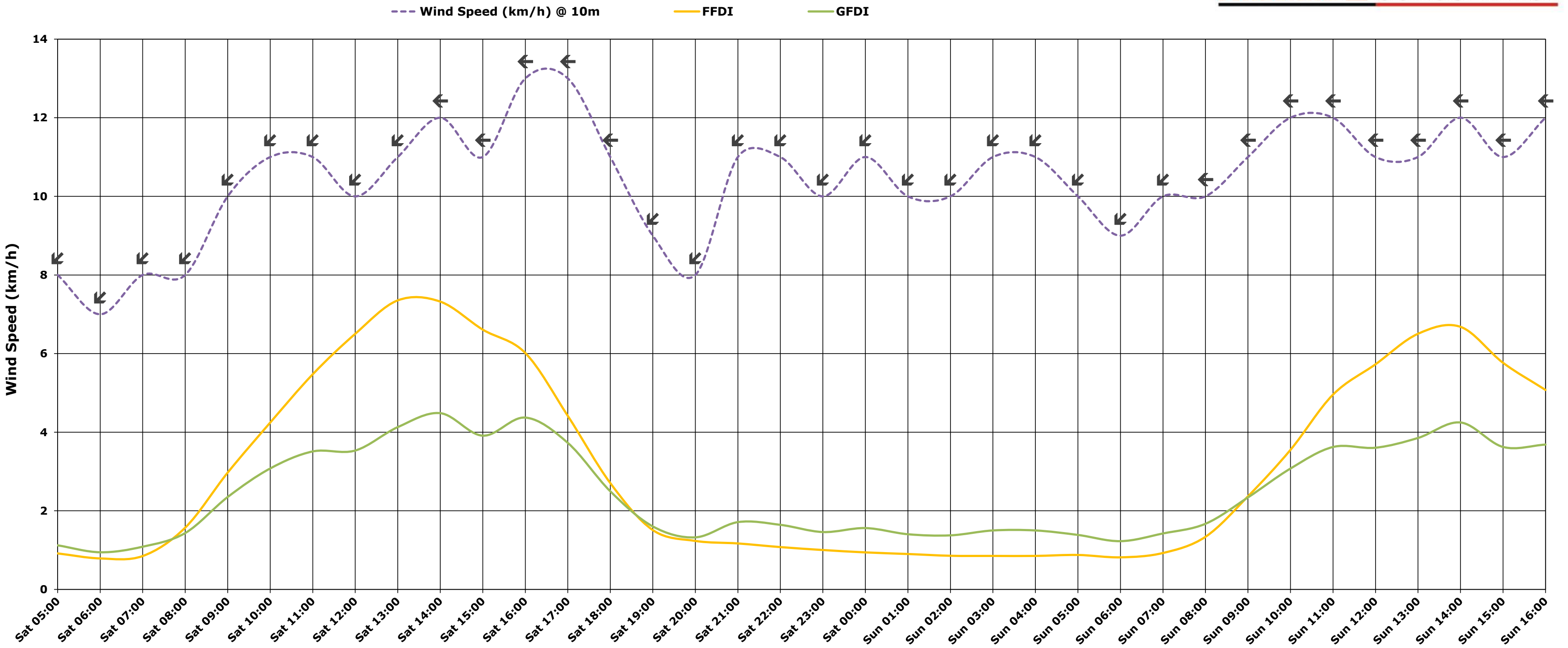
Forecast start: Saturday, 31 August 2024

Forecast end: Sunday, 1 September 2024

KBDI: 67

DF: 9

36 Hour Forecast - Surface Wind Speed and Direction, FFDI & GFDI



Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: **05:28 on Saturday, 31 August 2024**

Some data on this app. is sourced from the **Bureau of Meteorology**. Click here for details.

Forecast Location: -17.57, 145.40

Forecast Location: Kaban | **KBDI:** 67

Forecast start: Saturday, 31 August 2024 | **DF:** 9

Forecast end: Sunday, 1 September 2024

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Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Drought Factor	Leaflet 80 FMC (%)	Combined Forest FMC (%)	FFDI	GFDI	Cloud Cover %	Mixing Height (m ASL)	Wind Dir (Cardinal 8pt) @ 1000m	Wind Dir (Arrow 8pt) @ 1000m	Wind Speed (km/h) @1000m	Wind Dir (Cardinal 8pt) @ 1500m	Wind Dir (Arrow 8pt) @ 1500m	Wind Speed (km/h) @ 1500m
Sat 05:00	13	89	ENE	↙	8	9	18.8		1	1	39	773	E	←	19	SE	↖	7
Sat 06:00	12	92	ENE	↙	7	9	19.4		1	1	37	750	E	←	20	SE	↖	9
Sat 07:00	13	91	ENE	↙	8	9	19.2	18.8	1	1	35	759	E	←	22	SE	↖	11
Sat 08:00	17	77	ENE	↙	8	9	16.5	19.3	2	1	30	1,010	E	←	20	SE	↖	11
Sat 09:00	20	64	ENE	↙	10	9	13.9	19.1	3	2	26	1,262	E	←	20	E	←	15
Sat 10:00	23	57	ENE	↙	11	9	12.4	16.4	4	3	21	1,445	E	←	19	E	←	15
Sat 11:00	24	51	ENE	↙	11	9	11.3	13.9	5	4	19	1,633	E	←	19	E	←	17
Sat 12:00	26	46	ENE	↙	10	9	8.6	12.4	7	4	17	1,851	E	←	19	NE	↙	19
Sat 13:00	27	44	ENE	↙	11	9	8.2	11.3	7	4	15	1,995	E	←	19	NE	↙	17
Sat 14:00	27	45	E	←	12	9	8.3	7.5	7	4	16	1,988	E	←	19	E	←	15
Sat 15:00	26	47	E	←	11	9	8.6	7.1	7	4	17	1,930	E	←	19	E	←	15
Sat 16:00	25	50	E	←	13	9	9.2	7.2	6	4	18	1,812	E	←	19	E	←	15
Sat 17:00	24	57	E	←	13	9	10.4	7.5	4	4	17	1,545	E	←	20	E	←	13
Sat 18:00	21	68	E	←	11	9	12.2	8.0	3	2	16	1,229	E	←	20	E	←	13
Sat 19:00	18	81	ENE	↙	9	9	14.4	9.1	2	2	15	1,054	E	←	20	E	←	15
Sat 20:00	17	85	ENE	↙	8	9	15.1	10.7	1	1	22	1,016	E	←	20	E	←	17
Sat 21:00	16	87	ENE	↙	11	9	15.7	12.6	1	2	28	965	E	←	22	E	←	19
Sat 22:00	15	89	ENE	↙	11	9	16.0	13.2	1	2	35	895	E	←	22	E	←	19
Sat 23:00	15	90	ENE	↙	10	9	16.2	13.7	1	1	42	911	E	←	24	E	←	19
Sat 00:00	15	93	ENE	↙	11	9	18.6	14.0	1	2	48	924	E	←	24	E	←	20
Sun 01:00	15	93	ENE	↙	10	9	18.7	14.1	1	1	55	956	E	←	26	E	←	20
Sun 02:00	15	94	ENE	↙	10	9	18.9	18.6	1	1	56	942	E	←	24	E	←	20
Sun 03:00	15	95	ENE	↙	11	9	19.0	18.6	1	2	57	923	E	←	26	E	←	20
Sun 04:00	15	95	ENE	↙	11	9	19.0	18.8	1	2	58	923	E	←	26	E	←	20
Sun 05:00	15	94	ENE	↙	10	9	18.8	19.0	1	1	56	952	E	←	26	E	←	20
Sun 06:00	15	95	ENE	↙	9	9	19.0	19.0	1	1	53	953	E	←	26	E	←	20
Sun 07:00	15	93	ENE	↙	10	9	18.6	18.8	1	1	51	1,021	E	←	26	E	←	20
Sun 08:00	18	84	E	←	10	9	17.0	18.9	1	2	43	1,109	E	←	24	E	←	22
Sun 09:00	20	71	E	←	11	9	14.8	18.5	2	2	36	1,272	E	←	24	E	←	22
Sun 10:00	22	62	E	←	12	9	13.2	17.0	4	3	28	1,459	E	←	22	E	←	22
Sun 11:00	24	54	E	←	12	9	11.8	14.8	5	4	24	1,629	E	←	22	E	←	22
Sun 12:00	25	51	E	←	11	9	9.2	13.2	6	4	20	1,831	E	←	22	E	←	22
Sun 13:00	26	48	E	←	11	9	8.7	11.8	7	4	16	1,971	E	←	22	E	←	19
Sun 14:00	26	48	E	←	12	9	8.7	8.1	7	4	20	1,987	E	←	22	E	←	19
Sun 15:00	26	51	E	←	11	9	9.2	7.6	6	4	24	1,933	E	←	22	E	←	19
Sun 16:00	25	54	E	←	12	9	9.8	7.6	5	4	28	1,843	E	←	22	E	←	19

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: 05:28 on Saturday, 31 August 2024

Forecast Location: -17.57, 145.40

Forecast Location: Kaban

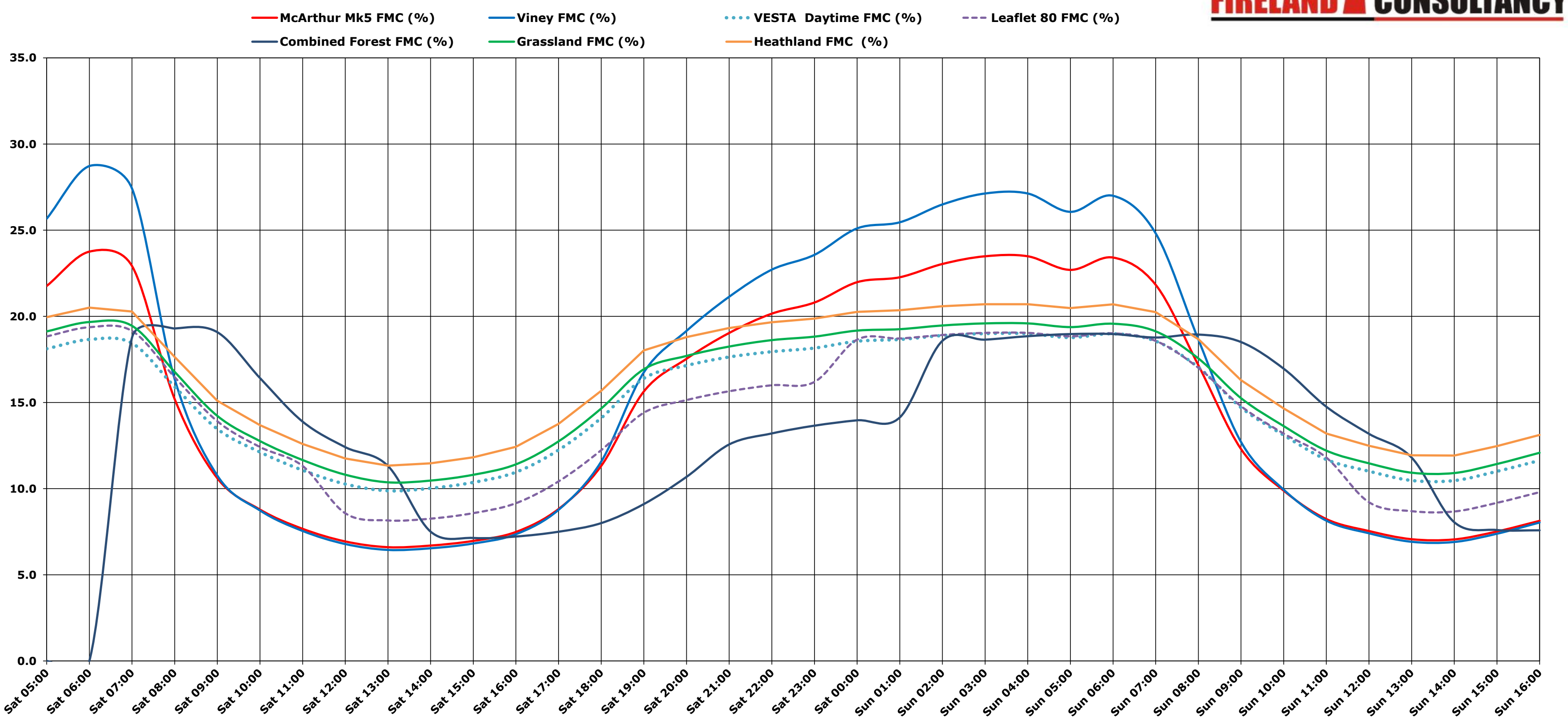
Forecast start: Saturday, 31 August 2024

Forecast end: Sunday, 1 September 2024

KBDI: 67

DF: 9

36 Hour Forecast - Fuel Moisture Content



Time and Date forecast data published: 05:28 on Saturday, 31 August 2024

Forecast Location: -17.57, 145.40

36 Hour Fire Behaviour Estimates

Forecast location: Kaban
Forecast start: Saturday, 31 August 2024
Forecast end: Sunday, 1 September 2024

KBDI: 67
DF: 9

Grass curing: 100
Grass fuel load (t/ha): 4

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						McArthur - Leaflet 80															CSIRO Fire Spread Meter for Northern Australia Grasslands									
						Dry Sclerophyll Forest Light fuels = 8t/ha (40 - 60% canopy cover)								Dry Sclerophyll Forest Moderate - Heavy fuels = 12t/ha (40 - 60% canopy cover)							Grassy Woodland Assumes 100% grass curing (5 - 7m high, canopy cover <30%)					Grassy Open Forest Assumes 100% grass curing (10 - 15m tall, canopy cover 30-70%)				
Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	QPWS PGB Fire Severity Class - Light fuels (Intensity)	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning
Sat 05:00	13	89	ENE	↙	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.8	53	0.3	109	6 - 11	Generally suitable	32	0.3	65	0 - 5	Marginal
Sat 06:00	12	92	ENE	↙	7	2.9	2	0.0	0.4	Below	Low	0.7	2.3	2.9	3	0.1	0.7	Below	0.9	2.7	16	0.2	34	0 - 5	Marginal	10	0.2	20	0 - 5	Marginal
Sat 07:00	13	91	ENE	↙	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.7	33	0.3	68	0 - 5	Marginal	20	0.2	41	0 - 5	Marginal
Sat 08:00	17	77	ENE	↙	8	3.1	4	0.1	0.7	Below	Low	0.8	2.6	3.1	5	0.1	1.2	Below	1.2	3.2	194	0.5	400	6 - 11	Generally suitable	116	0.4	240	6 - 11	Generally suitable
Sat 09:00	20	64	ENE	↙	10	3.5	7	0.1	1.1	Below	Low	1.1	3.1	3.5	10	0.2	1.8	Below	1.7	4.1	460	0.6	951	6 - 11	Generally suitable	276	0.5	571	6 - 11	Generally suitable
Sat 10:00	23	57	ENE	↙	11	3.6	10	0.2	1.4	Below	Low	1.3	3.5	3.6	14	0.3	2.3	Below	2.2	5.0	666	0.7	1376	6 - 11	Generally suitable	400	0.6	826	6 - 11	Generally suitable
Sat 11:00	24	51	ENE	↙	11	3.6	12	0.2	1.6	Below	Low	1.5	3.8	3.6	19	0.4	2.8	Yes	2.6	5.7	738	0.7	1526	6 - 11	Generally suitable	443	0.6	915	6 - 11	Generally suitable
Sat 12:00	26	46	ENE	↙	10	3.5	22	0.4	2.4	Yes	Low	2.3	5.1	3.5	34	0.7	4.1	Yes	4.1	8.2	725	0.7	1498	6 - 11	Generally suitable	435	0.6	899	6 - 11	Generally suitable
Sat 13:00	27	44	ENE	↙	11	3.6	25	0.4	2.6	Yes	Low	2.5	5.4	3.6	38	0.8	4.5	Yes	4.5	9.0	849	0.7	1754	6 - 11	Generally suitable	509	0.6	1053	6 - 11	Generally suitable
Sat 14:00	27	45	E	←	12	3.8	25	0.4	2.6	Yes	Low	2.5	5.5	3.8	38	0.8	4.5	Yes	4.5	9.0	925	0.8	1911	6 - 11	Generally suitable	555	0.6	1147	6 - 11	Generally suitable
Sat 15:00	26	47	E	←	11	3.6	23	0.4	2.4	Yes	Low	2.3	5.2	3.6	35	0.7	4.2	Yes	4.2	8.4	810	0.7	1673	6 - 11	Generally suitable	486	0.6	1004	6 - 11	Generally suitable
Sat 16:00	25	50	E	←	13	4.0	21	0.3	2.3	Yes	Low	2.2	5.0	4.0	32	0.7	4.0	Yes	3.9	8.0	911	0.8	1882	6 - 11	Generally suitable	546	0.6	1129	6 - 11	Generally suitable
Sat 17:00	24	57	E	←	13	4.0	16	0.3	1.9	Below	Low	1.8	4.3	4.0	24	0.5	3.3	Yes	3.1	6.6	801	0.7	1655	6 - 11	Generally suitable	480	0.6	993	6 - 11	Generally suitable
Sat 18:00	21	68	E	←	11	3.6	10	0.2	1.4	Below	Low	1.4	3.5	3.6	15	0.4	2.4	Below	2.2	5.1	554	0.6	1144	6 - 11	Generally suitable	332	0.6	687	6 - 11	Generally suitable
Sat 19:00	18	81	ENE	↙	9	3.3	6	0.1	1.0	Below	Low	1.0	2.9	3.3	9	0.2	1.7	Below	1.6	3.9	215	0.5	444	6 - 11	Generally suitable	129	0.4	267	6 - 11	Generally suitable
Sat 20:00	17	85	ENE	↙	8	3.1	5	0.1	0.8	Below	Low	0.9	2.8	3.1	7	0.2	1.5	Below	1.4	3.6	138	0.4	285	6 - 11	Generally suitable	83	0.4	171	6 - 11	Generally suitable
Sat 21:00	16	87	ENE	↙	11	3.6	5	0.1	0.8	Below	Low	0.9	2.8	3.6	7	0.2	1.4	Below	1.4	3.6	341	0.6	704	6 - 11	Generally suitable	204	0.5	422	6 - 11	Generally suitable
Sat 22:00	15	89	ENE	↙	11	3.6	4	0.1	0.8	Below	Low	0.9	2.7	3.6	6	0.2	1.3	Below	1.3	3.5	318	0.5	658	6 - 11	Generally suitable	191	0.5	395	6 - 11	Generally suitable
Sat 23:00	15	90	ENE	↙	10	3.5	4	0.1	0.8	Below	Low	0.9	2.7	3.5	6	0.2	1.3	Below	1.3	3.4	94	0.4	194	6 - 11	Generally suitable	56	0.3	116	6 - 11	Generally suitable
Sat 00:00	15	93	ENE	↙	11	3.6	2	0.0	0.5	Below	Low	0.7	2.4	3.6	4	0.1	0.9	Below	1.0	2.9	286	0.5	590	6 - 11	Generally suitable	171	0.5	354	6 - 11	Generally suitable
Sun 01:00	15	93	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	1.0	2.8	59	0.3	123	6 - 11	Generally suitable	36	0.3	74	0 - 5	Marginal
Sun 02:00	15	94	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.8	Below	0.9	2.8	42	0.3	87	0 - 5	Marginal	25	0.2	52	0 - 5	Marginal
Sun 03:00	15	95	ENE	↙	11	3.6	2	0.0	0.5	Below	Low	0.7	2.4	3.6	3	0.1	0.8	Below	0.9	2.8	261	0.5	539	6 - 11	Generally suitable	157	0.4	324	6 - 11	Generally suitable
Sun 04:00	15	95	ENE	↙	11	3.6	2	0.0	0.5	Below	Low	0.7	2.4	3.6	3	0.1	0.8	Below	0.9	2.8	261	0.5	539	6 - 11	Generally suitable	157	0.4	324	6 - 11	Generally suitable
Sun 05:00	15	94	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	0.9	2.8	50	0.3	103	6 - 11	Generally suitable	30	0.3	62	0 - 5	Marginal
Sun 06:00	15	95	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.8	Below	0.9	2.8	30	0.3	62	0 - 5	Marginal	18	0.2	37	0 - 5	Marginal
Sun 07:00	15	93	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	1.0	2.9	69	0.3	143	6 - 11	Generally suitable	42	0.3	86	0 - 5	Marginal
Sun 08:00	18	84	E	←	10	3.5	3	0.1	0.7	Below	Low	0.8	2.6	3.5	5	0.1	1.1	Below	1.1	3.2	195	0.5	402	6 - 11	Generally suitable	117	0.4	241	6 - 11	Generally suitable
Sun 09:00	20	71	E	←	11	3.6	6	0.1	1.0	Below	Low	1.0	2.9	3.6	9	0.2	1.6	Below	1.6	3.9	518	0.6	1071	6 - 11	Generally suitable	311	0.5	643	6 - 11	Generally suitable
Sun 10:00	22	62	E	←	12	3.8	8	0.2	1.3	Below	Low	1.2	3.3	3.8	13	0.3	2.1	Below	2.0	4.6	677	0.7	1398	6 - 11	Generally suitable	406	0.6	839	6 - 11	Generally suitable
Sun 11:00	24	54	E	←	12	3.8	12	0.2	1.5	Below	Low	1.5	3.7	3.8	17	0.4	2.7	Yes	2.5	5.5	770	0.7	1591	6 - 11	Generally suitable	462	0.6	954	6 - 11	Generally suitable
Sun 12:00	25	51	E	←	11	3.6	20	0.3	2.3	Yes	Low	2.1	4.8	3.6	30	0.7	3.9	Yes	3.8	7.7	753	0.7	1557	6 - 11	Generally suitable	452	0.6	934	6 - 11	Generally suitable
Sun 13:00	26	48	E	←	11	3.6	23	0.4	2.4	Yes	Low	2.3	5.1	3.6	34	0.7	4.2	Yes	4.1	8.4	799	0.7	1652	6 - 11	Generally suitable	479	0.6	991	6 - 11	Generally suitable
Sun 14:00	26	48	E	←	12	3.8	23	0.4	2.5	Yes	Low	2.3	5.2	3.8	35	0.8	4.3	Yes	4.3	8.6	882	0.8	1823	6 - 11	Generally suitable	529	0.6	1094	6 - 11	Generally suitable
Sun 15:00	26	51	E	←	11	3.6	20	0.3	2.3	Yes	Low	2.1	4.9	3.6	31	0.7	3.9	Yes	3.8	7.8	757	0.7	1564	6 - 11	Generally suitable	454	0.6	938	6 - 11	Generally suitable
Sun 16:00	25	54	E	←	12	3.8	18	0.3	2.1	Below	Low	2.0	4.6	3.8	27	0.6	3.6	Yes	3.5	7.2	778	0.7	1608	6 - 11	Generally suitable	467	0.6	965	6 - 11	Generally suitable

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes.
Time and Date forecast data published: 5:28 AM **on** Saturday, 31 August 2024

Some data on this app is sourced from the Bureau of Meteorology. Click here for details.

Forecast Location: -17.57, 145.40

Draft product - under development.

Sources of equations used for Modelling and assumptions:
Leaflet 80 Equations used in this table are taken from Gould, J.S. (1994) *Evaluation of McArthur's control burning guide in regrowth Eucalyptus sieberi forest*. Australian Journal of Forestry, 57:2, 86-93.
QPWS PBG Optimum conditions for planned burns is taken from Table A - Light fuels = 8 t/ha and Table B Moderate - heavy fuels = 12t/ha in the QPWS *PBG - How to assess if your burn is ready to go*.
QPWS PBG Fire Severity Class is taken from Table 3 Open forests/woodlands in the QPWS *PBG - How to assess if your burn is ready to go*. Determined using fire intensity values.
Burrows Scorch Height is calculated using equations taken from Burrows (1997) *Predicting canopy scorch height in jarrah forests*. Flame height equations have been used.
Equations for the CSIRO Fire Spread Meter for Northern Australia Grasslands is taken from Cheney, N.P., Gould, J.S. and Catchpole, W.R. (1998) *Prediction of Fire Spread in Grasslands*. International Journal of Wildland Fire 8. 1 - 13.
AFDRS Fire Behaviour Index calculations are based on the Matthews, S. (2022) *AFDRS Fire Behaviour Index Technical Guide*.
AFDRS Implications for Planned Burning are taken from the AFDRS *Fire Behaviour Index Reference Manual Version 1*.
Grass curing is assumed to be 100% by default for grass fire behaviour calculations.
All fire behaviour calculations assume no slope.

APPENDIX 2 – WEATHER OBSERVATION DATA

Weather Observations for PORTABLE QFRK (Ravenshoe)

Station Details	ID: 250075	Name: RAVENSHOE (QFRK)
Lat: -17.61	Lon: 145.49	Height: 922.0 m

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
31/08/2024	08:00am	16.3	90	E	20	26	0.2
31/08/2024	08:10am	16.5	89	E	22	24	0.2
31/08/2024	08:20am	16.9	87	ENE	24	26	0.2
31/08/2024	08:30am	17.3	86	E	22	24	0.2
31/08/2024	08:40am	17.6	87	E	22	24	0.2
31/08/2024	08:50am	17.8	85	E	22	26	0.2
31/08/2024	09:00am	18.1	83	E	24	26	0.2
31/08/2024	09:10am	18.8	80	E	19	22	0
31/08/2024	09:20am	19.3	81	E	17	20	0
31/08/2024	09:30am	19.6	76	E	19	20	0
31/08/2024	09:40am	20	71	E	19	24	0
31/08/2024	09:50am	20	73	E	17	22	0
31/08/2024	10:00am	20.3	72	E	17	19	0
31/08/2024	10:10am	20.5	70	E	15	20	0
31/08/2024	10:20am	21	67	E	11	13	0
31/08/2024	10:30am	21.2	66	E	11	17	0
31/08/2024	10:40am	21.9	63	ENE	9	15	0
31/08/2024	10:50am	22.2	64	ENE	11	15	0
31/08/2024	11:00am	22.2	64	E	15	19	0
31/08/2024	11:10am	22.1	62	E	17	20	0
31/08/2024	11:20am	21.9	61	E	20	22	0
31/08/2024	11:30am	22.3	62	E	19	20	0
31/08/2024	11:40am	22.5	58	E	17	20	0
31/08/2024	11:50am	22.8	57	E	17	20	0
31/08/2024	12:00pm	22.8	62	E	17	22	0
31/08/2024	12:10pm	23.3	58	E	15	19	0
31/08/2024	12:20pm	23.3	54	E	17	22	0
31/08/2024	12:30pm	23.4	57	E	17	20	0
31/08/2024	12:40pm	23.8	57	E	17	19	0
31/08/2024	12:50pm	23.8	59	E	17	19	0
31/08/2024	01:00pm	23.9	59	E	19	22	0
31/08/2024	01:10pm	24.1	55	E	15	20	0
31/08/2024	01:20pm	24.5	53	E	13	19	0
31/08/2024	01:30pm	24.3	54	E	15	17	0
31/08/2024	01:40pm	24.2	56	E	15	19	0

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
31/08/2024	01:50pm	24.6	53	E	15	17	0
31/08/2024	02:00pm	24.5	54	E	15	19	0
31/08/2024	02:10pm	24.9	54	ENE	13	15	0
31/08/2024	02:20pm	24.6	56	E	15	19	0
31/08/2024	02:30pm	24.6	56	E	15	17	0
31/08/2024	02:40pm	24.6	55	E	13	17	0
31/08/2024	02:50pm	25	58	ENE	11	15	0
31/08/2024	03:00pm	24.8	56	ENE	13	17	0
31/08/2024	03:10pm	24.8	56	E	15	17	0
31/08/2024	03:20pm	24.8	58	ENE	13	15	0
31/08/2024	03:30pm	24.4	57	ENE	15	17	0
31/08/2024	03:40pm	24.6	55	ENE	11	13	0
31/08/2024	03:50pm	24.3	57	ENE	13	17	0
31/08/2024	04:00pm	24.1	55	E	13	17	0
31/08/2024	04:10pm	23.9	58	ENE	13	19	0
31/08/2024	04:20pm	23.8	58	E	13	19	0
31/08/2024	04:30pm	23.6	62	E	13	17	0
31/08/2024	04:40pm	23.2	62	ENE	13	15	0
31/08/2024	04:50pm	22.7	62	E	15	19	0
31/08/2024	05:00pm	22.4	66	ENE	15	20	0
31/08/2024	05:10pm	22.1	68	ENE	15	17	0
31/08/2024	05:20pm	21.6	71	E	15	19	0
31/08/2024	05:30pm	21.2	73	E	15	17	0

APPENDIX 3 – DAILY SITE BRIEFING

Daily Site Briefing

000137 / Kaban Planned Burn Program 2024

Complete

Document No:	000137
Client:	Neoen & Vestas
Site / Project Name:	Kaban Planned Burn Program 2024
Location:	Hollands Rd Tumoulin QLD 4888 Australia (-17.561026933978933, 145.41368782952446)
Briefing conducted on:	31.08.2024 07:39 AEST
Briefing conducted by:	Francis Hines

Record of Briefing:	
Site induction:	
Site induction complete by all workers?	Yes
Site rules and procedures understood?	Yes
Work health and safety:	
JSEA/Safety documentation still current?	Yes
Fireland Prescribed Burn JSEA Kaban 2024 V0.2 JSEA Polaris V1.1	
Any site changes since yesterday?	No
Fatigue management:	
Workers rested and fit for work?	Yes
Traffic Management:	
Daily Traffic Management Plan communicated?	Yes
Plant and equipment:	
All equipment pre-starts completed?	Yes
Operators have competency for plant and equipment and Verification of Competency (VOC) provided?	Yes
Communications:	
Work site communications channel?	UHF 17 & FC 1
Emergency procedures:	
Location of first aid kits identified?	Yes
First aid qualified staff identified?	Yes
Emergency response procedure discussed?	Yes
Daily muster point location?	Sawmill
Fauna, Flora and Cultural Heritage:	

Fauna Management - Plant operators

Fauna management procedure - plant operators.pdf

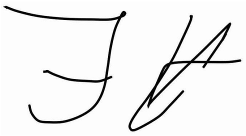
Fauna/flora management procedure understood?	Yes
Cultural Heritage procedure understood? **1. FIND: A potential Cultural Heritage item or object is found.** **2. STOP: STOP WORK IMMEDIATELY and install an exclusion zone around the area.** **3. NOTIFY: Notify a responsible person (e.g. Site Supervisor, Project Manager).** **4. MANAGE: Report the discovery to the Project Manager for advice on management.**	Yes
Environmental Clearance Certificate understood?	N/A
Tool Box talk - topic of the day:	
Select a topic for discussion.	Hazard trees

Record of Attendance

Briefing attendees

Briefing attendees 1

Attendees name and signature:



Francis Hines
31.08.2024 07:43 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 2

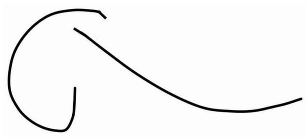
Attendees name and signature:

Cameron Allanson
31.08.2024 07:43 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 3

Attendees name and signature:

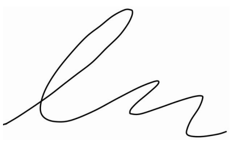


Courtney Dangerfield
31.08.2024 07:44 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 4

Attendees name and signature:



Miles Cross
31.08.2024 07:44 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 5

Attendees name and signature:

EH

Emma Henry
31.08.2024 07:44 AEST

Agency/Company	Fireland Consultancy

S28 – A OPERATIONAL POST BURN REPORT

BURN NAME	**LMZ 05**	**Lot/Plan/s No.** (all approvals obtained) ☒ Yes	2/RP735194
Burn No.	LMZ 05		
Location	Kaban Green Power Hub	**Road Segment No.**	
LGA	Tablelands Regional	**Proposed Timing**	June – Sept 2024
Date burn started	30/08/2024	**Time**	16:00
Date burn/s deemed out	03/09/2024	**Time**	13:00
Permit #	F506578	**Complexity**	CR – 2 (66)

Incident Controller	Francis Hines	Fireland
	Name	Position

SITUATION – OUTCOMES

Area to be treated	5.75 ha	Percentage aim	80 – 100%	Last fire	Unknown
Actual treated area	5.75 ha	Percentage achieved	> 90%	Severity class	Moderate

MISSION – OUTCOMES

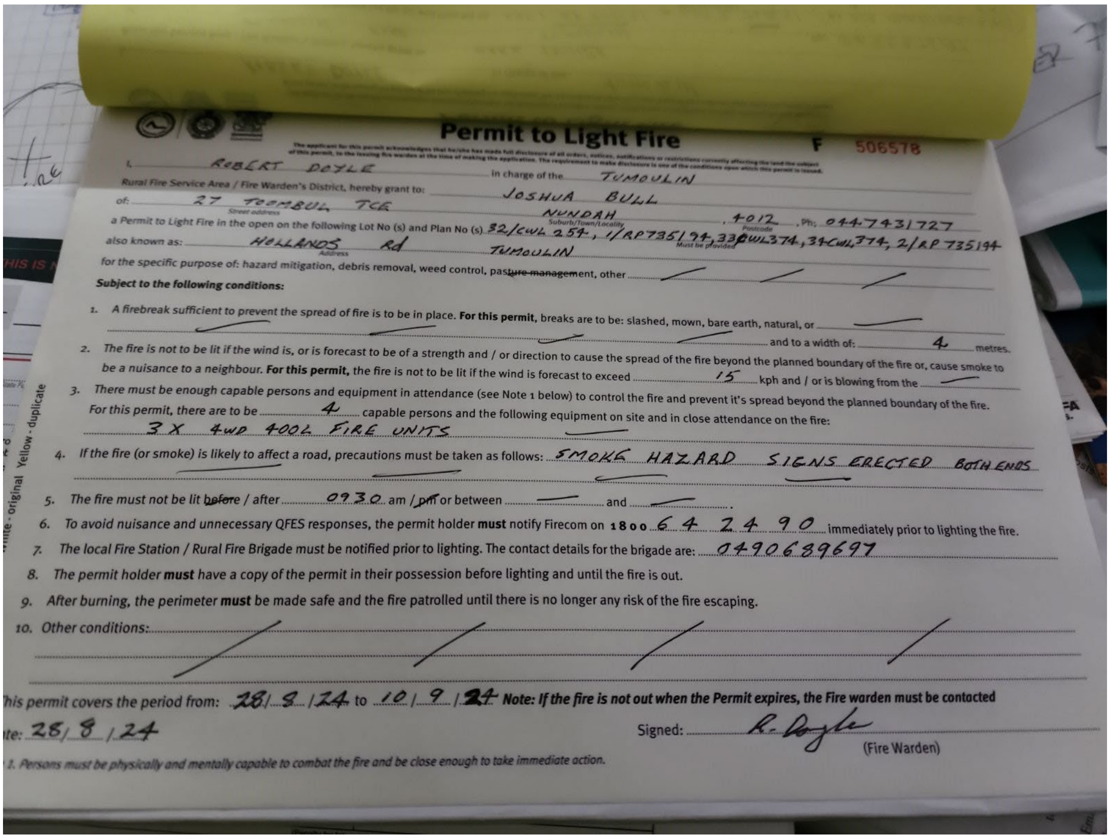
Aim & Objectives (Outline the general intent of the proposed burn and the specific objectives. Consider fuel load, fuel structure & mosaic effect)	• Reduce surface and near-surface fuels to support weed management. • Exclude fire from mown grass area north of fence line. • Remove surface and near-surface fuels over 80 - 100% of the area, focused around the cattle yards.
Outcomes (Outline if the objectives were met, if not why not)	Objectives met. Surface and Near-surface fuels extensively reduced across the site. Cattle yards, sheds and fencing protected from fire impact.
List recommendations (For burn area, may include fire trail works)	Ongoing maintenance of Fire Trails W10 and W11 that form the western boundary of this unit is required as per the recommendations contained in the Landscape Fire Management Plan (April 2023). There are 4 – 5 Leucaena plants growing in the creekline to the south west of Adam's cottage. Follow-up treatment of these plants is recommended to prevent further spread throughout the Wind Farm.

EXECUTION – DETAILS				
Weather observations	Refer to: • Appendix 1 for weather forecast information. • Appendix 2 for weather observation data.			
Comments (List any weather conditions that significantly impacted operations)	Overall site conditions were at the drier end of desired conditions. As a result burn coverage and fuel consumption was high.			
	Fire danger index	5	Estimated KBDI	65
Ignition used (Describe the ignition)	☒ On ground ignition ☐ Aerial Ignition Hand ignition undertaken using predominately backing fire.			
Implementation overview	• Backing fire used throughout the block. • Multistage ignition required to manage risks to cattle yards, sheds and fencing.			
Implementation details	**30/08/2024** 15:30 – briefed crews 15:45 – notified Adam Lockyer of intention to commence ignition. 16:00 – commenced ignition at 5m working north around cattle yards and sheds. 17:00 - ignition complete around cattle yards and old shed. Working fire downhill on western and eastern side. 18:00 - ignition complete. Crews working to secure edges. 19:00 – burn secure. Crews departed site. 19:00 - updated Adam Lockyer. 19:00 - updated Vestas and Neoen. 19:20 - updated Firecom. **31/08/2024** 07:30 – crews back on site. Burn checked and confirmed as secure. Burn was checked several times a day over the following days before being deemed safe at 13:00 on 03/09/2024.			

ADMINISTRATION	
Complaints ☒ **No Issues**	Nil.
Infrastructure damage ☒ **No Issues**	Nil.
Impact on road network ☒ **No Issues**	Nil.
Impact on community ☒ **No Issues**	Nil.
Impact on direct residents or stakeholders ☒ **No Issues**	Nil.
Other (Include any other comments)	Nil.

SAFETY	
JSEA / Briefing	Refer to Appendix 3 – for Daily Site Briefing.
Any incidents	Nil.

PERMIT TO LIGHT FIRE



Permit to Light Fire F 506578

I, ROBERT DOYLE in charge of the TUMOULIN Rural Fire Service Area / Fire Warden's District, hereby grant to: JOSHUA BULL

of: 27 TOOMBUL TCE (Street address) NUNDAH (Suburb/Town/Locality), 4012 (Postcode), Ph: 0447431727

a Permit to Light Fire in the open on the following Lot No (s) and Plan No (s) 32/CWL 254, 1/RP735194, 33CWL374, 34CWL374, 2/RP735194 (Must be provided)

also known as: HOLLANDS Rd (Address) TUMOULIN

for the specific purpose of: hazard mitigation, debris removal, weed control, pas~~ture management~~ent, other

Subject to the following conditions:

1. A firebreak sufficient to prevent the spread of fire is to be in place. **For this permit,** breaks are to be: slashed, mown, bare earth, natural, or ______ and to a width of: 4 metres.
2. The fire is not to be lit if the wind is, or is forecast to be of a strength and / or direction to cause the spread of the fire beyond the planned boundary of the fire or, cause smoke to be a nuisance to a neighbour. **For this permit,** the fire is not to be lit if the wind is forecast to exceed 15 kph and / or is blowing from the ______
3. There must be enough capable persons and equipment in attendance (see Note 1 below) to control the fire and prevent it's spread beyond the planned boundary of the fire. For this permit, there are to be 4 capable persons and the following equipment on site and in close attendance on the fire: 3 X 4WD 400L FIRE UNITS
4. If the fire (or smoke) is likely to affect a road, precautions must be taken as follows: SMOKE HAZARD SIGNS ERECTED BOTH ENDS
5. The fire must not be lit ~~before~~ / after 0930 am / ~~pm~~ or between ______ and ______.
6. To avoid nuisance and unnecessary QFES responses, the permit holder **must** notify Firecom on 1800 64 24 90 immediately prior to lighting the fire.
7. The local Fire Station / Rural Fire Brigade must be notified prior to lighting. The contact details for the brigade are: 0490689697
8. The permit holder **must** have a copy of the permit in their possession before lighting and until the fire is out.
9. After burning, the perimeter **must** be made safe and the fire patrolled until there is no longer any risk of the fire escaping.
10. Other conditions:

This permit covers the period from: 28/8/24 to 10/9/24 **Note: If the fire is not out when the Permit expires, the Fire warden must be contacted**

Date: 28/8/24 Signed: R. Doyle (Fire Warden)

1. Persons must be physically and mentally capable to combat the fire and be close enough to take immediate action.

OPERATIONAL MAP

LMZ 05

8/5/2024

Kaban_Extent

Kaban_Offsets

Greater Glider Offset

Operational Burn Points

Location Reference

Staging Area

Burn Plan Area

Standard Point Assets

Access Control

Water

Built Asset

Standard Roads Tracks Trails

Standard Lineal Assets

World Imagery

Low Resolution 15m Imagery

High Resolution 60cm Imagery

High Resolution 30cm Imagery

Citations

60cm Resolution Metadata

1:2,000

0 0.02 0.04 0.08 mi

0 0.04 0.07 0.14 km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PHOTOS

PHOTOS

PHOTOS

PHOTOS

APPENDIX 1 – WEATHER FORECAST INFORMATION

Forecast location: Kaban

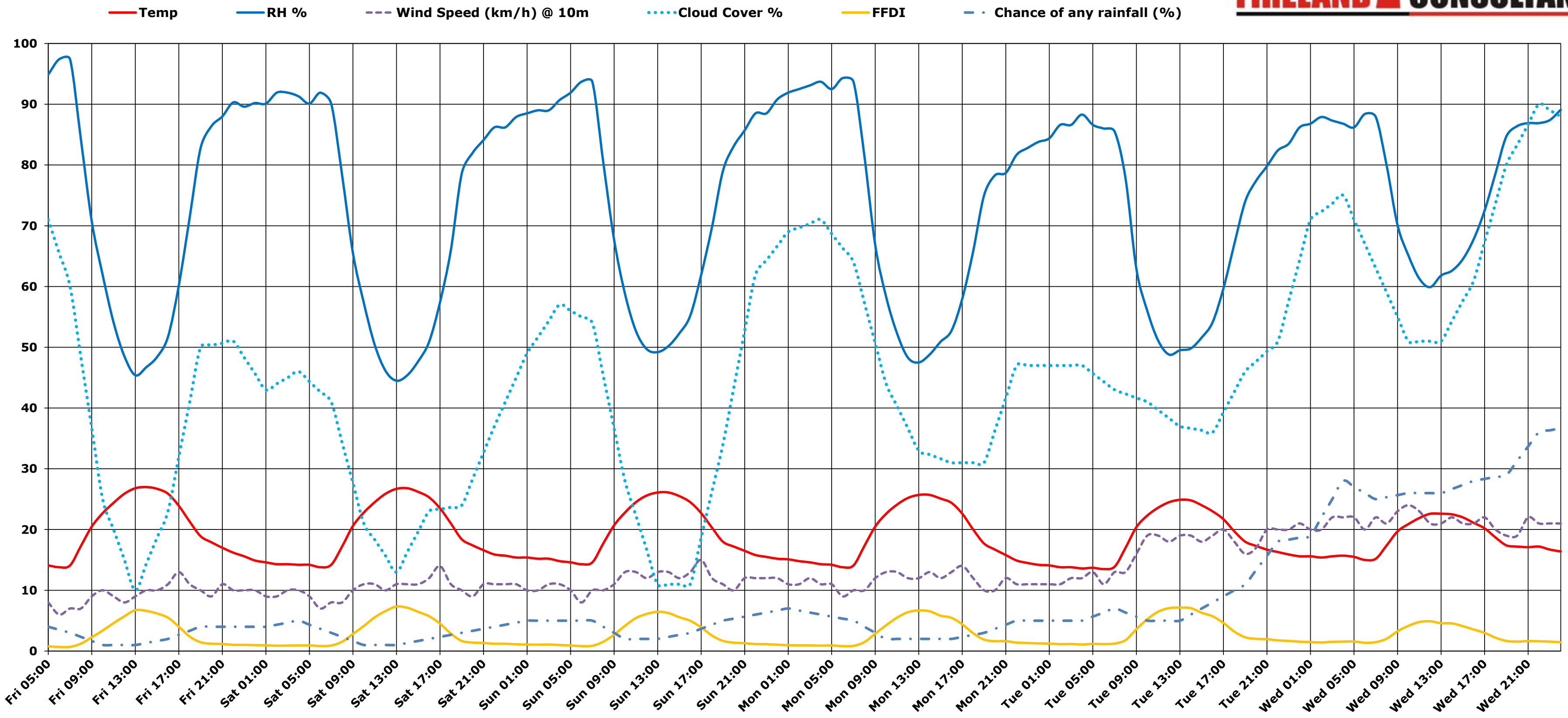
Forecast start: Friday, 30 August 2024

Forecast end: Wednesday, 4 September 2024

KBDI: 65

DF: 9

6 Day Lookahead - Temp, RH, WS, Cloud Cover and FFDI



Time and Date forecast data published: **05:48 on Friday, 30 August 2024**

Forecast Location: -17.57, 145.40

Forecast location: Kaban

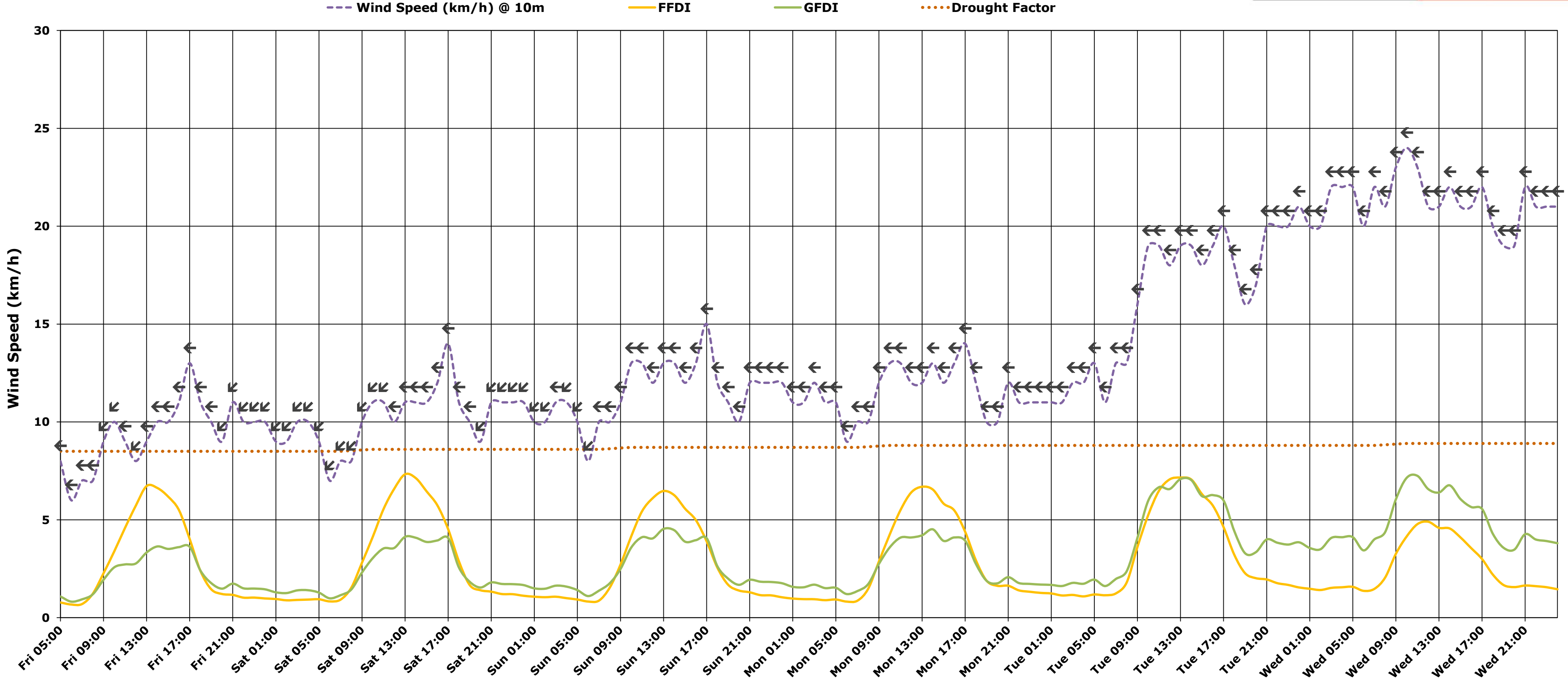
Forecast start: Friday, 30 August 2024

Forecast end: Wednesday, 4 September 2024

KBDI: 65

DF: 9

6 Day Lookahead - Surface Wind Speed and Direction, FFDI, GFDI & DF



Note: Wind Direction has been simplified to the 8 major Cardinal points for display purposes.

GFDI is calculated using a user entered Grass Curing Value of: 100

Time and Date forecast data published: 05:48 on Friday, 30 August 2024

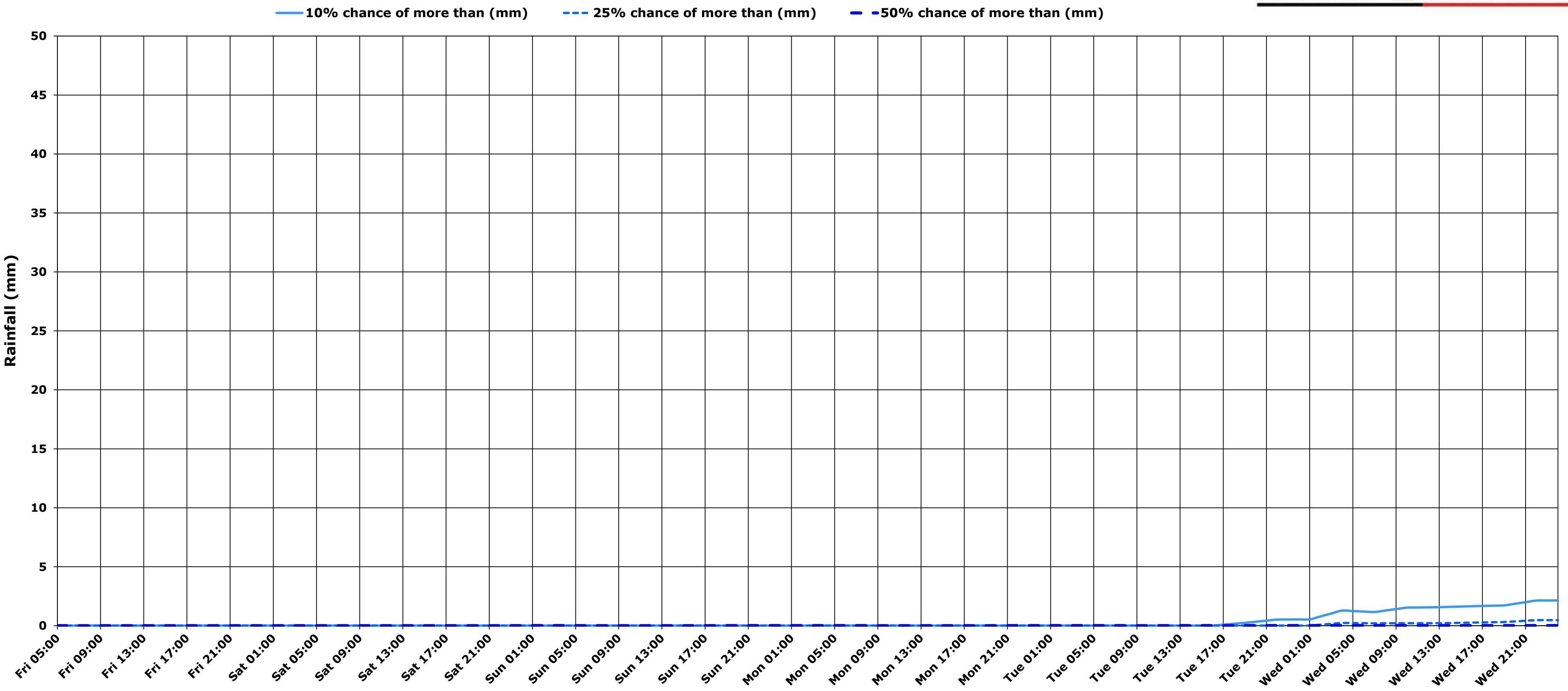
Forecast Location: -17.57, 145.40

Forecast location: Kaban **KBDI:** 65

Forecast start: Friday, 30 August 2024 **DF:** 9

Forecast end: Wednesday, 4 September 2024

6 Day Lookahead - % Chance of more than XXmm of rainfall

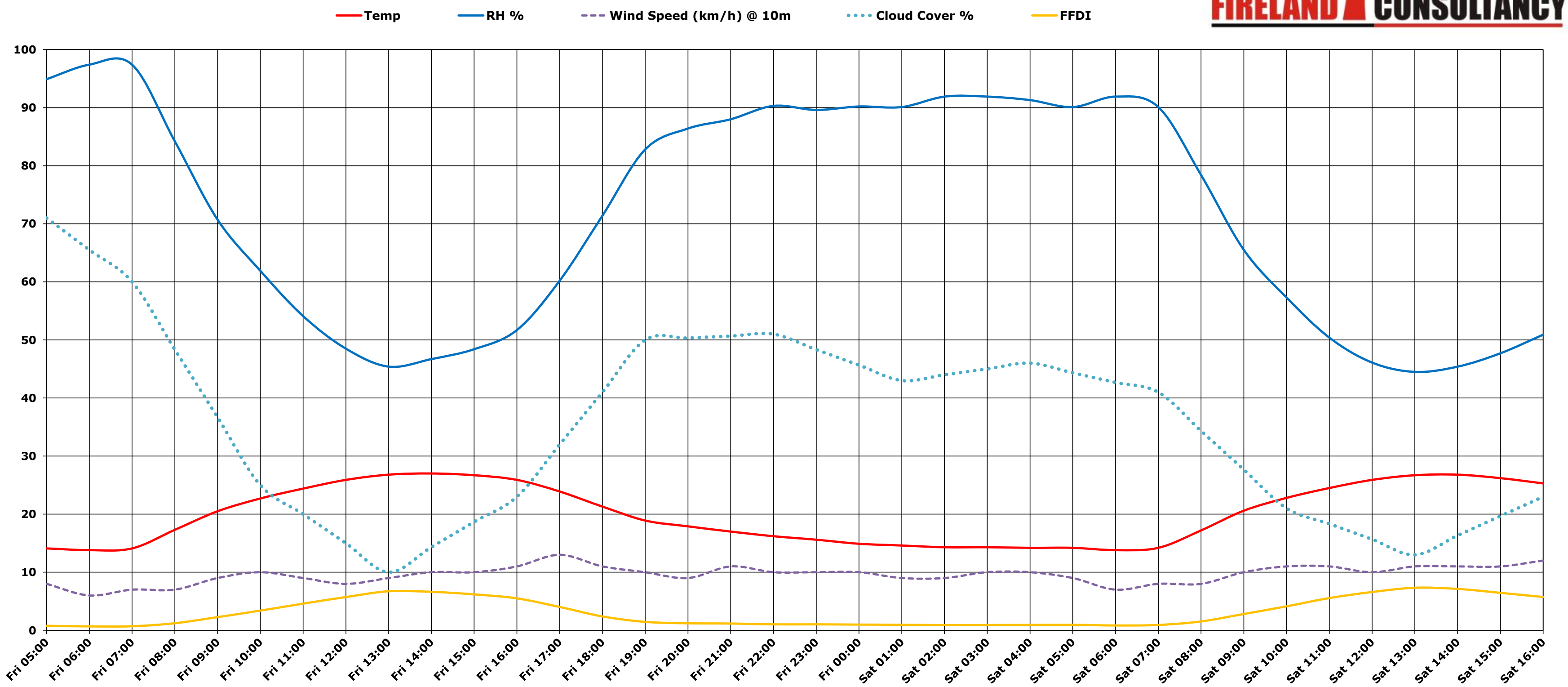


Time and Date forecast data published: 05:48 on Friday, 30 August 2024

Forecast Location: -17.57, 145.40

Forecast Location: Kaban | **KBDI:** 65
Forecast start: Friday, 30 August 2024 | **DF:** 9
Forecast end: Saturday, 31 August 2024

36 Hour Forecast - Temp, RH, WS, Cloud Cover and FFDI



Time and Date forecast data published: 5:48 AM on Friday, 30 August 2024

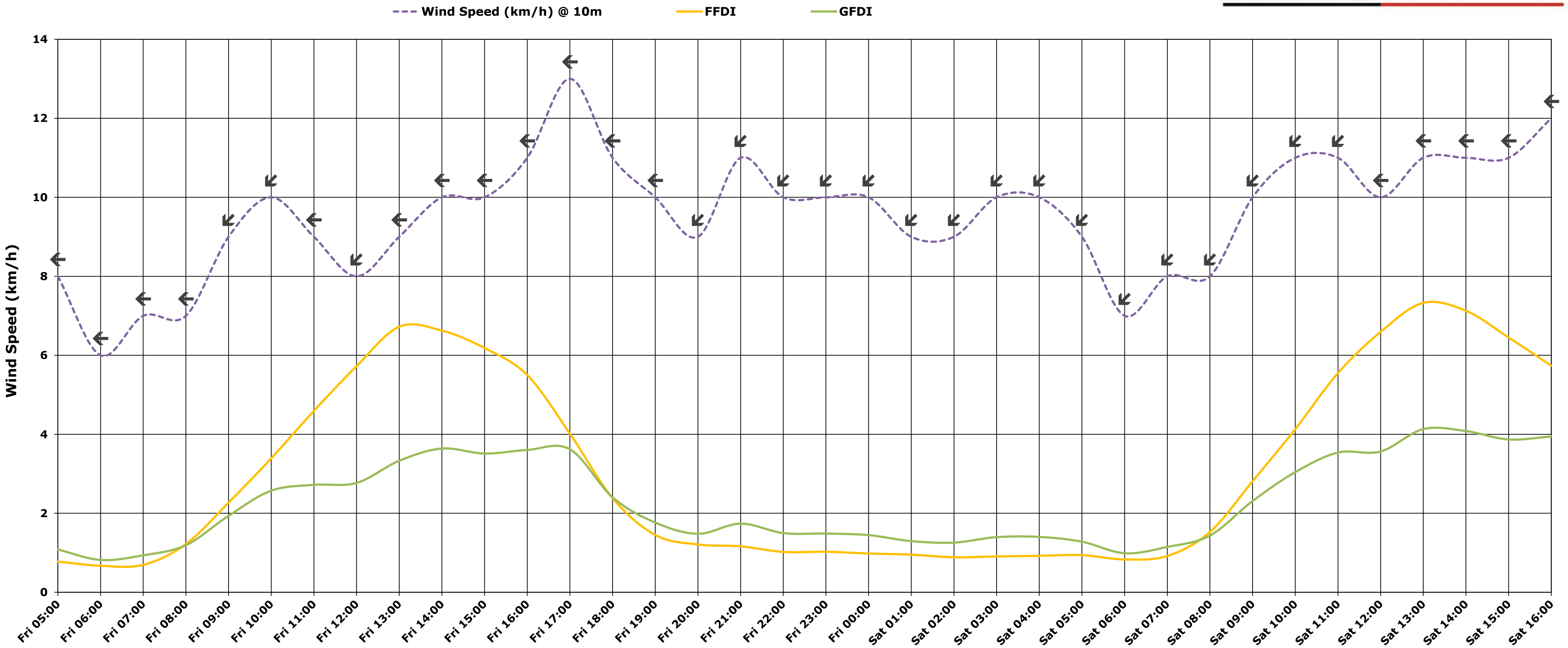
Some data on this app. is sourced from the Bureau of Meteorology. Click here for details.

Forecast Location: -17.57, 145.40

Forecast Location: Kaban
Forecast start: Friday, 30 August 2024
Forecast end: Saturday, 31 August 2024

KBDI: 65
DF: 9

36 Hour Forecast - Surface Wind Speed and Direction, FFDI & GFDI



Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: **05:48** **on** **Friday, 30 August 2024**

Some data on this app. is sourced from the **Bureau of Meteorology.** Click here for details.

Forecast Location: -17.57, 145.40

Forecast Location: Kaban **KBDI:** 65

Forecast start: Friday, 30 August 2024 **DF:** 9

Forecast end: Saturday, 31 August 2024

FIRELAND CONSULTANCY

Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Drought Factor	Leaflet 80 FMC (%)	Combined Forest FMC (%)	FFDI	GFDI	Cloud Cover %	Mixing Height (m ASL)	Wind Dir (Cardinal 8pt) @ 1000m	Wind Dir (Arrow 8pt) @ 1000m	Wind Speed (km/h) @1000m	Wind Dir (Cardinal 8pt) @ 1500m	Wind Dir (Arrow 8pt) @ 1500m	Wind Speed (km/h) @ 1500m
Fri 05:00	14	95	E	←	8	9	19.2		1	1	71	788	E	←	17	E	←	19
Fri 06:00	14	97	E	←	6	9	19.5		1	1	66	751	E	←	17	E	←	17
Fri 07:00	14	97	E	←	7	9	19.5	19.1	1	1	60	788	E	←	15	E	←	17
Fri 08:00	17	84	E	←	7	9	17.1	19.5	1	1	48	1,093	E	←	15	NE	↙	17
Fri 09:00	21	71	ENE	↙	9	9	14.7	19.4	2	2	37	1,319	NE	↙	15	NE	↙	15
Fri 10:00	23	62	ENE	↙	10	9	13.1	17.0	3	3	25	1,499	NE	↙	13	NE	↙	15
Fri 11:00	24	54	E	←	9	9	11.7	14.6	5	3	20	1,667	E	←	11	NE	↙	15
Fri 12:00	26	49	ENE	↙	8	9	8.8	13.0	6	3	15	1,838	E	←	15	NE	↙	13
Fri 13:00	27	45	E	←	9	9	8.3	11.7	7	3	10	1,972	E	←	13	NE	↙	11
Fri 14:00	27	47	E	←	10	9	8.4	7.7	7	4	14	1,987	E	←	15	NE	↙	11
Fri 15:00	27	48	E	←	10	9	8.7	7.2	6	4	19	1,957	E	←	17	E	←	11
Fri 16:00	26	52	E	←	11	9	9.3	7.3	5	4	23	1,836	E	←	19	E	←	11
Fri 17:00	24	60	E	←	13	9	10.7	7.6	4	4	32	1,613	E	←	19	E	←	9
Fri 18:00	21	71	E	←	11	9	12.7	8.1	2	2	41	1,385	E	←	19	E	←	9
Fri 19:00	19	83	E	←	10	9	14.6	9.4	1	2	50	1,121	E	←	19	SE	↖	7
Fri 20:00	18	86	ENE	↙	9	9	15.2	11.0	1	1	50	1,071	E	←	19	SE	↖	7
Fri 21:00	17	88	ENE	↙	11	9	15.6	12.7	1	2	51	1,032	E	←	19	SE	↖	9
Fri 22:00	16	90	ENE	↙	10	9	16.0	13.3	1	1	51	999	E	←	19	SE	↖	11
Fri 23:00	16	90	ENE	↙	10	9	16.0	13.6	1	1	48	929	E	←	20	SE	↖	13
Fri 00:00	15	90	ENE	↙	10	9	18.4	14.0	1	1	46	846	E	←	20	E	←	15
Sat 01:00	15	90	ENE	↙	9	9	18.5	14.0	1	1	43	835	E	←	20	E	←	15
Sat 02:00	14	92	ENE	↙	9	9	18.8	18.4	1	1	44	807	E	←	20	E	←	17
Sat 03:00	14	92	ENE	↙	10	9	18.8	18.4	1	1	45	850	E	←	20	E	←	17
Sat 04:00	14	91	ENE	↙	10	9	18.7	18.7	1	1	46	848	E	←	19	E	←	19
Sat 05:00	14	90	ENE	↙	9	9	18.6	18.7	1	1	44	834	E	←	20	E	←	19
Sat 06:00	14	92	ENE	↙	7	9	18.9	18.7	1	1	43	774	E	←	20	E	←	19
Sat 07:00	14	90	ENE	↙	8	9	18.6	18.5	1	1	41	834	E	←	22	E	←	19
Sat 08:00	17	78	ENE	↙	8	9	16.4	18.9	2	1	34	1,068	E	←	20	E	←	20
Sat 09:00	21	66	ENE	↙	10	9	14.0	18.5	3	2	28	1,229	E	←	20	E	←	22
Sat 10:00	23	57	ENE	↙	11	9	12.5	16.4	4	3	21	1,346	E	←	19	E	←	22
Sat 11:00	25	50	ENE	↙	11	9	11.3	14.0	6	4	18	1,545	E	←	19	E	←	24
Sat 12:00	26	46	E	←	10	9	8.5	12.5	7	4	16	1,760	E	←	20	E	←	20
Sat 13:00	27	45	E	←	11	9	8.2	11.3	7	4	13	1,856	E	←	19	E	←	19
Sat 14:00	27	45	E	←	11	9	8.3	7.5	7	4	16	1,870	E	←	20	E	←	17
Sat 15:00	26	48	E	←	11	9	8.7	7.1	6	4	20	1,833	E	←	20	E	←	17
Sat 16:00	25	51	E	←	12	9	9.3	7.2	6	4	23	1,763	E	←	20	E	←	15

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: 05:48 on Friday, 30 August 2024

Forecast Location: -17.57, 145.40

Forecast Location: Kaban

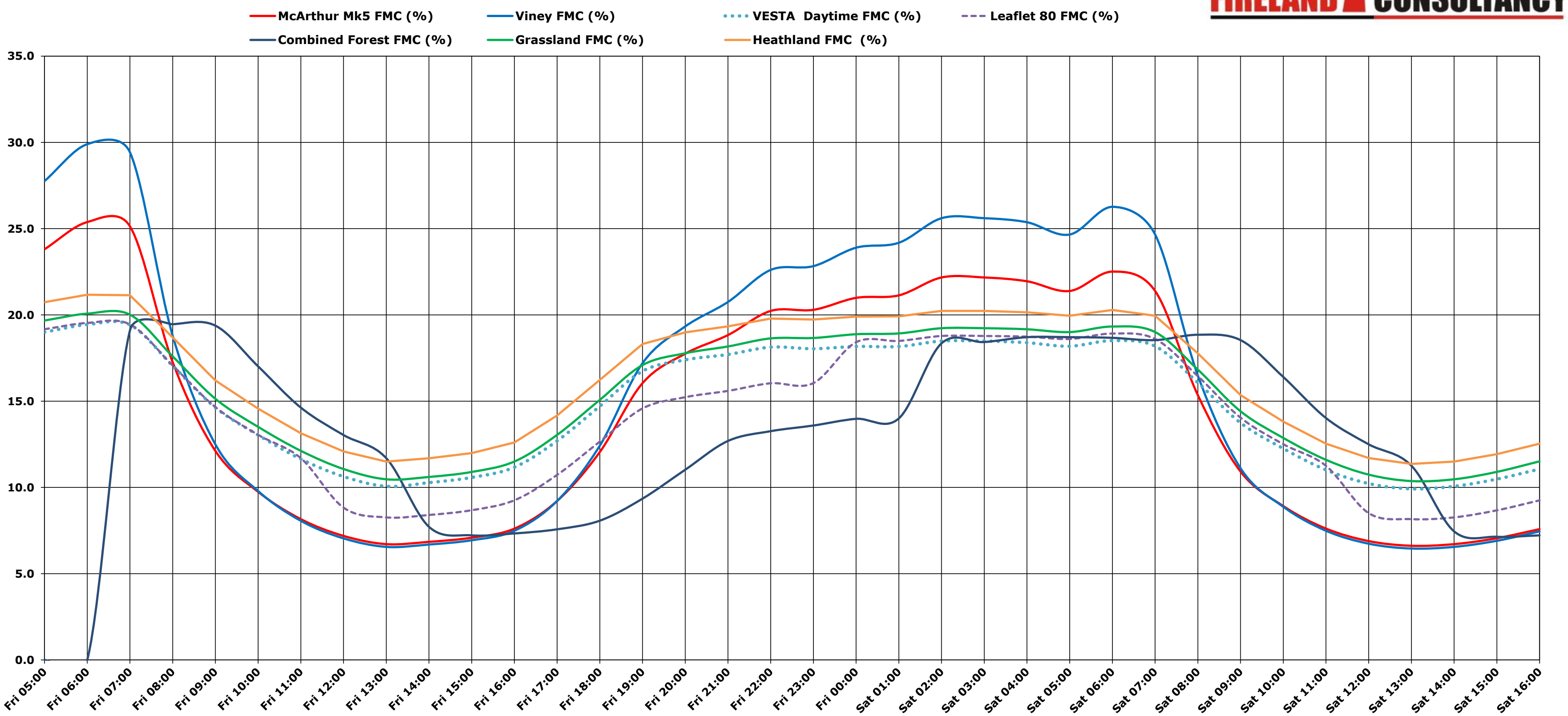
Forecast start: Friday, 30 August 2024

Forecast end: Saturday, 31 August 2024

KBDI: 65

DF: 9

36 Hour Forecast - Fuel Moisture Content



Time and Date forecast data published: 05:48 on Friday, 30 August 2024

Forecast Location: -17.57, 145.40

36 Hour Fire Behaviour Estimates

FIRELAND CONSULTANCY

Forecast location: Kaban
Forecast start: Friday, 30 August 2024
Forecast end: Saturday, 31 August 2024

KBDI: 65
DF: 9

Grass curing: 100
Grass fuel load (t/ha): 4

						McArthur - Leaflet 80															CSIRO Fire Spread Meter for Northern Australia Grasslands									
						Dry Sclerophyll Forest Light fuels = 8t/ha (40 - 60% canopy cover)								Dry Sclerophyll Forest Moderate - Heavy fuels = 12t/ha (40 - 60% canopy cover)							Grassy Woodland Assumes 100% grass curing (5 - 7m high, canopy cover <30%)					Grassy Open Forest Assumes 100% grass curing (10 - 15m tall, canopy cover 30-70%)				
Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	QPWS PGB Fire Severity Class - Light fuels (Intensity)	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning
Fri 05:00	14	95	E	←	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.7	19	0.2	40	0 - 5	Marginal	12	0.2	24	0 - 5	Marginal
Fri 06:00	14	97	E	←	6	2.7	2	0.0	0.4	Below	Low	0.7	2.3	2.7	2	0.1	0.7	Below	0.8	2.6	1	0.1	2	0 - 5	Marginal	1	0.1	1	0 - 5	Marginal
Fri 07:00	14	97	E	←	7	2.9	2	0.0	0.4	Below	Low	0.7	2.3	2.9	3	0.1	0.7	Below	0.9	2.7	1	0.1	3	0 - 5	Marginal	1	0.1	2	0 - 5	Marginal
Fri 08:00	17	84	E	←	7	2.9	3	0.1	0.6	Below	Low	0.8	2.5	2.9	4	0.1	1.0	Below	1.1	3.0	119	0.4	247	6 - 11	Generally suitable	72	0.3	148	6 - 11	Generally suitable
Fri 09:00	21	71	ENE	↙	9	3.3	5	0.1	0.9	Below	Low	1.0	2.9	3.3	8	0.2	1.6	Below	1.5	3.8	341	0.6	704	6 - 11	Generally suitable	204	0.5	423	6 - 11	Generally suitable
Fri 10:00	23	62	ENE	↙	10	3.5	8	0.1	1.2	Below	Low	1.2	3.2	3.5	12	0.3	2.0	Below	1.9	4.5	517	0.6	1068	6 - 11	Generally suitable	310	0.5	641	6 - 11	Generally suitable
Fri 11:00	24	54	E	←	9	3.3	11	0.2	1.4	Below	Low	1.4	3.6	3.3	16	0.4	2.5	Below	2.3	5.2	552	0.6	1141	6 - 11	Generally suitable	331	0.6	685	6 - 11	Generally suitable
Fri 12:00	26	49	ENE	↙	8	3.1	20	0.3	2.2	Yes	Low	2.0	4.7	3.1	30	0.6	3.8	Yes	3.7	7.5	532	0.6	1100	6 - 11	Generally suitable	319	0.5	660	6 - 11	Generally suitable
Fri 13:00	27	45	E	←	9	3.3	23	0.4	2.4	Yes	Low	2.3	5.1	3.3	35	0.7	4.2	Yes	4.1	8.3	662	0.7	1367	6 - 11	Generally suitable	397	0.6	820	6 - 11	Generally suitable
Fri 14:00	27	47	E	←	10	3.5	23	0.4	2.4	Yes	Low	2.3	5.1	3.5	35	0.7	4.2	Yes	4.1	8.3	741	0.7	1531	6 - 11	Generally suitable	445	0.6	919	6 - 11	Generally suitable
Fri 15:00	27	48	E	←	10	3.5	22	0.3	2.3	Yes	Low	2.2	5.0	3.5	32	0.7	4.0	Yes	3.9	8.0	718	0.7	1484	6 - 11	Generally suitable	431	0.6	890	6 - 11	Generally suitable
Fri 16:00	26	52	E	←	11	3.6	20	0.3	2.2	Yes	Low	2.0	4.7	3.6	29	0.6	3.7	Yes	3.6	7.5	751	0.7	1552	6 - 11	Generally suitable	451	0.6	931	6 - 11	Generally suitable
Fri 17:00	24	60	E	←	13	4.0	15	0.2	1.8	Below	Low	1.7	4.1	4.0	22	0.5	3.1	Yes	2.9	6.3	779	0.7	1611	6 - 11	Generally suitable	468	0.6	966	6 - 11	Generally suitable
Fri 18:00	21	71	E	←	11	3.6	9	0.2	1.3	Below	Low	1.3	3.4	3.6	14	0.3	2.2	Below	2.1	4.8	529	0.6	1093	6 - 11	Generally suitable	317	0.5	656	6 - 11	Generally suitable
Fri 19:00	19	83	E	←	10	3.5	6	0.1	0.9	Below	Low	1.0	2.9	3.5	8	0.2	1.6	Below	1.5	3.8	232	0.5	479	6 - 11	Generally suitable	139	0.4	287	6 - 11	Generally suitable
Fri 20:00	18	86	ENE	↙	9	3.3	5	0.1	0.8	Below	Low	0.9	2.8	3.3	7	0.2	1.4	Below	1.4	3.6	156	0.4	322	6 - 11	Generally suitable	93	0.4	193	6 - 11	Generally suitable
Fri 21:00	17	88	ENE	↙	11	3.6	5	0.1	0.8	Below	Low	0.9	2.8	3.6	7	0.2	1.4	Below	1.4	3.5	345	0.6	713	6 - 11	Generally suitable	207	0.5	428	6 - 11	Generally suitable
Fri 22:00	16	90	ENE	↙	10	3.5	4	0.1	0.8	Below	Low	0.9	2.7	3.5	6	0.2	1.3	Below	1.3	3.4	108	0.4	224	6 - 11	Generally suitable	65	0.3	134	6 - 11	Generally suitable
Fri 23:00	16	90	ENE	↙	10	3.5	4	0.1	0.8	Below	Low	0.9	2.7	3.5	6	0.2	1.3	Below	1.3	3.4	107	0.4	220	6 - 11	Generally suitable	64	0.3	132	6 - 11	Generally suitable
Fri 00:00	15	90	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	4	0.1	0.9	Below	1.0	2.9	89	0.4	184	6 - 11	Generally suitable	53	0.3	110	6 - 11	Generally suitable
Sat 01:00	15	90	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.9	Below	1.0	2.8	75	0.3	155	6 - 11	Generally suitable	45	0.3	93	0 - 5	Marginal
Sat 02:00	14	92	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.8	Below	0.9	2.8	54	0.3	112	6 - 11	Generally suitable	32	0.3	67	0 - 5	Marginal
Sat 03:00	14	92	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	0.9	2.8	61	0.3	127	6 - 11	Generally suitable	37	0.3	76	0 - 5	Marginal
Sat 04:00	14	91	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	0.9	2.8	66	0.3	137	6 - 11	Generally suitable	40	0.3	82	0 - 5	Marginal
Sat 05:00	14	90	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.9	Below	0.9	2.8	70	0.3	144	6 - 11	Generally suitable	42	0.3	86	0 - 5	Marginal
Sat 06:00	14	92	ENE	↙	7	2.9	2	0.0	0.5	Below	Low	0.7	2.4	2.9	3	0.1	0.8	Below	0.9	2.7	33	0.3	69	0 - 5	Marginal	20	0.2	41	0 - 5	Marginal
Sat 07:00	14	90	ENE	↙	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.8	60	0.3	124	6 - 11	Generally suitable	36	0.3	74	0 - 5	Marginal
Sat 08:00	17	78	ENE	↙	8	3.1	4	0.1	0.7	Below	Low	0.8	2.6	3.1	5	0.1	1.2	Below	1.2	3.2	191	0.5	394	6 - 11	Generally suitable	114	0.4	236	6 - 11	Generally suitable
Sat 09:00	21	66	ENE	↙	10	3.5	6	0.1	1.0	Below	Low	1.1	3.0	3.5	10	0.2	1.8	Below	1.7	4.1	445	0.6	920	6 - 11	Generally suitable	267	0.5	552	6 - 11	Generally suitable
Sat 10:00	23	57	ENE	↙	11	3.6	9	0.2	1.3	Below	Low	1.3	3.4	3.6	14	0.3	2.3	Below	2.1	4.9	659	0.7	1363	6 - 11	Generally suitable	396	0.6	818	6 - 11	Generally suitable
Sat 11:00	25	50	ENE	↙	11	3.6	13	0.2	1.6	Below	Low	1.5	3.9	3.6	19	0.4	2.8	Yes	2.6	5.7	743	0.7	1536	6 - 11	Generally suitable	446	0.6	921	6 - 11	Generally suitable
Sat 12:00	26	46	E	←	10	3.5	23	0.4	2.4	Yes	Low	2.3	5.1	3.5	34	0.7	4.2	Yes	4.1	8.3	730	0.7	1509	6 - 11	Generally suitable	438	0.6	905	6 - 11	Generally suitable
Sat 13:00	27	45	E	←	11	3.6	25	0.4	2.6	Yes	Low	2.5	5.4	3.6	38	0.8	4.5	Yes	4.5	9.0	849	0.7	1754	6 - 11	Generally suitable	509	0.6	1052	6 - 11	Generally suitable
Sat 14:00	27	45	E	←	11	3.6	25	0.4	2.6	Yes	Low	2.4	5.4	3.6	37	0.8	4.4	Yes	4.4	8.8	839	0.7	1735	6 - 11	Generally suitable	504	0.6	1041	6 - 11	Generally suitable
Sat 15:00	26	48	E	←	11	3.6	23	0.4	2.4	Yes	Low	2.3	5.1	3.6	34	0.7	4.1	Yes	4.1	8.3	801	0.7	1656	6 - 11	Generally suitable	481	0.6	994	6 - 11	Generally suitable
Sat 16:00	25	51	E	←	12	3.8	20	0.3	2.3	Yes	Low	2.1	4.8	3.8	31	0.7	3.9	Yes	3.8	7.7	826	0.7	1708	6 - 11	Generally suitable	496	0.6	1025	6 - 11	Generally suitable

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes.
Time and Date forecast data published: 5:48 AM **on** Friday, 30 August 2024

Some data on this app. is sourced from the Bureau of Meteorology. Click here for details.

Forecast Location: -17.57, 145.40

Draft product - under development.

Sources of equations used for Modelling and assumptions:
Leaflet 80 Equations used in this table are taken from Gould, J.S. (1994) *Evaluation of McArthur's control burning guide in regrowth Eucalyptus sieberi forest*. Australian Journal of Forestry, 57:2, 86-93.
QPWS PBG Optimum conditions for planned burns is taken from Table A - Light fuels = 8 t/ha and Table B Moderate - heavy fuels = 12t/ha in the QPWS *PBG - How to assess if your burn is ready to go*.
QPWS PBG Fire Severity Class is taken from Table 3 Open forests/woodlands in the QPWS *PBG - How to assess if your burn is ready to go*. Determined using fire intensity values.
Burrows Scorch Height is calculated using equations taken from Burrows (1997) *Predicting canopy scorch height in jarrah forests*. Flame height equations have been used.
Equations for the CSIRO Fire Spread Meter for Northern Australia Grasslands is taken from Cheney, N.P., Gould, J.S. and Catchpole, W.R. (1998) *Prediction of Fire Spread in Grasslands*. International Journal of Wildland Fire 8. 1 - 13.
AFDRS Fire Behaviour Index calculations are based on the Matthews, S. (2022) *AFDRS Fire Behaviour Index Technical Guide*.
AFDRS Implications for Planned Burning are taken from the AFDRS *Fire Behaviour Index Reference Manual Version 1*.
Grass curing is assumed to be 100% by default for grass fire behaviour calculations.
All fire behaviour calculations assume no slope.

APPENDIX 2 – WEATHER OBSERVATION DATA

Weather Observations for PORTABLE QFRK (Ravenshoe)

Station Details	ID: 250075	Name: RAVENSHOE (QFRK)
Lat: -17.61	Lon: 145.49	Height: 922.0 m

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
30/08/2024	04:00pm	24.7	58	E	13	15	0
30/08/2024	04:10pm	24.5	56	E	13	15	0
30/08/2024	04:20pm	24.5	58	ENE	11	15	0
30/08/2024	04:30pm	24.5	55	ENE	11	13	0
30/08/2024	04:40pm	24	58	ENE	13	15	0
30/08/2024	04:50pm	23.5	60	E	13	17	0
30/08/2024	05:00pm	23.2	63	E	13	15	0
30/08/2024	05:10pm	22.7	64	ENE	13	15	0
30/08/2024	05:20pm	22.2	66	ENE	13	15	0
30/08/2024	05:30pm	21.8	70	E	11	13	0
30/08/2024	05:40pm	21.2	76	ENE	11	13	0
30/08/2024	05:50pm	20.3	80	ENE	13	15	0
30/08/2024	06:00pm	19.5	83	ENE	15	15	0
30/08/2024	06:10pm	18.7	86	ENE	15	17	0
30/08/2024	06:20pm	18.1	88	E	15	15	0
30/08/2024	06:30pm	17.7	89	E	13	15	0
30/08/2024	06:40pm	17.6	90	ENE	15	20	0
30/08/2024	06:50pm	17.3	91	E	13	19	0
30/08/2024	07:00pm	17.3	89	E	17	19	0

APPENDIX 3 – DAILY SITE BRIEFING

Daily Site Briefing

000136 / Kaban

Complete

Document No:	000136
Client:	Vestas and Neoen
Site / Project Name:	Kaban
Location:	Tumoulin QLD 4888 Australia (-17.559531311849877, 145.39053495734353)
Briefing conducted on:	30.08.2024 10:42 AEST
Briefing conducted by:	Francis Hines

Record of Briefing:	
Site induction:	
Site induction complete by all workers?	Yes
Site rules and procedures understood?	Yes
Work health and safety:	
JSEA/Safety documentation still current? Fireland Prescribed Burn JSEA Kaban 2024 V0.2 JSEA Polaris V1.1	Yes
Any site changes since yesterday?	N/A
Fatigue management:	
Workers rested and fit for work?	Yes
Traffic Management:	
Daily Traffic Management Plan communicated?	Yes
Plant and equipment:	
All equipment pre-starts completed?	Yes
Operators have competency for plant and equipment and Verification of Competency (VOC) provided?	Yes
Communications:	
Work site communications channel?	Fireland Channel 1 & UHF 17
Emergency procedures:	
Location of first aid kits identified?	Yes
First aid qualified staff identified?	Yes
Emergency response procedure discussed?	Yes
Daily muster point location?	Sawmill
Fauna, Flora and Cultural Heritage:	

Fauna Management - Plant operators

[Fauna management procedure - plant operators.pdf]

Fauna/flora management procedure understood?	Yes
Cultural Heritage procedure understood? **1. FIND: A potential Cultural Heritage item or object is found.** **2. STOP: STOP WORK IMMEDIATELY and install an exclusion zone around the area.** **3. NOTIFY: Notify a responsible person (e.g. Site Supervisor, Project Manager).** **4. MANAGE: Report the discovery to the Project Manager for advice on management.**	Yes
Environmental Clearance Certificate understood?	N/A

Tool Box talk - topic of the day:

Select a topic for discussion.	Other from group

UXO potential in work area.

Record of Attendance

Briefing attendees

Briefing attendees 1

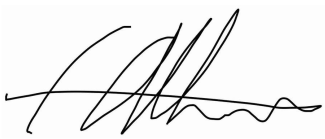
Attendees name and signature:

Francis Hines
30.08.2024 10:44 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 2

Attendees name and signature:



Cameron Allanson
30.08.2024 10:45 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 3

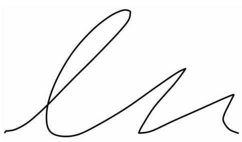
Attendees name and signature:

Emma Henry
30.08.2024 10:45 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 4

Attendees name and signature:

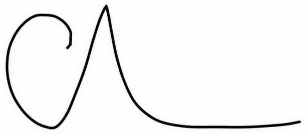


Miles Cross
30.08.2024 10:47 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 5

Attendees name and signature:



Courtney Dangerfield
30.08.2024 10:47 AEST

Agency/Company	Fireland Consultancy

S28 – A OPERATIONAL POST BURN REPORT

BURN NAME	**LMZ 07**	**Lot/Plan/s No.** (all approvals obtained) ☒ Yes	2/RP735194
Burn No.	LMZ 07		
Location	Kaban Green Power Hub	**Road Segment No.**	
LGA	Tablelands Regional	**Proposed Timing**	June – Sept 2024
Date burn started	30/08/2024	**Time**	12:35
Date burn deemed safe	03/09/2024	**Time**	13:00
Permit #	F506578	**Complexity**	CR 2 (69)

Incident Controller	Francis Hines	Fireland
	Name	Position

SITUATION – OUTCOMES

Area to be treated	5.35 ha	Percentage aim	<30% at landscape level	Last fire	Unknown
Actual treated area	5.35ha	Percentage achieved	<30% at landscape level. >90% coverage within unit.	Severity class	Moderate

MISSION – OUTCOMES

Aim & Objectives (Outline the general intent of the proposed burn and the specific objectives. Consider fuel load, fuel structure & mosaic effect)	To reduce the likelihood of high-intensity wildfires that may impact site vegetation and species habitat suitability. Implement Low to Moderate intensity planned burns with <30% coverage (at a landscape level).
Outcomes (Outline if the objectives were met, if not why not)	Objectives met. Desired coverage achieved at a landscape level through operational programming.
List recommendations (For burn area, may include fire trail works)	Ongoing maintenance of Fire Trail W15 that forms the southwestern boundary of this unit is required as per the recommendations contained in the Landscape Fire Management Plan (April 2023).

EXECUTION – DETAILS

Weather observations	Refer to: • Appendix 1 for weather forecast information. • Appendix 2 for weather observation data.
Comments (List any weather conditions that significantly impacted operations)	Overall site conditions were at the drier end of desired conditions. As a result burn coverage and fuel consumption was high. Fire danger index: 7 — Estimated KBDI: 65
Ignition used (Describe the ignition)	☒ On ground ignition ☐ Aerial Ignition Hand ignition undertaken using predominately backing fire.
Implementation overview	Backing fire used throughout the operation.
Implementation details	**30/08/24** 10:40 – assessed site conditions and briefed crews. 12:20 – opened Permit to Light Fire through Firecom. 12:20 – notified local rural fire brigade of intention to undertake burn. 12:25 – notified Vestas and Neoen of intention to commence ignition. 12:25 – notified Adam Lockyer of intention to commence ignition. 12:30 – notified QPWS of intention to commence ignition. 12:35 - commenced ignition at 7h at the southern end of the burn with crews working simultaneously along the southwestern and southeastern boundaries using backing fire. 14:15 - ignition complete along southwestern and southeastern boundaries. Crews allowing fire to back through block to the north and the east. 15:00 - burn has worked its way out to the main access track along the northern boundary and has ignited all the windrowed timber. Boundaries secure. 19:00 – crews departed scene. 19:20 – updated Firecom. **31/08/2024** 07:30 – crews back on site. Burn checked and confirmed as secure. Burn was checked several times a day over the following days before being deemed safe at 13:00 on 03/09/2024.

ADMINISTRATION	
Complaints ☒ **No Issues**	Nil.
Infrastructure damage ☒ **No Issues**	Nil.
Impact on road network ☒ **No Issues**	Nil.
Impact on community ☒ **No Issues**	Nil.
Impact on direct residents or stakeholders ☒ **No Issues**	Nil
Other (Include any other comments)	Nil.

SAFETY	
JSEA / Briefing	Refer to Appendix 3 – for Daily Site Briefing.
Any incidents	Nil

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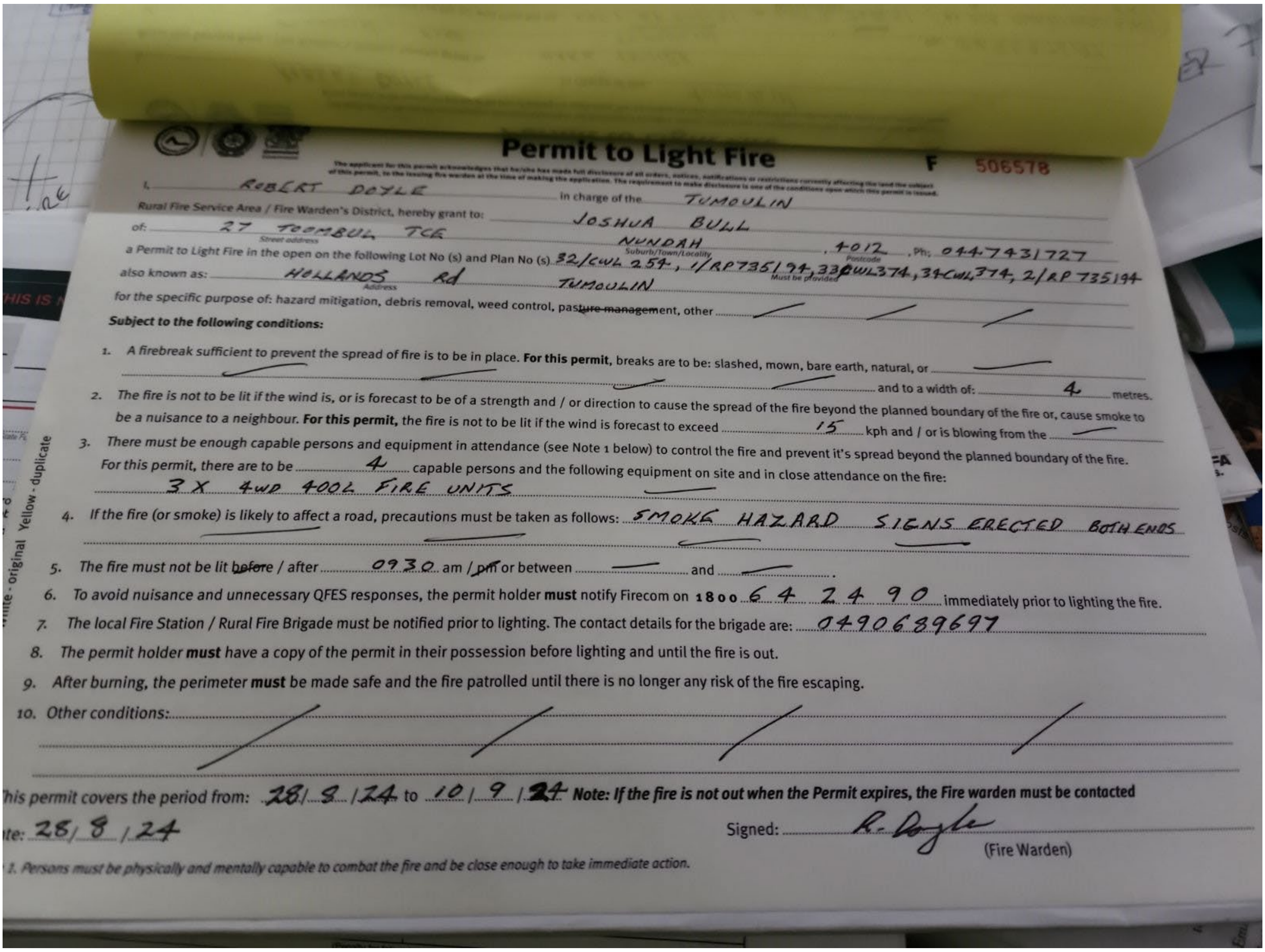
PERMIT TO LIGHT FIRE



Permit to Light Fire F 506578

I, ROBERT DOYLE in charge of the TUMOULIN Rural Fire Service Area / Fire Warden's District, hereby grant to: JOSHUA BULL

of: 27 TOOMBUL TCE (Street address) NUNDAH (Suburb/Town/Locality) 4012 (Postcode) Ph: 0447431727

a Permit to Light Fire in the open on the following Lot No (s) and Plan No (s) 32/CWL 254, 1/RP735194, 33CWL374, 34CWL374, 2/RP735194 (Must be provided)

also known as: HOLLANDS Rd TUMOULIN (Address)

for the specific purpose of: hazard mitigation, debris removal, weed control, pas~~ture management~~, other

Subject to the following conditions:

1. A firebreak sufficient to prevent the spread of fire is to be in place. **For this permit**, breaks are to be: slashed, mown, bare earth, natural, or .... and to a width of: 4 metres.
2. The fire is not to be lit if the wind is, or is forecast to be of a strength and / or direction to cause the spread of the fire beyond the planned boundary of the fire or, cause smoke to be a nuisance to a neighbour. **For this permit,** the fire is not to be lit if the wind is forecast to exceed 15 kph and / or is blowing from the ....
3. There must be enough capable persons and equipment in attendance (see Note 1 below) to control the fire and prevent it's spread beyond the planned boundary of the fire. For this permit, there are to be 4 capable persons and the following equipment on site and in close attendance on the fire: 3 X 4WD 400L FIRE UNITS
4. If the fire (or smoke) is likely to affect a road, precautions must be taken as follows: SMOKE HAZARD SIGNS ERECTED BOTH ENDS
5. The fire must not be lit ~~before~~ / after 0930 am / ~~pm~~ or between .... and ....
6. To avoid nuisance and unnecessary QFES responses, the permit holder **must** notify Firecom on 1800 64 24 90 immediately prior to lighting the fire.
7. The local Fire Station / Rural Fire Brigade must be notified prior to lighting. The contact details for the brigade are: 0490689697
8. The permit holder **must** have a copy of the permit in their possession before lighting and until the fire is out.
9. After burning, the perimeter **must** be made safe and the fire patrolled until there is no longer any risk of the fire escaping.
10. Other conditions: ....

This permit covers the period from: 28/8/24 to 10/9/24 **Note: If the fire is not out when the Permit expires, the Fire warden must be contacted**

Date: 28/8/24 Signed: R. Doyle (Fire Warden)

Note 1. Persons must be physically and mentally capable to combat the fire and be close enough to take immediate action.

White - original Yellow - duplicate

OPERATIONAL MAP

LMZ 07

8/5/2024

1:2,500

Kaban_Cultural
Kaban_Extent
Kaban_Offsets
Greater Glider Offset
Operational Burn Points
Location Reference
Staging Area
Burn Plan Area
Standard Point Assets
Access Control
Built Asset
Standard Roads Tracks Trails
Standard Lineal Assets
World Imagery
Low Resolution 15m Imagery
High Resolution 60cm Imagery
High Resolution 30cm Imagery
Citations
60cm Resolution Metadata

0 0.03 0.06 0.12 mi
0 0.04 0.09 0.18 km

Maxar

PHOTOS

PHOTOS

PHOTOS

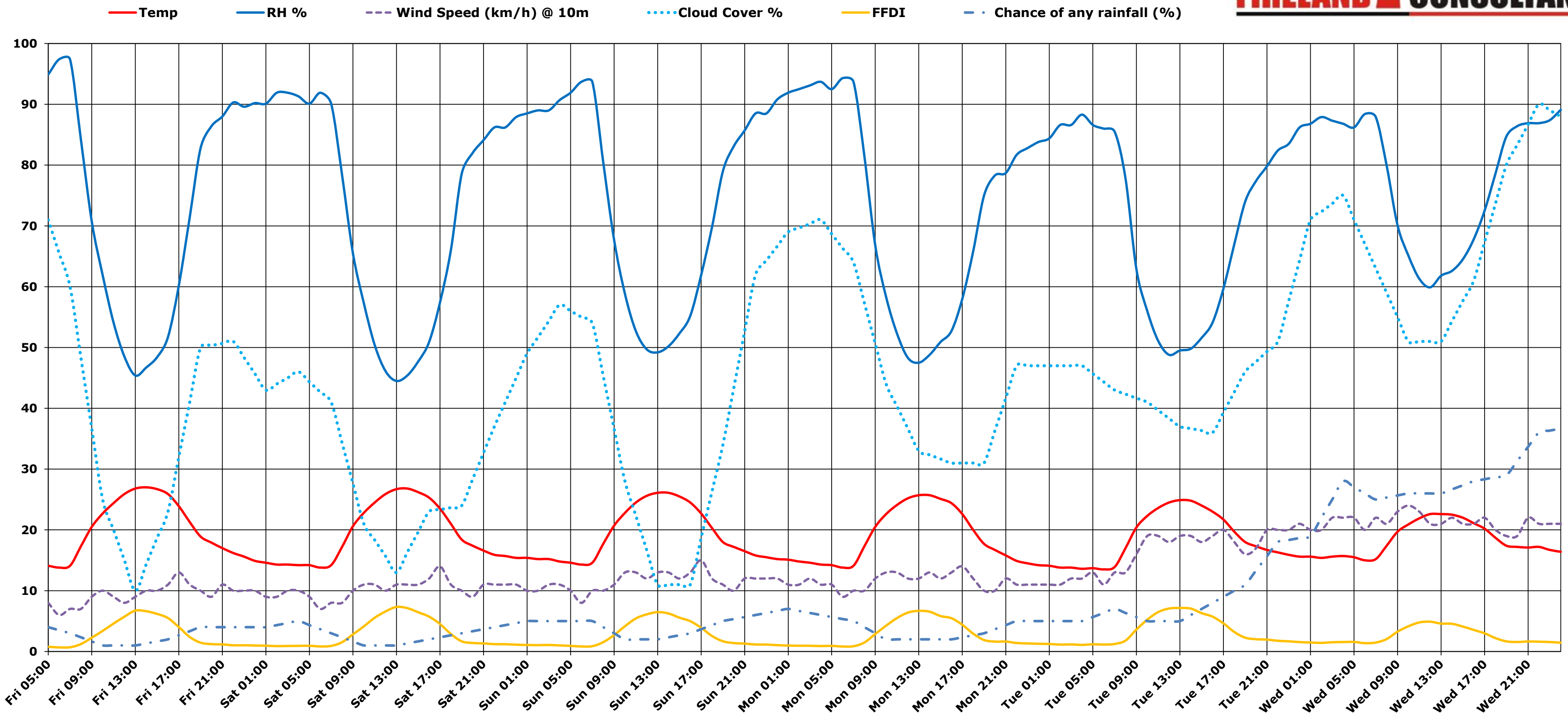
PHOTOS

APPENDIX 1 – WEATHER FORECAST INFORMATION

Forecast location: Kaban
Forecast start: Friday, 30 August 2024
Forecast end: Wednesday, 4 September 2024

KBDI: 65
DF: 9

6 Day Lookahead - Temp, RH, WS, Cloud Cover and FFDI



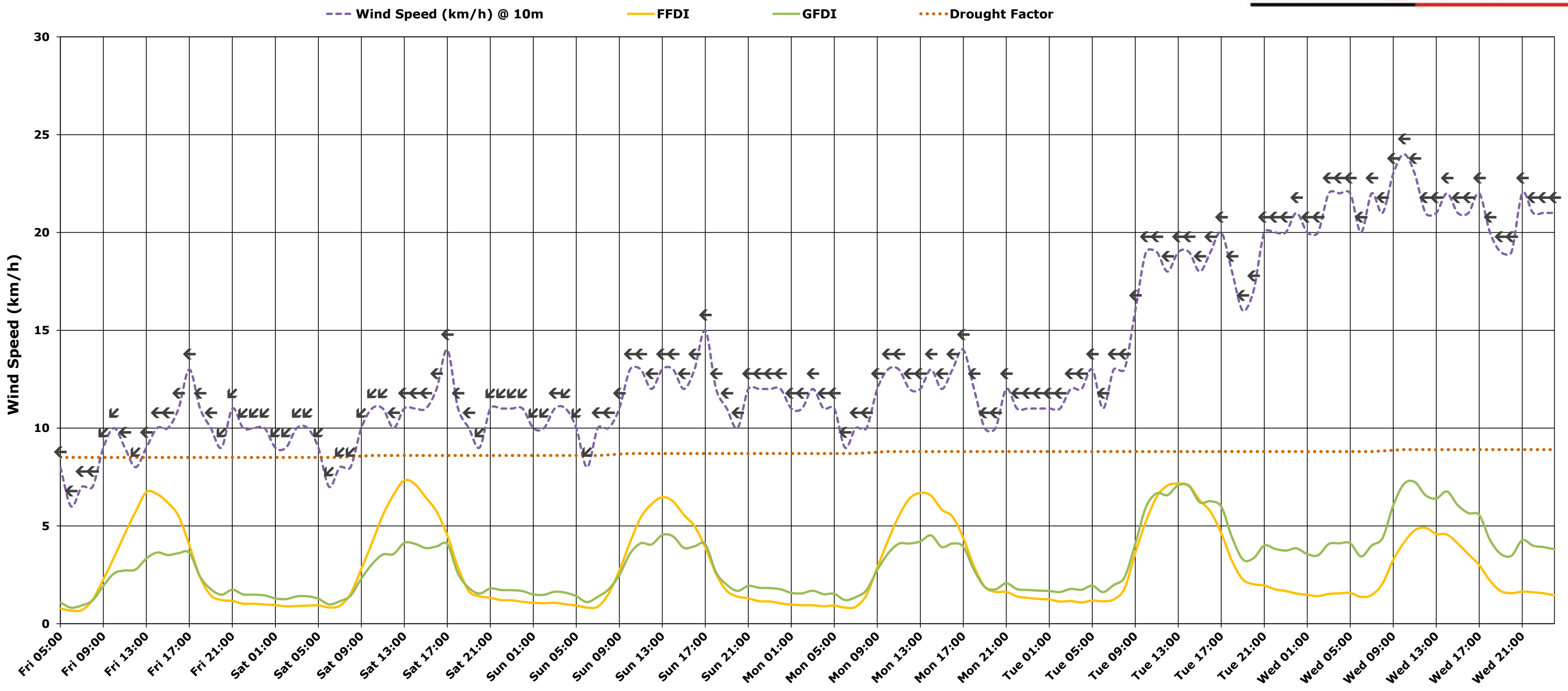
Time and Date forecast data published: 05:48 on Friday, 30 August 2024

Some data on this app. is sourced from the **Bureau of Meteorology**. Click here for details.

Forecast Location: -17.57, 145.40

Forecast location:	**Kaban**	**KBDI:**	**65**
Forecast start:	**Friday, 30 August 2024**	**DF:**	**9**
Forecast end:	**Wednesday, 4 September 2024**		

6 Day Lookahead - Surface Wind Speed and Direction, FFDI, GFDI & DF



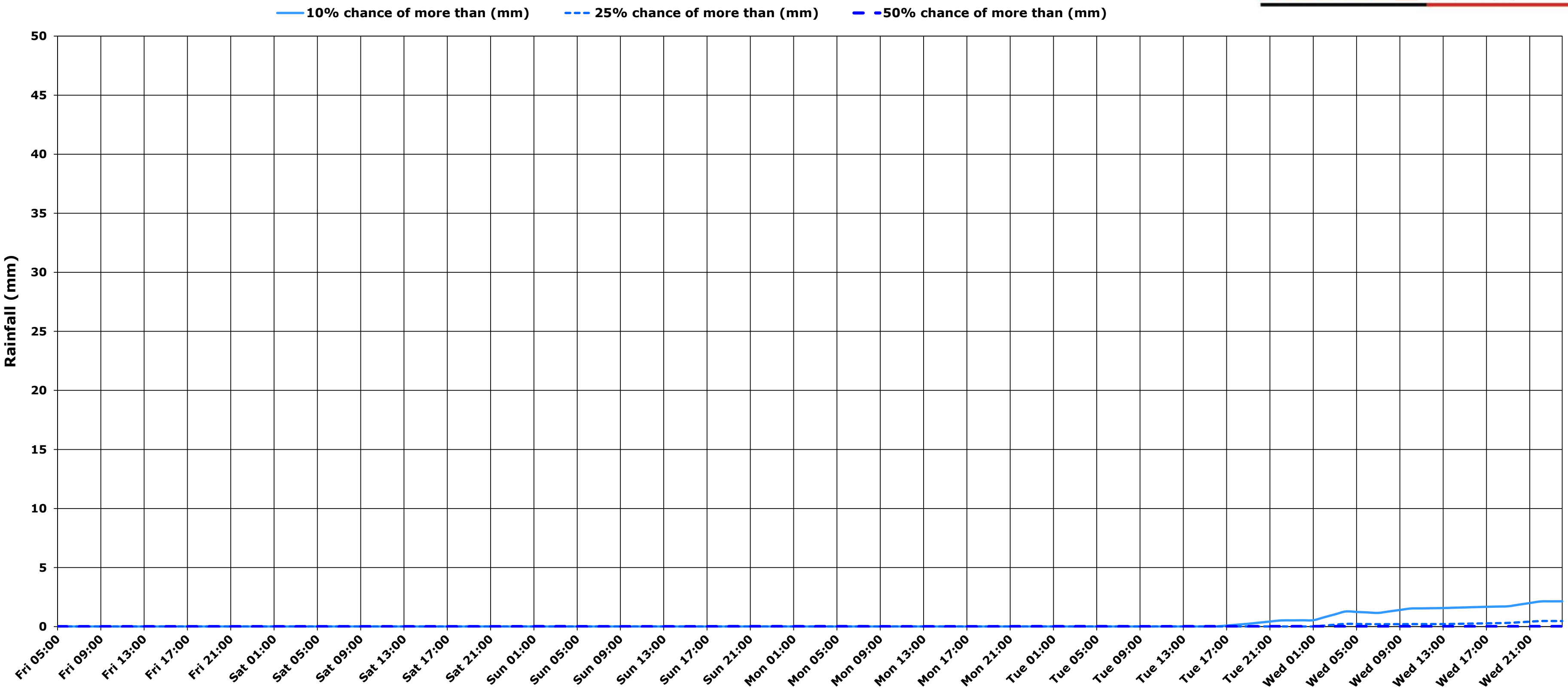
Note: Wind Direction has been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: 05:48 on Friday, 30 August 2024

Forecast Location: -17.57, 145.40

Forecast location:	**Kaban**	**KBDI:**	**65**
Forecast start:	**Friday, 30 August 2024**	**DF:**	**9**
Forecast end:	**Wednesday, 4 September 2024**		

6 Day Lookahead - % Chance of more than XXmm of rainfall

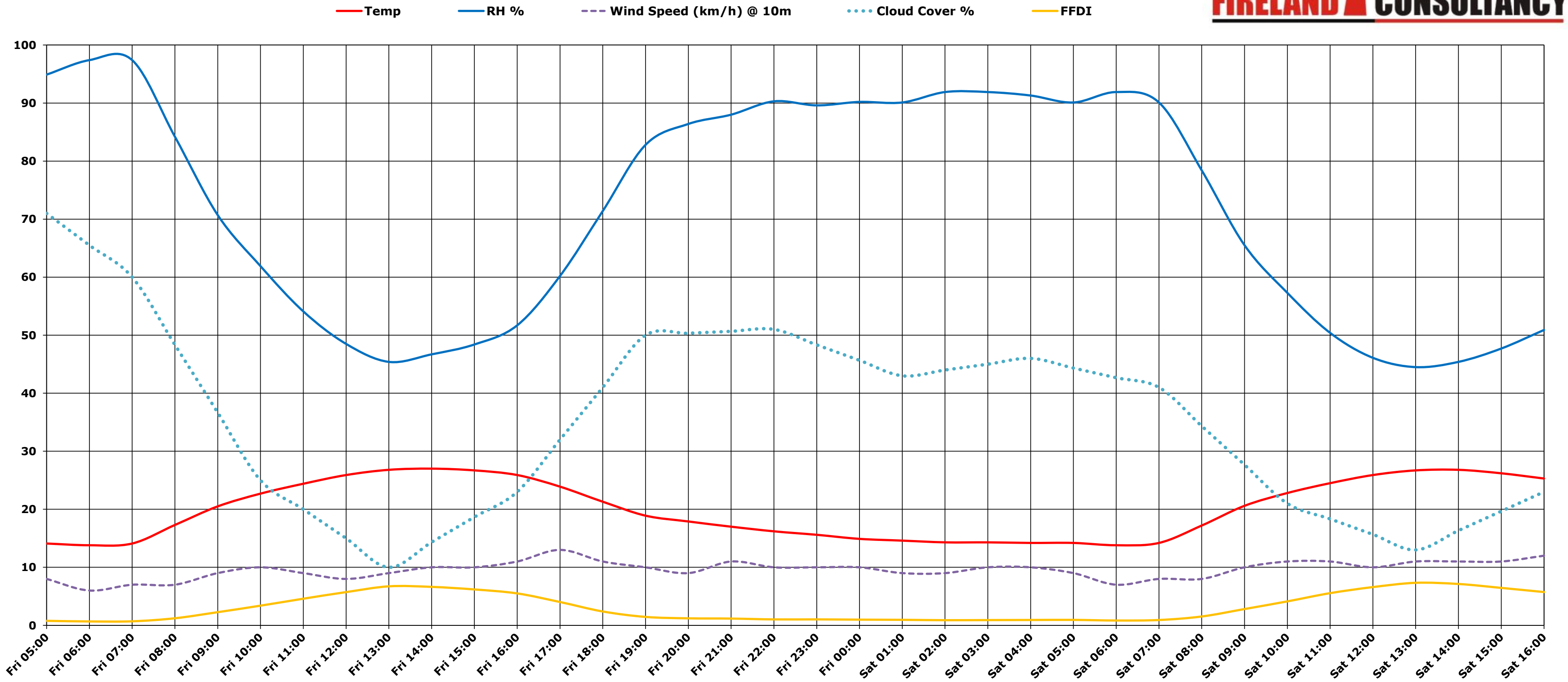


Time and Date forecast data published: **05:48** **on** **Friday, 30 August 2024**

Forecast Location: -17.57, 145.40

Forecast Location:	**Kaban**	**KBDI:**	**65**
Forecast start:	**Friday, 30 August 2024**	**DF:**	**9**
Forecast end:	**Saturday, 31 August 2024**		

36 Hour Forecast - Temp, RH, WS, Cloud Cover and FFDI



Time and Date forecast data published: **5:48 AM** **on** **Friday, 30 August 2024**

Forecast Location: -17.57, 145.40

Forecast Location: Kaban

Forecast start: Friday, 30 August 2024

Forecast end: Saturday, 31 August 2024

KBDI: 65

DF: 9

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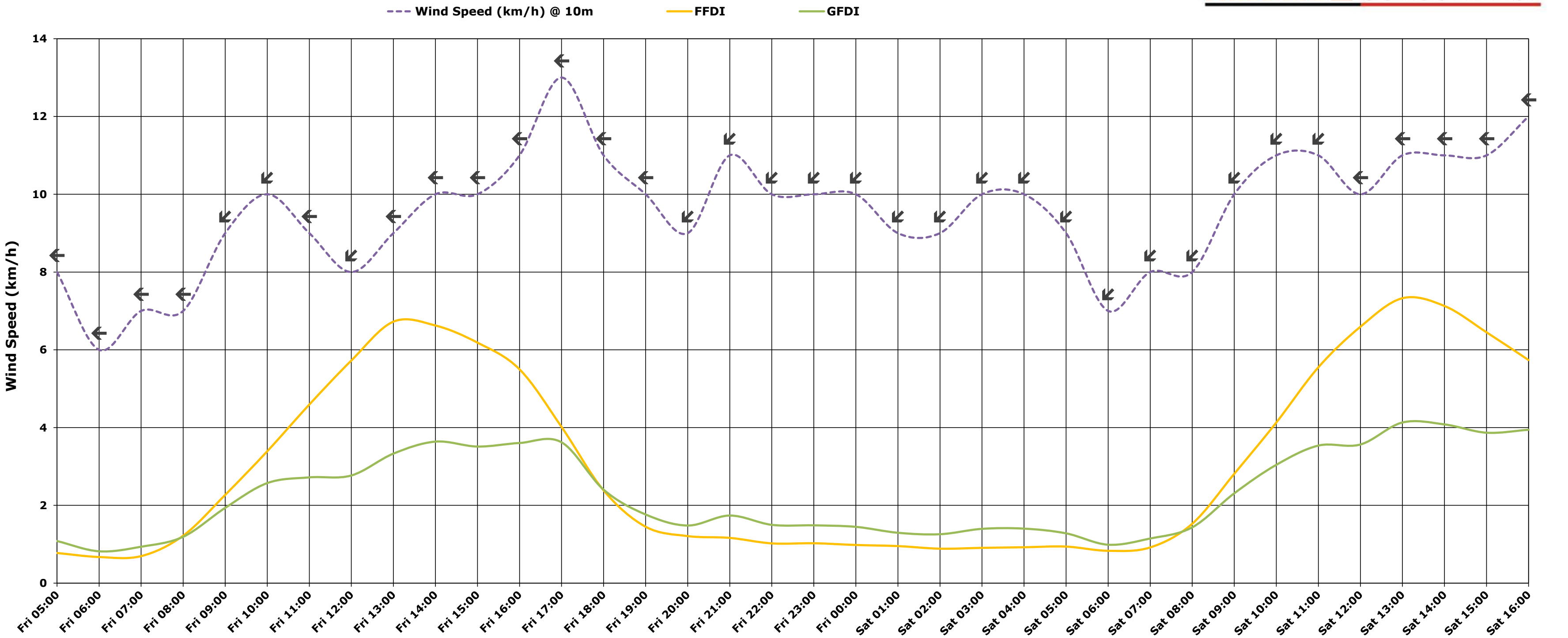
36 Hour Forecast - Surface Wind Speed and Direction, FFDI & GFDI



Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: **05:48 on Friday, 30 August 2024**

Forecast Location: -17.57, 145.40

FIRELAND CONSULTANCY

Forecast Location: Kaban **KBDI:** 65
Forecast start: Friday, 30 August 2024 **DF:** 9
Forecast end: Saturday, 31 August 2024

Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Drought Factor	Leaflet 80 FMC (%)	Combined Forest FMC (%)	FFDI	GFDI	Cloud Cover %	Mixing Height (m ASL)	Wind Dir (Cardinal 8pt) @ 1000m	Wind Dir (Arrow 8pt) @ 1000m	Wind Speed (km/h) @1000m	Wind Dir (Cardinal 8pt) @ 1500m	Wind Dir (Arrow 8pt) @ 1500m	Wind Speed (km/h) @ 1500m
Fri 05:00	14	95	E	←	8	9	19.2		1	1	71	788	E	←	17	E	←	19
Fri 06:00	14	97	E	←	6	9	19.5		1	1	66	751	E	←	17	E	←	17
Fri 07:00	14	97	E	←	7	9	19.5	19.1	1	1	60	788	E	←	15	E	←	17
Fri 08:00	17	84	E	←	7	9	17.1	19.5	1	1	48	1,093	E	←	15	NE	↙	17
Fri 09:00	21	71	ENE	↙	9	9	14.7	19.4	2	2	37	1,319	NE	↙	15	NE	↙	15
Fri 10:00	23	62	ENE	↙	10	9	13.1	17.0	3	3	25	1,499	NE	↙	13	NE	↙	15
Fri 11:00	24	54	E	←	9	9	11.7	14.6	5	3	20	1,667	E	←	11	NE	↙	15
Fri 12:00	26	49	ENE	↙	8	9	8.8	13.0	6	3	15	1,838	E	←	15	NE	↙	13
Fri 13:00	27	45	E	←	9	9	8.3	11.7	7	3	10	1,972	E	←	13	NE	↙	11
Fri 14:00	27	47	E	←	10	9	8.4	7.7	7	4	14	1,987	E	←	15	NE	↙	11
Fri 15:00	27	48	E	←	10	9	8.7	7.2	6	4	19	1,957	E	←	17	E	←	11
Fri 16:00	26	52	E	←	11	9	9.3	7.3	5	4	23	1,836	E	←	19	E	←	11
Fri 17:00	24	60	E	←	13	9	10.7	7.6	4	4	32	1,613	E	←	19	E	←	9
Fri 18:00	21	71	E	←	11	9	12.7	8.1	2	2	41	1,385	E	←	19	E	←	9
Fri 19:00	19	83	E	←	10	9	14.6	9.4	1	2	50	1,121	E	←	19	SE	↖	7
Fri 20:00	18	86	ENE	↙	9	9	15.2	11.0	1	1	50	1,071	E	←	19	SE	↖	7
Fri 21:00	17	88	ENE	↙	11	9	15.6	12.7	1	2	51	1,032	E	←	19	SE	↖	9
Fri 22:00	16	90	ENE	↙	10	9	16.0	13.3	1	1	51	999	E	←	19	SE	↖	11
Fri 23:00	16	90	ENE	↙	10	9	16.0	13.6	1	1	48	929	E	←	20	SE	↖	13
Fri 00:00	15	90	ENE	↙	10	9	18.4	14.0	1	1	46	846	E	←	20	E	←	15
Sat 01:00	15	90	ENE	↙	9	9	18.5	14.0	1	1	43	835	E	←	20	E	←	15
Sat 02:00	14	92	ENE	↙	9	9	18.8	18.4	1	1	44	807	E	←	20	E	←	17
Sat 03:00	14	92	ENE	↙	10	9	18.8	18.4	1	1	45	850	E	←	20	E	←	17
Sat 04:00	14	91	ENE	↙	10	9	18.7	18.7	1	1	46	848	E	←	19	E	←	19
Sat 05:00	14	90	ENE	↙	9	9	18.6	18.7	1	1	44	834	E	←	20	E	←	19
Sat 06:00	14	92	ENE	↙	7	9	18.9	18.7	1	1	43	774	E	←	20	E	←	19
Sat 07:00	14	90	ENE	↙	8	9	18.6	18.5	1	1	41	834	E	←	22	E	←	19
Sat 08:00	17	78	ENE	↙	8	9	16.4	18.9	2	1	34	1,068	E	←	20	E	←	20
Sat 09:00	21	66	ENE	↙	10	9	14.0	18.5	3	2	28	1,229	E	←	20	E	←	22
Sat 10:00	23	57	ENE	↙	11	9	12.5	16.4	4	3	21	1,346	E	←	19	E	←	22
Sat 11:00	25	50	ENE	↙	11	9	11.3	14.0	6	4	18	1,545	E	←	19	E	←	24
Sat 12:00	26	46	E	←	10	9	8.5	12.5	7	4	16	1,760	E	←	20	E	←	20
Sat 13:00	27	45	E	←	11	9	8.2	11.3	7	4	13	1,856	E	←	19	E	←	19
Sat 14:00	27	45	E	←	11	9	8.3	7.5	7	4	16	1,870	E	←	20	E	←	17
Sat 15:00	26	48	E	←	11	9	8.7	7.1	6	4	20	1,833	E	←	20	E	←	17
Sat 16:00	25	51	E	←	12	9	9.3	7.2	6	4	23	1,763	E	←	20	E	←	15

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: 05:48 on Friday, 30 August 2024

Forecast Location: -17.57, 145.40

Forecast Location: Kaban

Forecast start: Friday, 30 August 2024

Forecast end: Saturday, 31 August 2024

KBDI: 65

DF: 9

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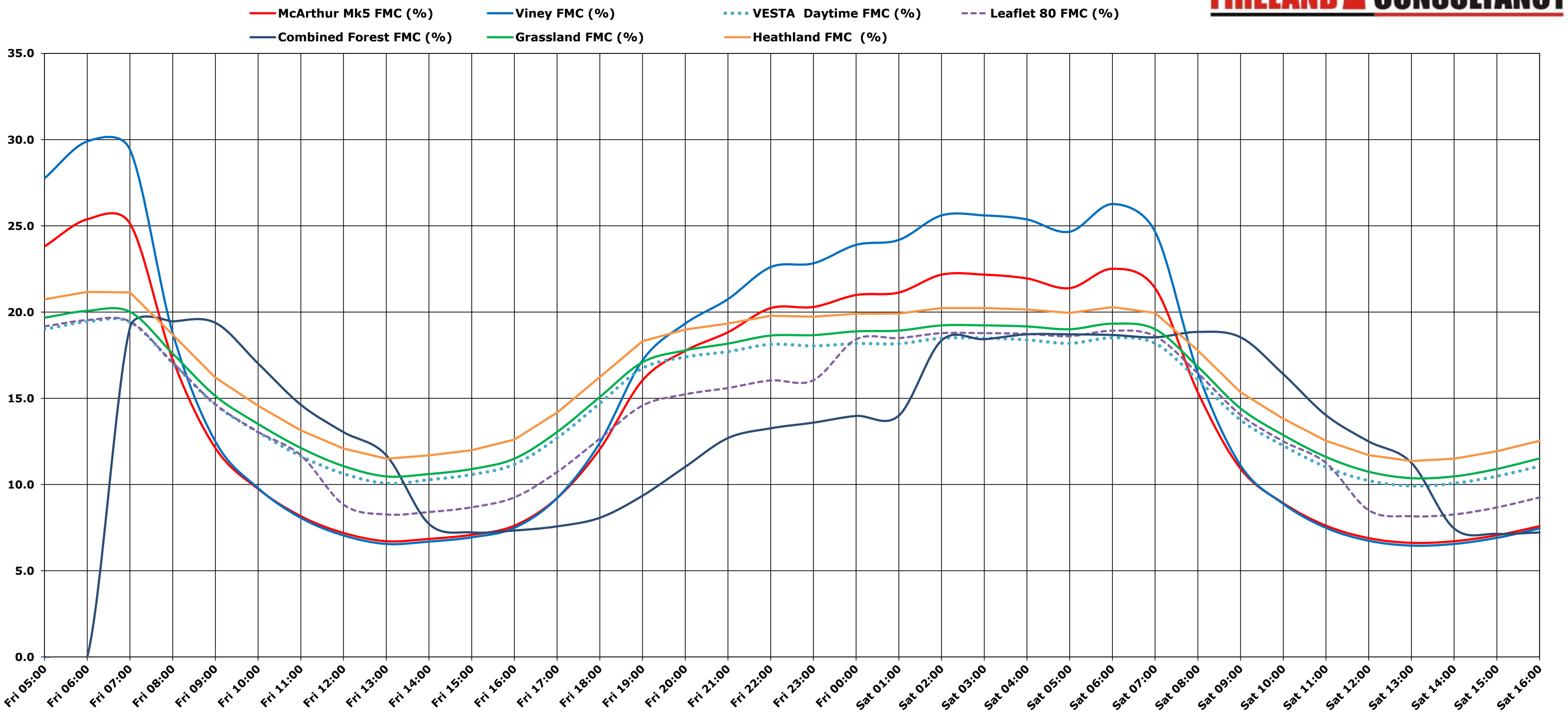
36 Hour Forecast - Fuel Moisture Content



Time and Date forecast data published: 05:48 on Friday, 30 August 2024

Forecast Location: -17.57, 145.40

36 Hour Fire Behaviour Estimates

FIRELAND CONSULTANCY

Forecast location: Kaban
Forecast start: Friday, 30 August 2024
Forecast end: Saturday, 31 August 2024

KBDI: 65
DF: 9

Grass curing: 100
Grass fuel load (t/ha): 4

						McArthur - Leaflet 80															CSIRO Fire Spread Meter for Northern Australia Grasslands									
						Dry Sclerophyll Forest Light fuels = 8t/ha (40 - 60% canopy cover)								Dry Sclerophyll Forest Moderate - Heavy fuels = 12t/ha (40 - 60% canopy cover)							Grassy Woodland Assumes 100% grass curing (5 - 7m high, canopy cover <30%)					Grassy Open Forest Assumes 100% grass curing (10 - 15m tall, canopy cover 30-70%)				
Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	QPWS PGB Fire Severity Class - Light fuels (Intensity)	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning
Fri 05:00	14	95	E	←	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.7	19	0.2	40	0 - 5	Marginal	12	0.2	24	0 - 5	Marginal
Fri 06:00	14	97	E	←	6	2.7	2	0.0	0.4	Below	Low	0.7	2.3	2.7	2	0.1	0.7	Below	0.8	2.6	1	0.1	2	0 - 5	Marginal	1	0.1	1	0 - 5	Marginal
Fri 07:00	14	97	E	←	7	2.9	2	0.0	0.4	Below	Low	0.7	2.3	2.9	3	0.1	0.7	Below	0.9	2.7	1	0.1	3	0 - 5	Marginal	1	0.1	2	0 - 5	Marginal
Fri 08:00	17	84	E	←	7	2.9	3	0.1	0.6	Below	Low	0.8	2.5	2.9	4	0.1	1.0	Below	1.1	3.0	119	0.4	247	6 - 11	Generally suitable	72	0.3	148	6 - 11	Generally suitable
Fri 09:00	21	71	ENE	↙	9	3.3	5	0.1	0.9	Below	Low	1.0	2.9	3.3	8	0.2	1.6	Below	1.5	3.8	341	0.6	704	6 - 11	Generally suitable	204	0.5	423	6 - 11	Generally suitable
Fri 10:00	23	62	ENE	↙	10	3.5	8	0.1	1.2	Below	Low	1.2	3.2	3.5	12	0.3	2.0	Below	1.9	4.5	517	0.6	1068	6 - 11	Generally suitable	310	0.5	641	6 - 11	Generally suitable
Fri 11:00	24	54	E	←	9	3.3	11	0.2	1.4	Below	Low	1.4	3.6	3.3	16	0.4	2.5	Below	2.3	5.2	552	0.6	1141	6 - 11	Generally suitable	331	0.6	685	6 - 11	Generally suitable
Fri 12:00	26	49	ENE	↙	8	3.1	20	0.3	2.2	Yes	Low	2.0	4.7	3.1	30	0.6	3.8	Yes	3.7	7.5	532	0.6	1100	6 - 11	Generally suitable	319	0.5	660	6 - 11	Generally suitable
Fri 13:00	27	45	E	←	9	3.3	23	0.4	2.4	Yes	Low	2.3	5.1	3.3	35	0.7	4.2	Yes	4.1	8.3	662	0.7	1367	6 - 11	Generally suitable	397	0.6	820	6 - 11	Generally suitable
Fri 14:00	27	47	E	←	10	3.5	23	0.4	2.4	Yes	Low	2.3	5.1	3.5	35	0.7	4.2	Yes	4.1	8.3	741	0.7	1531	6 - 11	Generally suitable	445	0.6	919	6 - 11	Generally suitable
Fri 15:00	27	48	E	←	10	3.5	22	0.3	2.3	Yes	Low	2.2	5.0	3.5	32	0.7	4.0	Yes	3.9	8.0	718	0.7	1484	6 - 11	Generally suitable	431	0.6	890	6 - 11	Generally suitable
Fri 16:00	26	52	E	←	11	3.6	20	0.3	2.2	Yes	Low	2.0	4.7	3.6	29	0.6	3.7	Yes	3.6	7.5	751	0.7	1552	6 - 11	Generally suitable	451	0.6	931	6 - 11	Generally suitable
Fri 17:00	24	60	E	←	13	4.0	15	0.2	1.8	Below	Low	1.7	4.1	4.0	22	0.5	3.1	Yes	2.9	6.3	779	0.7	1611	6 - 11	Generally suitable	468	0.6	966	6 - 11	Generally suitable
Fri 18:00	21	71	E	←	11	3.6	9	0.2	1.3	Below	Low	1.3	3.4	3.6	14	0.3	2.2	Below	2.1	4.8	529	0.6	1093	6 - 11	Generally suitable	317	0.5	656	6 - 11	Generally suitable
Fri 19:00	19	83	E	←	10	3.5	6	0.1	0.9	Below	Low	1.0	2.9	3.5	8	0.2	1.6	Below	1.5	3.8	232	0.5	479	6 - 11	Generally suitable	139	0.4	287	6 - 11	Generally suitable
Fri 20:00	18	86	ENE	↙	9	3.3	5	0.1	0.8	Below	Low	0.9	2.8	3.3	7	0.2	1.4	Below	1.4	3.6	156	0.4	322	6 - 11	Generally suitable	93	0.4	193	6 - 11	Generally suitable
Fri 21:00	17	88	ENE	↙	11	3.6	5	0.1	0.8	Below	Low	0.9	2.8	3.6	7	0.2	1.4	Below	1.4	3.5	345	0.6	713	6 - 11	Generally suitable	207	0.5	428	6 - 11	Generally suitable
Fri 22:00	16	90	ENE	↙	10	3.5	4	0.1	0.8	Below	Low	0.9	2.7	3.5	6	0.2	1.3	Below	1.3	3.4	108	0.4	224	6 - 11	Generally suitable	65	0.3	134	6 - 11	Generally suitable
Fri 23:00	16	90	ENE	↙	10	3.5	4	0.1	0.8	Below	Low	0.9	2.7	3.5	6	0.2	1.3	Below	1.3	3.4	107	0.4	220	6 - 11	Generally suitable	64	0.3	132	6 - 11	Generally suitable
Fri 00:00	15	90	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	4	0.1	0.9	Below	1.0	2.9	89	0.4	184	6 - 11	Generally suitable	53	0.3	110	6 - 11	Generally suitable
Sat 01:00	15	90	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.9	Below	1.0	2.8	75	0.3	155	6 - 11	Generally suitable	45	0.3	93	0 - 5	Marginal
Sat 02:00	14	92	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.8	Below	0.9	2.8	54	0.3	112	6 - 11	Generally suitable	32	0.3	67	0 - 5	Marginal
Sat 03:00	14	92	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	0.9	2.8	61	0.3	127	6 - 11	Generally suitable	37	0.3	76	0 - 5	Marginal
Sat 04:00	14	91	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	0.9	2.8	66	0.3	137	6 - 11	Generally suitable	40	0.3	82	0 - 5	Marginal
Sat 05:00	14	90	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.9	Below	0.9	2.8	70	0.3	144	6 - 11	Generally suitable	42	0.3	86	0 - 5	Marginal
Sat 06:00	14	92	ENE	↙	7	2.9	2	0.0	0.5	Below	Low	0.7	2.4	2.9	3	0.1	0.8	Below	0.9	2.7	33	0.3	69	0 - 5	Marginal	20	0.2	41	0 - 5	Marginal
Sat 07:00	14	90	ENE	↙	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.8	60	0.3	124	6 - 11	Generally suitable	36	0.3	74	0 - 5	Marginal
Sat 08:00	17	78	ENE	↙	8	3.1	4	0.1	0.7	Below	Low	0.8	2.6	3.1	5	0.1	1.2	Below	1.2	3.2	191	0.5	394	6 - 11	Generally suitable	114	0.4	236	6 - 11	Generally suitable
Sat 09:00	21	66	ENE	↙	10	3.5	6	0.1	1.0	Below	Low	1.1	3.0	3.5	10	0.2	1.8	Below	1.7	4.1	445	0.6	920	6 - 11	Generally suitable	267	0.5	552	6 - 11	Generally suitable
Sat 10:00	23	57	ENE	↙	11	3.6	9	0.2	1.3	Below	Low	1.3	3.4	3.6	14	0.3	2.3	Below	2.1	4.9	659	0.7	1363	6 - 11	Generally suitable	396	0.6	818	6 - 11	Generally suitable
Sat 11:00	25	50	ENE	↙	11	3.6	13	0.2	1.6	Below	Low	1.5	3.9	3.6	19	0.4	2.8	Yes	2.6	5.7	743	0.7	1536	6 - 11	Generally suitable	446	0.6	921	6 - 11	Generally suitable
Sat 12:00	26	46	E	←	10	3.5	23	0.4	2.4	Yes	Low	2.3	5.1	3.5	34	0.7	4.2	Yes	4.1	8.3	730	0.7	1509	6 - 11	Generally suitable	438	0.6	905	6 - 11	Generally suitable
Sat 13:00	27	45	E	←	11	3.6	25	0.4	2.6	Yes	Low	2.5	5.4	3.6	38	0.8	4.5	Yes	4.5	9.0	849	0.7	1754	6 - 11	Generally suitable	509	0.6	1052	6 - 11	Generally suitable
Sat 14:00	27	45	E	←	11	3.6	25	0.4	2.6	Yes	Low	2.4	5.4	3.6	37	0.8	4.4	Yes	4.4	8.8	839	0.7	1735	6 - 11	Generally suitable	504	0.6	1041	6 - 11	Generally suitable
Sat 15:00	26	48	E	←	11	3.6	23	0.4	2.4	Yes	Low	2.3	5.1	3.6	34	0.7	4.1	Yes	4.1	8.3	801	0.7	1656	6 - 11	Generally suitable	481	0.6	994	6 - 11	Generally suitable
Sat 16:00	25	51	E	←	12	3.8	20	0.3	2.3	Yes	Low	2.1	4.8	3.8	31	0.7	3.9	Yes	3.8	7.7	826	0.7	1708	6 - 11	Generally suitable	496	0.6	1025	6 - 11	Generally suitable

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes.

Time and Date forecast data published: 5:48 AM **on** Friday, 30 August 2024

Some data on this app is sourced from the Bureau of Meteorology. Click here for details.

Forecast Location: -17.57, 145.40

Draft product - under development.

Sources of equations used for Modelling and assumptions:

Leaflet 80 Equations used in this table are taken from Gould, J.S. (1994) *Evaluation of McArthur's control burning guide in regrowth Eucalyptus sieberi forest*. Australian Journal of Forestry, 57:2, 86-93.

QPWS PBG Optimum conditions for planned burns is taken from Table A - Light fuels = 8 t/ha and Table B Moderate - heavy fuels = 12t/ha in the QPWS *PBG - How to assess if your burn is ready to go*.

QPWS PBG Fire Severity Class is taken from Table 3 Open forests/woodlands in the QPWS *PBG - How to assess if your burn is ready to go*. Determined using fire intensity values.

Burrows Scorch Height is calculated using equations taken from Burrows (1997) *Predicting canopy scorch height in jarrah forests*. Flame height equations have been used.

Equations for the CSIRO Fire Spread Meter for Northern Australia Grasslands is taken from Cheney, N.P., Gould, J.S. and Catchpole, W.R. (1998) *Prediction of Fire Spread in Grasslands*. International Journal of Wildland Fire 8. 1 - 13.

AFDRS Fire Behaviour Index calculations are based on the Matthews, S. (2022) *AFDRS Fire Behaviour Index Technical Guide*.

AFDRS Implications for Planned Burning are taken from the AFDRS *Fire Behaviour Index Reference Manual Version 1*.

Grass curing is assumed to be 100% by default for grass fire behaviour calculations.

All fire behaviour calculations assume no slope.

APPENDIX 2 – WEATHER OBSERVATION DATA

Weather Observations for PORTABLE QFRK (Ravenshoe)

Station Details	ID: 250075	Name: RAVENSHOE (QFRK)
Lat: -17.61	Lon: 145.49	Height: 922.0 m

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
30/08/2024	12:00pm	24.5	54	ENE	6	11	0
30/08/2024	12:10pm	25	53	E	4	9	0
30/08/2024	12:20pm	25.4	50	-	7	11	0
30/08/2024	12:30pm	25.4	51	E	9	11	0
30/08/2024	12:40pm	25.6	51	ENE	9	11	0
30/08/2024	12:50pm	25.6	49	E	11	13	0
30/08/2024	01:00pm	25.9	48	E	11	13	0
30/08/2024	01:10pm	25.9	52	E	11	15	0
30/08/2024	01:20pm	25.9	48	E	11	17	0
30/08/2024	01:30pm	25.6	51	E	15	19	0
30/08/2024	01:40pm	25.9	51	E	13	15	0
30/08/2024	01:50pm	25.6	51	E	15	19	0
30/08/2024	02:00pm	26.1	48	E	13	17	0
30/08/2024	02:10pm	26	53	E	13	15	0
30/08/2024	02:20pm	26	52	E	13	17	0
30/08/2024	02:30pm	26	48	E	13	17	0
30/08/2024	02:40pm	25.8	49	E	17	19	0
30/08/2024	02:50pm	25.7	51	E	15	19	0
30/08/2024	03:00pm	25.8	52	E	13	19	0
30/08/2024	03:10pm	25.6	56	E	13	17	0
30/08/2024	03:20pm	25.7	54	E	13	15	0
30/08/2024	03:30pm	25.1	56	E	15	19	0
30/08/2024	03:40pm	25	57	E	15	17	0
30/08/2024	03:50pm	24.6	60	E	15	17	0
30/08/2024	04:00pm	24.7	58	E	13	15	0
30/08/2024	04:10pm	24.5	56	E	13	15	0
30/08/2024	04:20pm	24.5	58	ENE	11	15	0
30/08/2024	04:30pm	24.5	55	ENE	11	13	0
30/08/2024	04:40pm	24	58	ENE	13	15	0
30/08/2024	04:50pm	23.5	60	E	13	17	0
30/08/2024	05:00pm	23.2	63	E	13	15	0
30/08/2024	05:10pm	22.7	64	ENE	13	15	0
30/08/2024	05:20pm	22.2	66	ENE	13	15	0
30/08/2024	05:30pm	21.8	70	E	11	13	0
30/08/2024	05:40pm	21.2	76	ENE	11	13	0
30/08/2024	05:50pm	20.3	80	ENE	13	15	0

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
30/08/2024	06:00pm	19.5	83	ENE	15	15	0
30/08/2024	06:10pm	18.7	86	ENE	15	17	0
30/08/2024	06:20pm	18.1	88	E	15	15	0
30/08/2024	06:30pm	17.7	89	E	13	15	0
30/08/2024	06:40pm	17.6	90	ENE	15	20	0
30/08/2024	06:50pm	17.3	91	E	13	19	0
30/08/2024	07:00pm	17.3	89	E	17	19	0

APPENDIX 3 – DAILY SITE BRIEFING

Daily Site Briefing

000136 / Kaban

Complete

Document No:	000136
Client:	Vestas and Neoen
Site / Project Name:	Kaban
Location:	Tumoulin QLD 4888 Australia (-17.559531311849877, 145.39053495734353)
Briefing conducted on:	30.08.2024 10:42 AEST
Briefing conducted by:	Francis Hines

Record of Briefing:	
Site induction:	
Site induction complete by all workers?	Yes
Site rules and procedures understood?	Yes
Work health and safety:	
JSEA/Safety documentation still current? Fireland Prescribed Burn JSEA Kaban 2024 V0.2 JSEA Polaris V1.1	Yes
Any site changes since yesterday?	N/A
Fatigue management:	
Workers rested and fit for work?	Yes
Traffic Management:	
Daily Traffic Management Plan communicated?	Yes
Plant and equipment:	
All equipment pre-starts completed?	Yes
Operators have competency for plant and equipment and Verification of Competency (VOC) provided?	Yes
Communications:	
Work site communications channel?	Fireland Channel 1 & UHF 17
Emergency procedures:	
Location of first aid kits identified?	Yes
First aid qualified staff identified?	Yes
Emergency response procedure discussed?	Yes
Daily muster point location?	Sawmill
Fauna, Flora and Cultural Heritage:	

Fauna Management - Plant operators

[Fauna management procedure - plant operators.pdf]

Fauna/flora management procedure understood?	Yes
Cultural Heritage procedure understood? **1. FIND: A potential Cultural Heritage item or object is found.** **2. STOP: STOP WORK IMMEDIATELY and install an exclusion zone around the area.** **3. NOTIFY: Notify a responsible person (e.g. Site Supervisor, Project Manager).** **4. MANAGE: Report the discovery to the Project Manager for advice on management.**	Yes
Environmental Clearance Certificate understood?	N/A

Tool Box talk - topic of the day:

Select a topic for discussion.	Other from group

UXO potential in work area.

Record of Attendance

Briefing attendees

Briefing attendees 1

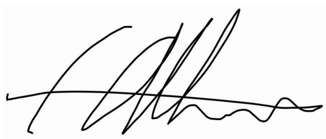
Attendees name and signature:

Francis Hines
30.08.2024 10:44 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 2

Attendees name and signature:



Cameron Allanson
30.08.2024 10:45 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 3

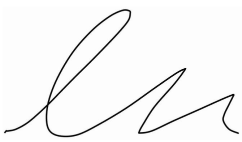
Attendees name and signature:

Emma Henry
30.08.2024 10:45 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 4

Attendees name and signature:

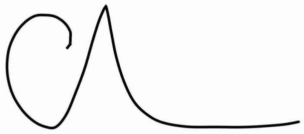


Miles Cross
30.08.2024 10:47 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 5

Attendees name and signature:



Courtney Dangerfield
30.08.2024 10:47 AEST

Agency/Company	Fireland Consultancy

S28 – A OPERATIONAL POST BURN REPORT

BURN NAME	**LMZ 11**	**Lot/Plan/s No.** (all approvals obtained) ☒ Yes	2/RP735194
Burn No.	2024_LMZ_11		
Location	Kaban Green Power Hub	**Road Segment No.**	NA
LGA	Tablelands Regional	**Proposed Timing**	June – Sept 2024
Date burn started	01/09/2024	**Time**	09:30
Date burn deemed out	03/09/2024	**Time**	13:00
Permit #	F506578	**Complexity**	CR – 2 (77)

Incident Controller	Francis Hines	Fireland
	Name	Position

SITUATION – OUTCOMES

Area to be treated	12.4Ha	Percentage aim	<30%	Last fire	Unknown
Actual treated area	12.4Ha	Percentage achieved	<30% at landscape level >90% coverage in Units LMZ 11.1 and LMZ 11.2 LMZ 11.3 left unburnt to protect Magnificent Brood Frog population	Severity class	Moderate

MISSION – OUTCOMES

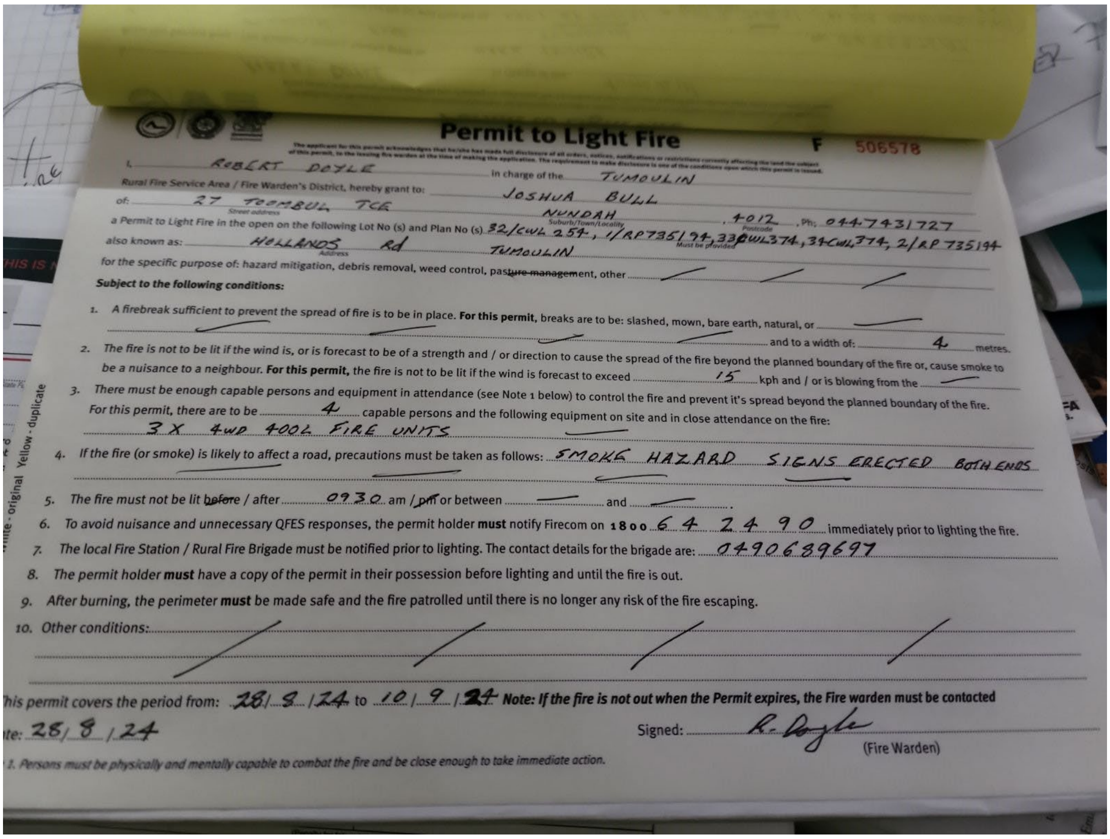
Aim & Objectives (Outline the general intent of the proposed burn and the specific objectives. Consider fuel load, fuel structure & mosaic effect)	• To reduce the likelihood of high-intensity wildfires that may impact site vegetation and species habitat suitability. • Exclude planned fire from known Magnificent Brood Frog population site in MU 11.3. • Implement Low to Moderate intensity planned burns with <30% coverage (at landscape level).
Outcomes (Outline if the objectives were met, if not why not)	Objectives met. Magnificent Brood Frog habitat remains undisturbed. Known location for *Coleus amoenus* protected with minimal disturbance. Desired coverage achieved at a landscape level through operational programming.
List recommendations (For burn area, may include fire trail works)	Ongoing maintenance of Fire Trails W19 and W20 that form the northern boundary of this unit is required as per the recommendations contained in the Landscape Fire Management Plan (April 2023).

EXECUTION – DETAILS				
Weather observations	Refer to: • Appendix 1 for weather forecast information. • Appendix 2 for weather observation data.			
Comments (List any weather conditions that significantly impacted operations)	Overall site conditions were at the drier end of desired conditions. As a result burn coverage and fuel consumption was high.			
	Fire danger index	7	Estimated KBDI	70
Ignition used (Describe the ignition)	☒ On ground ignition ☐ Aerial Ignition Hand ignition undertaken using predominately backing fire.			
Implementation overview	Backing fire used throughout the operation. Ignition commenced from top of hill adjacent to WTG 08 and fire allowed to back downhill.			
Implementation details	**01/09/24** 09:25 – briefed crews on ignition plan for LMZ 11. 09:30 – commenced ignition near 11e. 10:00 – ignition around WTG 08 complete. Commenced ignition at 11a (sawmill end). 11:00 – ignition complete along power easement at eastern boundary (11d through to 11f). 11:30 – ignition complete along main access road, allowing fire to back down hill from WTG 08 towards the west. 12:00 – ignition along northern boundary completed. Ignition complete. Crews working to secure edges. 14:00 – edges blacked out. 16:00 – prep complete on LMZ 12. Crews departed site. 16:00 – updated Neoen and Vestas. **02/09/24** 06:30 – crews back on site. 06:45 – previous burns checked and found to be very quiet. Burn was checked several times over the following day before being deemed safe at 13:00 on 03/09/2024.			

ADMINISTRATION	
Complaints ☒ **No Issues**	Nil.
Infrastructure damage ☒ **No Issues**	Nil.
Impact on road network ☒ **No Issues**	Nil.
Impact on community ☒ **No Issues**	Nil.
Impact on direct residents or stakeholders ☒ **No Issues**	Nil.
Other (Include any other comments)	Nil.

SAFETY	
JSEA / Briefing	Refer to Appendix 3 – for Daily Site Briefing.
Any incidents	Nil

PERMIT TO LIGHT FIRE



Permit to Light Fire F 506578

I, ROBERT DOYLE in charge of the TUMOULIN Rural Fire Service Area / Fire Warden's District, hereby grant to: JOSHUA BULL

of: 27 TOOMBUL TCE (Street address) NUNDAH (Suburb/Town/Locality), 4012 (Postcode), Ph: 0447431727

a Permit to Light Fire in the open on the following Lot No (s) and Plan No (s) 32/CWL 254, 1/RP735194, 33CWL374, 34CWL374, 2/RP735194 (Must be provided)

also known as: HOLLANDS Rd (Address) TUMOULIN

for the specific purpose of: hazard mitigation, debris removal, weed control, pas~~ture management~~, other

Subject to the following conditions:

1. A firebreak sufficient to prevent the spread of fire is to be in place. **For this permit,** breaks are to be: slashed, mown, bare earth, natural, or and to a width of: 4 metres.
2. The fire is not to be lit if the wind is, or is forecast to be of a strength and / or direction to cause the spread of the fire beyond the planned boundary of the fire or, cause smoke to be a nuisance to a neighbour. **For this permit,** the fire is not to be lit if the wind is forecast to exceed 15 kph and / or is blowing from the
3. There must be enough capable persons and equipment in attendance (see Note 1 below) to control the fire and prevent it's spread beyond the planned boundary of the fire. For this permit, there are to be 4 capable persons and the following equipment on site and in close attendance on the fire: 3 X 4WD 400L FIRE UNITS
4. If the fire (or smoke) is likely to affect a road, precautions must be taken as follows: SMOKE HAZARD SIGNS ERECTED BOTH ENDS
5. The fire must not be lit ~~before~~ / after 0930 am / ~~pm~~ or between and .
6. To avoid nuisance and unnecessary QFES responses, the permit holder **must** notify Firecom on 1800 64 24 90 immediately prior to lighting the fire.
7. The local Fire Station / Rural Fire Brigade must be notified prior to lighting. The contact details for the brigade are: 0490689697
8. The permit holder **must** have a copy of the permit in their possession before lighting and until the fire is out.
9. After burning, the perimeter **must** be made safe and the fire patrolled until there is no longer any risk of the fire escaping.
10. Other conditions:

This permit covers the period from: 28/8/24 to 10/9/24 **Note: If the fire is not out when the Permit expires, the Fire warden must be contacted**

Date: 28/8/24 Signed: R. Doyle (Fire Warden)

Note 1. Persons must be physically and mentally capable to combat the fire and be close enough to take immediate action.

White - original Yellow - duplicate

OPERATIONAL MAP

LMZ 11

7/30/2024

Brood Frog sighting recod	Kaban_Site_polygons	Standard Point Assets
Kaban_Cultural	Tower site	Access Control
Kaban_Coleus_amoenus	Operational Burn Points	Standard Roads Tracks Trails
Kaban_UndergroundPower	Location Reference	Standard Lineal Assets
	Burn Plan Area	World Imagery

Low Resolution 15m Imagery
High Resolution 60cm Imagery
High Resolution 30cm Imagery
Citations
60cm Resolution Metadata

1:2,500

0 0.03 0.06 0.12 mi
0 0.04 0.09 0.18 km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PHOTOS

PHOTOS

Fire excluded from *Coleus amoenus* population

PHOTOS

PHOTOS

APPENDIX 1 – WEATHER FORECAST INFORMATION

Forecast location: Kaban

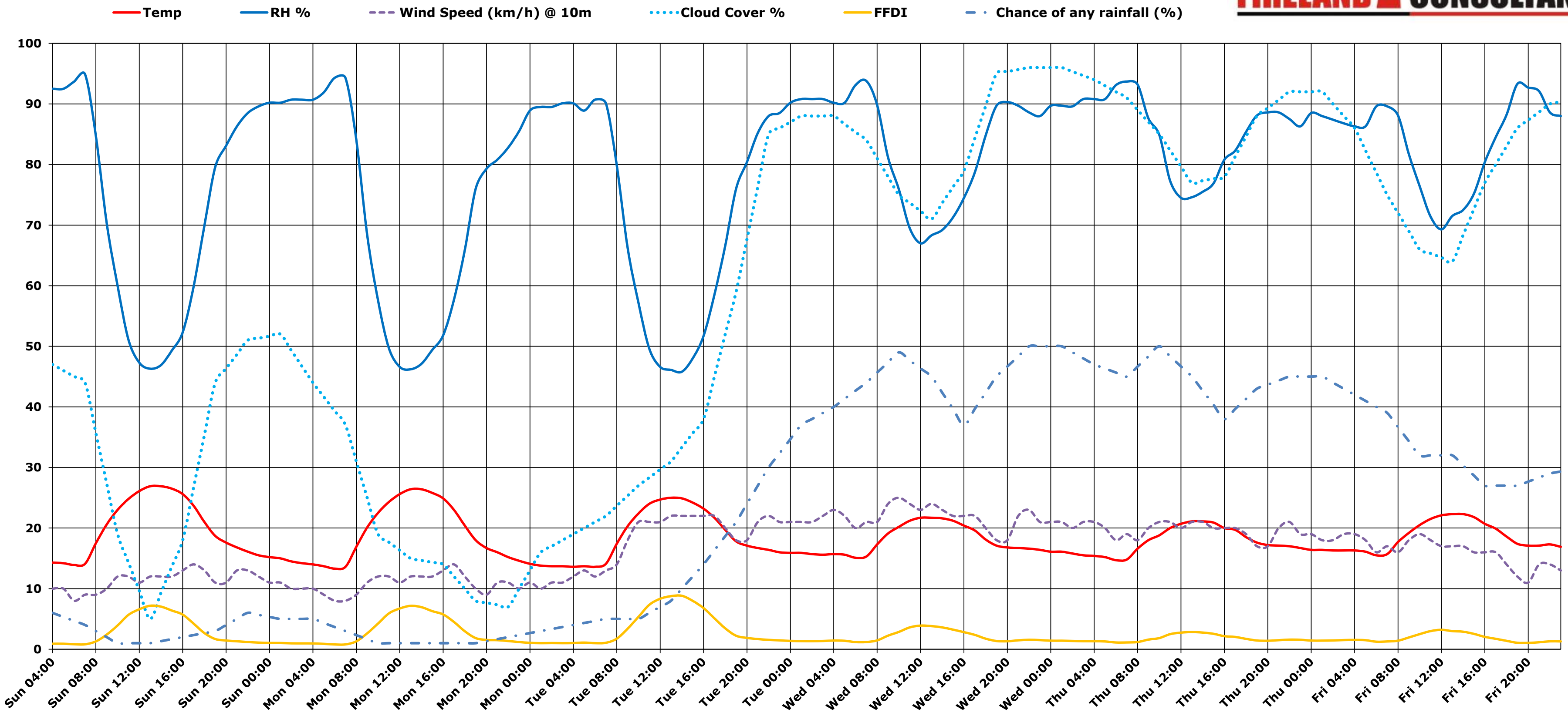
Forecast start: Sunday, 1 September 2024

Forecast end: Friday, 6 September 2024

KBDI: 70

DF: 9

6 Day Lookahead - Temp, RH, WS, Cloud Cover and FFDI



Time and Date forecast data published: 04:51 on Sunday, 1 September 2024

Forecast Location: -17.57, 145.40

Forecast location: Kaban

Forecast start: Sunday, 1 September 2024

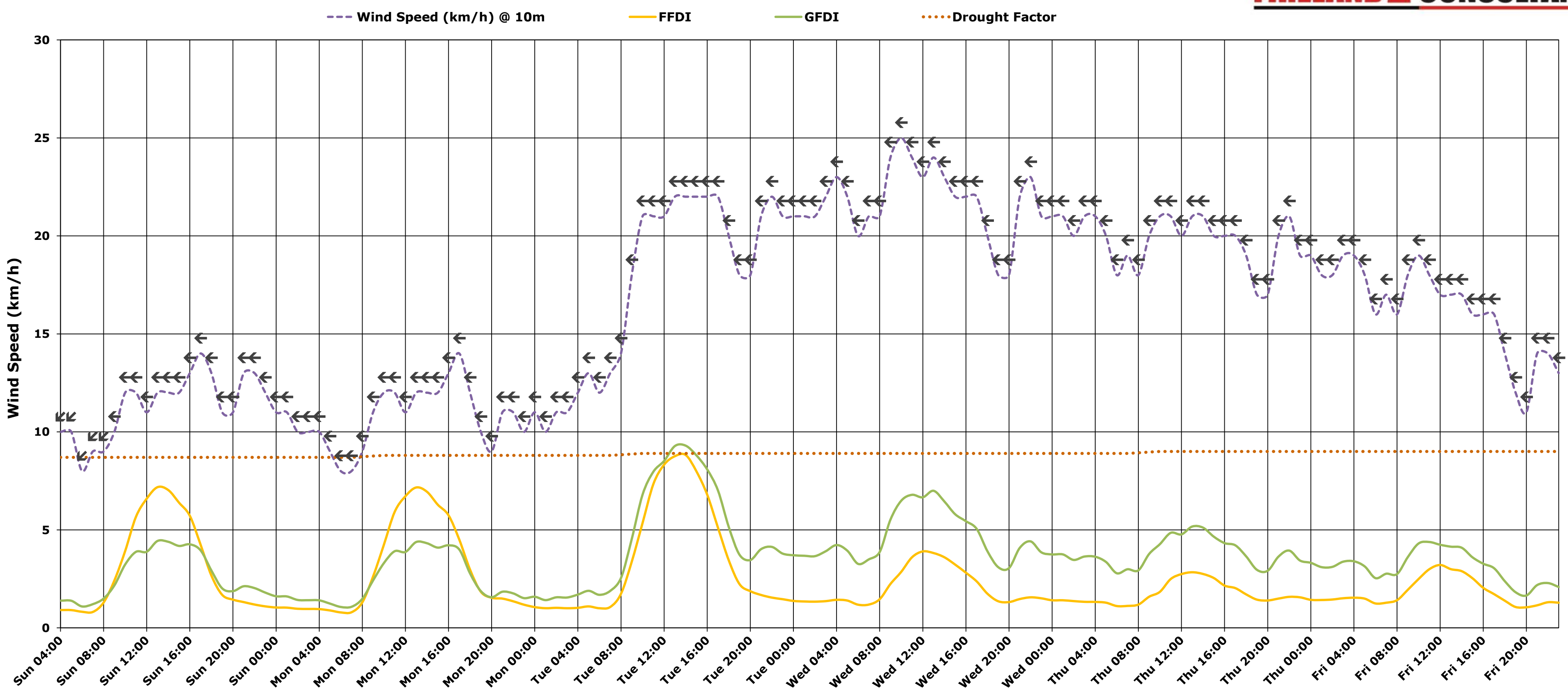
Forecast end: Friday, 6 September 2024

KBDI: 70

DF: 9

FIRELAND CONSULTANCY

6 Day Lookahead - Surface Wind Speed and Direction, FFDI, GFDI & DF



Note: Wind Direction has been simplified to the 8 major Cardinal points for display purposes.

GFDI is calculated using a user entered Grass Curing Value of: 100

Time and Date forecast data published: 04:51 on Sunday, 1 September 2024

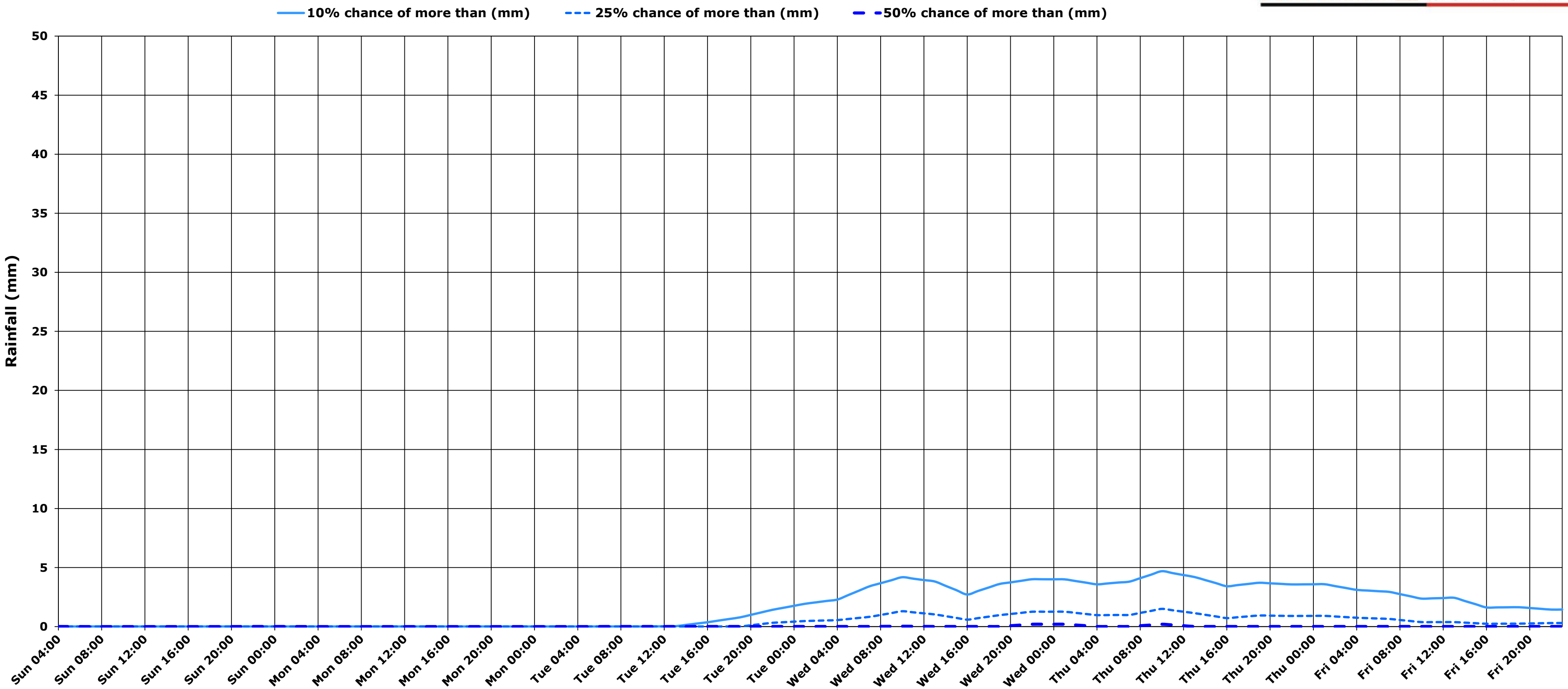
Forecast Location: -17.57, 145.40

Forecast location: Kaban **KBDI:** 70

Forecast start: Sunday, 1 September 2024 **DF:** 9

Forecast end: Friday, 6 September 2024

6 Day Lookahead - % Chance of more than XXmm of rainfall



Time and Date forecast data published: **04:51** **on** **Sunday, 1 September 2024**

Forecast Location: -17.57, 145.40

Forecast Location: Kaban

Forecast start: Sunday, 1 September 2024

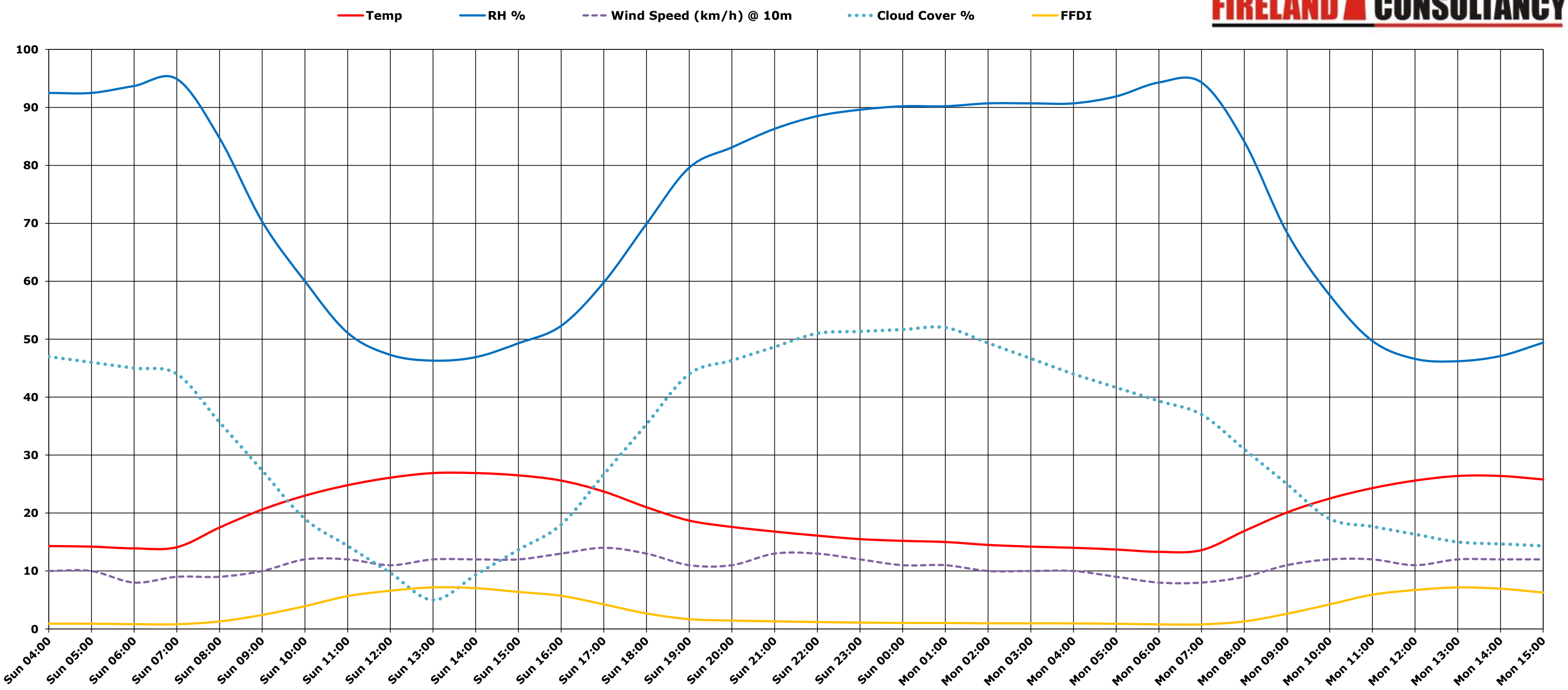
Forecast end: Monday, 2 September 2024

KBDI: 70

DF: 9

FIRELAND CONSULTANCY

36 Hour Forecast - Temp, RH, WS, Cloud Cover and FFDI



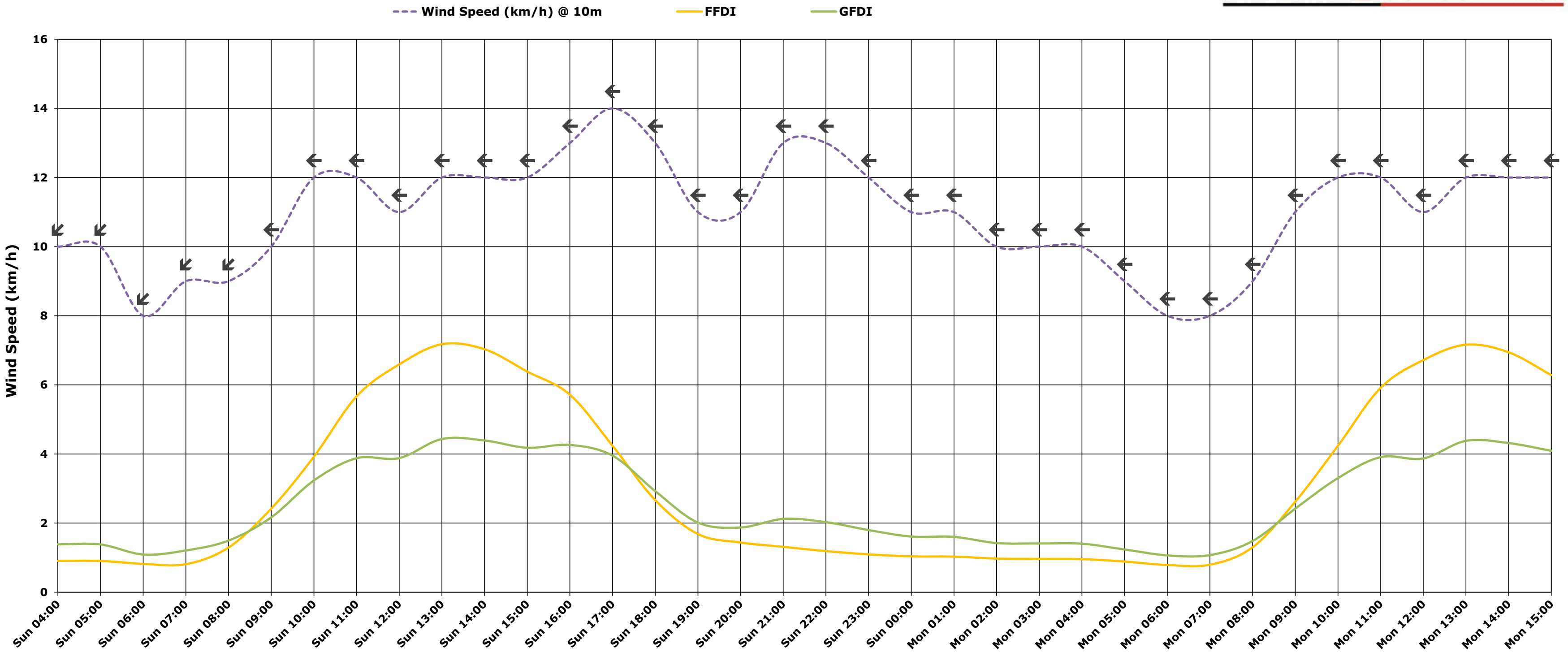
Time and Date forecast data published: 4:51 AM on Sunday, 1 September 2024

Forecast Location: -17.57, 145.40

Forecast Location:	**Kaban**	**KBDI:**	**70**
Forecast start:	**Sunday, 1 September 2024**	**DF:**	**9**
Forecast end:	**Monday, 2 September 2024**		

FIRELAND CONSULTANCY

36 Hour Forecast - Surface Wind Speed and Direction, FFDI & GFDI



Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: 04:51 on Sunday, 1 September 2024

Forecast Location: -17.57, 145.40

FIRELAND CONSULTANCY

Forecast Location: Kaban   **KBDI:** 70
Forecast start: Sunday, 1 September 2024   **DF:** 9
Forecast end: Monday, 2 September 2024

Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Drought Factor	Leaflet 80 FMC (%)	Combined Forest FMC (%)	FFDI	GFDI	Cloud Cover %	Mixing Height (m ASL)	Wind Dir (Cardinal 8pt) @ 1000m	Wind Dir (Arrow 8pt) @ 1000m	Wind Speed (km/h) @1000m	Wind Dir (Cardinal 8pt) @ 1500m	Wind Dir (Arrow 8pt) @ 1500m	Wind Speed (km/h) @ 1500m
Sun 04:00	14	93	ENE	↙	10	9	18.8		1	1	47	831	E	←	0	N	↓	15
Sun 05:00	14	93	ENE	↙	10	9	18.9		1	1	46	834	E	←	0	N	↓	13
Sun 06:00	14	94	ENE	↙	8	9	19.1	18.8	1	1	45	789	E	←	0	N	↓	15
Sun 07:00	14	95	ENE	↙	9	9	19.2	18.8	1	1	44	837	E	←	0	N	↓	17
Sun 08:00	18	85	ENE	↙	9	9	17.1	19.0	1	1	36	1,088	E	←	0	N	↓	17
Sun 09:00	21	70	E	←	10	9	14.6	19.1	2	2	27	1,233	E	←	0	N	↓	19
Sun 10:00	23	60	E	←	12	9	12.8	17.0	4	3	19	1,368	E	←	0	N	↓	19
Sun 11:00	25	51	E	←	12	9	11.2	14.6	6	4	14	1,653	E	←	0	N	↓	19
Sun 12:00	26	47	E	←	11	9	8.6	12.7	7	4	10	1,877	E	←	0	N	↓	17
Sun 13:00	27	46	E	←	12	9	8.4	11.3	7	4	5	2,000	E	←	0	N	↓	15
Sun 14:00	27	47	E	←	12	9	8.4	7.6	7	4	9	1,982	E	←	0	N	↓	15
Sun 15:00	27	49	E	←	12	9	8.8	7.3	6	4	14	1,915	E	←	0	N	↓	15
Sun 16:00	26	52	E	←	13	9	9.4	7.4	6	4	18	1,826	E	←	0	N	↓	17
Sun 17:00	24	60	E	←	14	9	10.7	7.7	4	4	27	1,624	E	←	0	N	↓	17
Sun 18:00	21	70	E	←	13	9	12.5	8.2	3	3	35	1,402	E	←	0	N	↓	20
Sun 19:00	19	80	E	←	11	9	14.2	9.3	2	2	44	1,203	E	←	0	N	↓	22
Sun 20:00	18	83	E	←	11	9	14.8	10.9	1	2	46	1,094	E	←	0	N	↓	22
Sun 21:00	17	86	E	←	13	9	15.4	12.4	1	2	49	1,066	E	←	0	N	↓	22
Sun 22:00	16	89	E	←	13	9	15.8	12.9	1	2	51	1,017	E	←	0	N	↓	22
Sun 23:00	16	90	E	←	12	9	16.1	13.4	1	2	51	982	E	←	0	N	↓	22
Sun 00:00	15	90	E	←	11	9	18.3	13.8	1	2	52	983	E	←	0	N	↓	22
Mon 01:00	15	90	E	←	11	9	18.4	14.0	1	2	52	998	E	←	0	N	↓	20
Mon 02:00	15	91	E	←	10	9	18.6	18.3	1	1	49	942	E	←	0	N	↓	20
Mon 03:00	14	91	E	←	10	9	18.7	18.3	1	1	47	923	E	←	0	N	↓	20
Mon 04:00	14	91	E	←	10	9	18.7	18.5	1	1	44	912	E	←	0	N	↓	22
Mon 05:00	14	92	E	←	9	9	18.9	18.6	1	1	42	872	E	←	0	N	↓	22
Mon 06:00	13	94	E	←	8	9	19.3	18.7	1	1	39	854	E	←	0	N	↓	24
Mon 07:00	14	94	E	←	8	9	19.2	18.9	1	1	37	868	E	←	0	N	↓	26
Mon 08:00	17	84	E	←	9	9	17.2	19.3	1	1	31	1,085	E	←	0	N	↓	26
Mon 09:00	20	68	E	←	11	9	14.5	19.2	3	2	25	1,225	E	←	0	N	↓	24
Mon 10:00	23	58	E	←	12	9	12.6	17.1	4	3	19	1,357	E	←	0	N	↓	24
Mon 11:00	24	50	E	←	12	9	11.2	14.5	6	4	18	1,580	E	←	0	N	↓	24
Mon 12:00	26	47	E	←	11	9	8.6	12.6	7	4	16	1,767	E	←	0	N	↓	22
Mon 13:00	26	46	E	←	12	9	8.4	11.2	7	4	15	1,833	E	←	0	N	↓	19
Mon 14:00	26	47	ESE	←	12	9	8.6	7.6	7	4	15	1,844	E	←	0	N	↓	19
Mon 15:00	26	49	ESE	←	12	9	9.0	7.4	6	4	14	1,813	E	←	0	N	↓	19

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

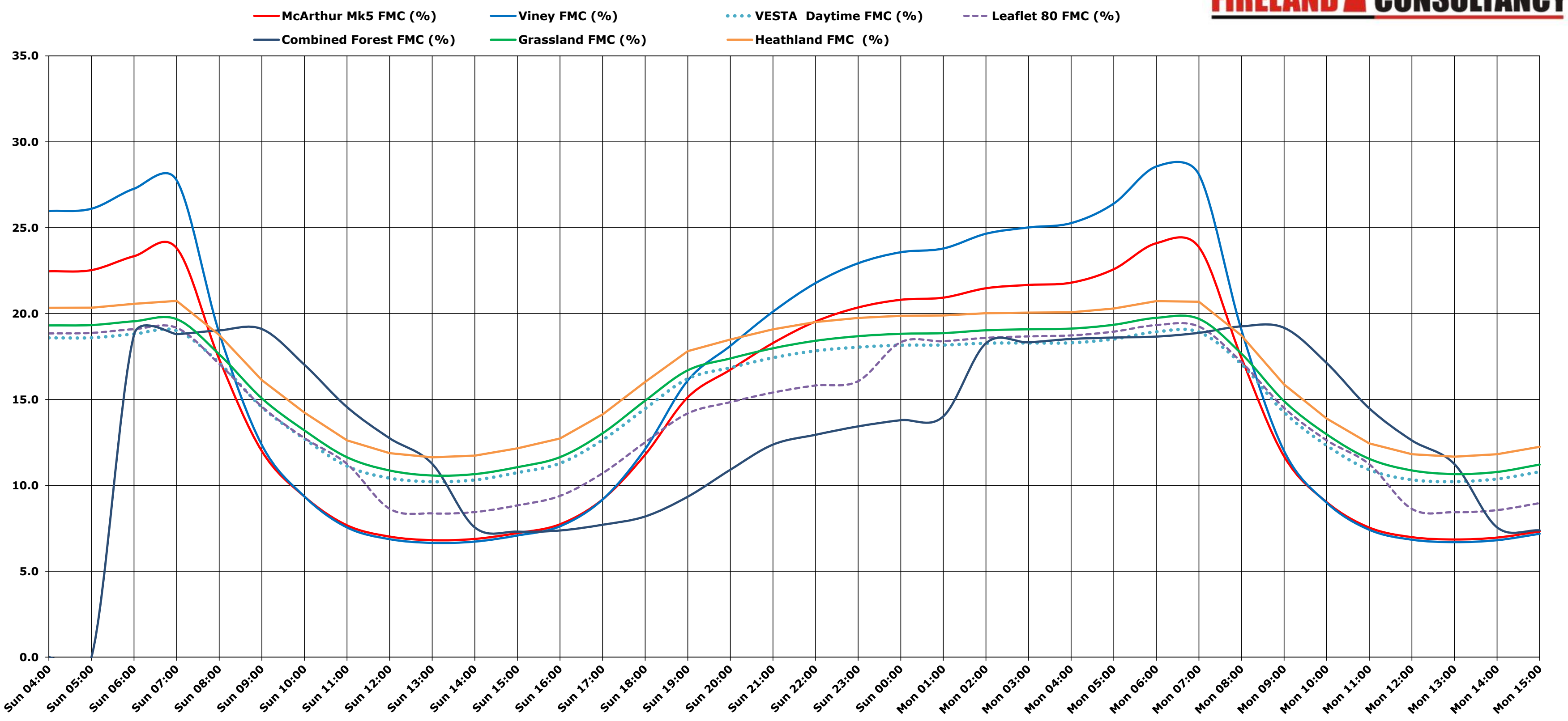
Time and Date forecast data published: 04:51 on Sunday, 1 September 2024

Forecast Location: -17.57, 145.40

Forecast Location:	**Kaban**	**KBDI:**	**70**
Forecast start:	**Sunday, 1 September 2024**	**DF:**	**9**
Forecast end:	**Monday, 2 September 2024**		

FIRELAND CONSULTANCY

36 Hour Forecast - Fuel Moisture Content



Time and Date forecast data published: **04:51** **on** **Sunday, 1 September 2024**

Some data on this app. is sourced from the **Bureau of Meteorology.** Click here for details.

Forecast Location: -17.57, 145.40

36 Hour Fire Behaviour Estimates

FIRELAND CONSULTANCY

Forecast location: Kaban
Forecast start: Sunday, 1 September 2024
Forecast end: Monday, 2 September 2024

KBDI: 70
DF: 9

Grass curing: 100
Grass fuel load (t/ha): 4

						McArthur - Leaflet 80															CSIRO Fire Spread Meter for Northern Australia Grasslands									
						Dry Sclerophyll Forest Light fuels = 8t/ha (40 - 60% canopy cover)								Dry Sclerophyll Forest Moderate - Heavy fuels = 12t/ha (40 - 60% canopy cover)							Grassy Woodland Assumes 100% grass curing (5 - 7m high, canopy cover <30%)					Grassy Open Forest Assumes 100% grass curing (10 - 15m tall, canopy cover 30-70%)				
Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	QWPS PGB Fire Severity Class - Light fuels (Intensity)	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning
Sun 04:00	14	93	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	0.9	2.8	55	0.3	113	6 - 11	Generally suitable	33	0.3	68	0 - 5	Marginal
Sun 05:00	14	93	ENE	↙	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	0.9	2.8	53	0.3	110	6 - 11	Generally suitable	32	0.3	66	0 - 5	Marginal
Sun 06:00	14	94	ENE	↙	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.7	27	0.3	56	0 - 5	Marginal	16	0.2	33	0 - 5	Marginal
Sun 07:00	14	95	ENE	↙	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.8	Below	0.9	2.8	23	0.2	47	0 - 5	Marginal	14	0.2	28	0 - 5	Marginal
Sun 08:00	18	85	ENE	↙	9	3.3	3	0.1	0.7	Below	Low	0.8	2.6	3.3	5	0.1	1.1	Below	1.1	3.1	166	0.4	344	6 - 11	Generally suitable	100	0.4	206	6 - 11	Generally suitable
Sun 09:00	21	70	E	←	10	3.5	6	0.1	1.0	Below	Low	1.0	3.0	3.5	9	0.2	1.7	Below	1.6	3.9	393	0.6	813	6 - 11	Generally suitable	236	0.5	488	6 - 11	Generally suitable
Sun 10:00	23	60	E	←	12	3.8	9	0.2	1.3	Below	Low	1.3	3.4	3.8	14	0.3	2.3	Below	2.1	4.9	705	0.7	1457	6 - 11	Generally suitable	423	0.6	874	6 - 11	Generally suitable
Sun 11:00	25	51	E	←	12	3.8	13	0.2	1.7	Below	Low	1.6	3.9	3.8	20	0.5	2.9	Yes	2.7	5.9	815	0.7	1685	6 - 11	Generally suitable	489	0.6	1011	6 - 11	Generally suitable
Sun 12:00	26	47	E	←	11	3.6	23	0.4	2.5	Yes	Low	2.3	5.2	3.6	34	0.8	4.2	Yes	4.2	8.4	804	0.7	1662	6 - 11	Generally suitable	483	0.6	997	6 - 11	Generally suitable
Sun 13:00	27	46	E	←	12	3.8	25	0.4	2.6	Yes	Low	2.5	5.4	3.8	38	0.8	4.5	Yes	4.5	9.0	914	0.8	1890	6 - 11	Generally suitable	549	0.6	1134	6 - 11	Generally suitable
Sun 14:00	27	47	E	←	12	3.8	25	0.4	2.6	Yes	Low	2.4	5.4	3.8	37	0.8	4.4	Yes	4.4	8.9	906	0.8	1873	6 - 11	Generally suitable	544	0.6	1124	6 - 11	Generally suitable
Sun 15:00	27	49	E	←	12	3.8	23	0.4	2.4	Yes	Low	2.3	5.1	3.8	34	0.7	4.2	Yes	4.1	8.4	868	0.7	1793	6 - 11	Generally suitable	521	0.6	1076	6 - 11	Generally suitable
Sun 16:00	26	52	E	←	13	4.0	21	0.3	2.3	Yes	Low	2.1	4.9	4.0	31	0.7	3.9	Yes	3.8	7.8	888	0.8	1836	6 - 11	Generally suitable	533	0.6	1101	6 - 11	Generally suitable
Sun 17:00	24	60	E	←	14	4.2	16	0.3	1.9	Below	Low	1.8	4.3	4.2	23	0.5	3.3	Yes	3.1	6.6	844	0.7	1744	6 - 11	Generally suitable	506	0.6	1046	6 - 11	Generally suitable
Sun 18:00	21	70	E	←	13	4.0	10	0.2	1.4	Below	Low	1.4	3.5	4.0	15	0.4	2.4	Below	2.3	5.1	645	0.7	1333	6 - 11	Generally suitable	387	0.6	800	6 - 11	Generally suitable
Sun 19:00	19	80	E	←	11	3.6	7	0.1	1.1	Below	Low	1.1	3.1	3.6	10	0.2	1.8	Below	1.7	4.1	432	0.6	894	6 - 11	Generally suitable	259	0.5	536	6 - 11	Generally suitable
Sun 20:00	18	83	E	←	11	3.6	6	0.1	1.0	Below	Low	1.0	2.9	3.6	8	0.2	1.6	Below	1.5	3.9	391	0.6	809	6 - 11	Generally suitable	235	0.5	485	6 - 11	Generally suitable
Sun 21:00	17	86	E	←	13	4.0	5	0.1	0.9	Below	Low	1.0	2.9	4.0	8	0.2	1.6	Below	1.5	3.7	428	0.6	885	6 - 11	Generally suitable	257	0.5	531	6 - 11	Generally suitable
Sun 22:00	16	89	E	←	13	4.0	5	0.1	0.9	Below	Low	0.9	2.8	4.0	7	0.2	1.5	Below	1.4	3.6	397	0.6	821	6 - 11	Generally suitable	238	0.5	492	6 - 11	Generally suitable
Sun 23:00	16	90	E	←	12	3.8	4	0.1	0.8	Below	Low	0.9	2.8	3.8	7	0.2	1.4	Below	1.3	3.5	347	0.6	717	6 - 11	Generally suitable	208	0.5	430	6 - 11	Generally suitable
Sun 00:00	15	90	E	←	11	3.6	3	0.1	0.6	Below	Low	0.7	2.5	3.6	4	0.1	1.0	Below	1.0	2.9	306	0.5	633	6 - 11	Generally suitable	184	0.5	380	6 - 11	Generally suitable
Mon 01:00	15	90	E	←	11	3.6	3	0.1	0.6	Below	Low	0.7	2.5	3.6	4	0.1	1.0	Below	1.0	2.9	304	0.5	629	6 - 11	Generally suitable	182	0.5	377	6 - 11	Generally suitable
Mon 02:00	15	91	E	←	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	4	0.1	0.9	Below	1.0	2.9	77	0.4	160	6 - 11	Generally suitable	46	0.3	96	0 - 5	Marginal
Mon 03:00	14	91	E	←	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	1.0	2.9	73	0.3	150	6 - 11	Generally suitable	44	0.3	90	0 - 5	Marginal
Mon 04:00	14	91	E	←	10	3.5	2	0.0	0.5	Below	Low	0.7	2.4	3.5	3	0.1	0.9	Below	1.0	2.8	70	0.3	144	6 - 11	Generally suitable	42	0.3	86	0 - 5	Marginal
Mon 05:00	14	92	E	←	9	3.3	2	0.0	0.5	Below	Low	0.7	2.4	3.3	3	0.1	0.8	Below	0.9	2.8	46	0.3	94	0 - 5	Marginal	27	0.3	57	0 - 5	Marginal
Mon 06:00	13	94	E	←	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.7	15	0.2	31	0 - 5	Marginal	9	0.2	19	0 - 5	Marginal
Mon 07:00	14	94	E	←	8	3.1	2	0.0	0.5	Below	Low	0.7	2.4	3.1	3	0.1	0.8	Below	0.9	2.7	18	0.2	38	0 - 5	Marginal	11	0.2	23	0 - 5	Marginal
Mon 08:00	17	84	E	←	9	3.3	3	0.1	0.6	Below	Low	0.8	2.6	3.3	5	0.1	1.1	Below	1.1	3.1	164	0.4	339	6 - 11	Generally suitable	98	0.4	203	6 - 11	Generally suitable
Mon 09:00	20	68	E	←	11	3.6	6	0.1	1.0	Below	Low	1.1	3.0	3.6	9	0.2	1.7	Below	1.6	4.0	539	0.6	1114	6 - 11	Generally suitable	323	0.5	668	6 - 11	Generally suitable
Mon 10:00	23	58	E	←	12	3.8	10	0.2	1.4	Below	Low	1.3	3.5	3.8	15	0.4	2.4	Below	2.2	5.0	720	0.7	1488	6 - 11	Generally suitable	432	0.6	893	6 - 11	Generally suitable
Mon 11:00	24	50	E	←	12	3.8	13	0.2	1.7	Below	Low	1.6	4.0	3.8	20	0.5	2.9	Yes	2.8	6.0	823	0.7	1702	6 - 11	Generally suitable	494	0.6	1021	6 - 11	Generally suitable
Mon 12:00	26	47	E	←	11	3.6	23	0.4	2.5	Yes	Low	2.3	5.3	3.6	35	0.8	4.3	Yes	4.3	8.6	804	0.7	1662	6 - 11	Generally suitable	482	0.6	997	6 - 11	Generally suitable
Mon 13:00	26	46	E	←	12	3.8	25	0.4	2.6	Yes	Low	2.5	5.5	3.8	38	0.8	4.5	Yes	4.5	9.0	906	0.8	1873	6 - 11	Generally suitable	544	0.6	1124	6 - 11	Generally suitable
Mon 14:00	26	47	ESE	←	12	3.8	24	0.4	2.6	Yes	Low	2.4	5.4	3.8	37	0.8	4.4	Yes	4.4	8.8	894	0.8	1848	6 - 11	Generally suitable	537	0.6	1109	6 - 11	Generally suitable
Mon 15:00	26	49	ESE	←	12	3.8	22	0.4	2.4	Yes	Low	2.3	5.1	3.8	33	0.7	4.2	Yes	4.1	8.3	854	0.7	1764	6 - 11	Generally suitable	512	0.6	1059	6 - 11	Generally suitable

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes.
Time and Date forecast data published: 4:51 AM **on** Sunday, 1 September 2024

Some data on this app is sourced from the Bureau of Meteorology. Click here for details.

Forecast Location: -17.57, 145.40

Draft product - under development.

Sources of equations used for Modelling and assumptions:
Leaflet 80 Equations used in this table are taken from Gould, J.S. (1994) *Evaluation of McArthur's control burning guide in regrowth Eucalyptus sieberi forest*. Australian Journal of Forestry, 57:2, 86-93.
QWPS PBG Optimum conditions for planned burns is taken from Table A - Light fuels = 8 t/ha and Table B Moderate - heavy fuels = 12t/ha in the QWPS *PBG - How to assess if your burn is ready to go*.
QWPS PBG Fire Severity Class is taken from Table 3 Open forests/woodlands in the QWPS *PBG - How to assess if your burn is ready to go*. Determined using fire intensity values.
Burrows Scorch Height is calculated using equations taken from Burrows (1997) *Predicting canopy scorch height in jarrah forests*. Flame height equations have been used.
Equations for the CSIRO Fire Spread Meter for Northern Australia Grasslands is taken from Cheney, N.P., Gould, J.S. and Catchpole, W.R. (1998) *Prediction of Fire Spread in Grasslands*. International Journal of Wildland Fire 8. 1 - 13.
AFDRS Fire Behaviour Index calculations are based on the Matthews, S. (2022) *AFDRS Fire Behaviour Index Technical Guide*.
AFDRS Implications for Planned Burning are taken from the AFDRS *Fire Behaviour Index Reference Manual Version 1*.
Grass curing is assumed to be 100% by default for grass fire behaviour calculations.
All fire behaviour calculations assume no slope.

APPENDIX 2 – WEATHER OBSERVATION DATA

Weather Observations for PORTABLE QFRK (Ravenshoe)							
Station Details		ID: 250075		Name: RAVENSHOE (QFRK)			
Lat: -17.61		Lon: 145.49		Height: 922.0 m			
Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
1/09/2024	09:00am	18.3	80	E	22	24	0.2
1/09/2024	09:10am	18.6	82	E	20	24	0
1/09/2024	09:20am	19.2	78	ENE	15	19	0
1/09/2024	09:30am	19.8	78	E	13	19	0
1/09/2024	09:40am	19.8	74	ENE	15	24	0
1/09/2024	09:50am	20.4	74	ENE	11	17	0
1/09/2024	10:00am	20.9	69	NE	11	17	0
1/09/2024	10:10am	21.2	70	ENE	15	20	0
1/09/2024	10:20am	21.4	69	ENE	13	17	0
1/09/2024	10:30am	21.6	68	ENE	15	19	0
1/09/2024	10:40am	21.5	69	ENE	17	20	0
1/09/2024	10:50am	22.1	63	ENE	13	19	0
1/09/2024	11:00am	22.4	60	ENE	15	19	0
1/09/2024	11:10am	22.5	63	E	17	22	0
1/09/2024	11:20am	22.4	62	E	19	20	0
1/09/2024	11:30am	22.4	61	E	17	20	0
1/09/2024	11:40am	22.7	61	E	17	19	0
1/09/2024	11:50am	22.9	62	E	15	20	0
1/09/2024	12:00pm	23.1	62	ENE	17	19	0
1/09/2024	12:10pm	23.4	60	E	13	19	0
1/09/2024	12:20pm	23.9	59	ENE	15	19	0
1/09/2024	12:30pm	24.1	58	ENE	15	19	0
1/09/2024	12:40pm	24.2	61	ENE	13	17	0
1/09/2024	12:50pm	24.3	62	ENE	13	17	0
1/09/2024	01:00pm	24.1	59	E	15	19	0
1/09/2024	01:10pm	24.4	56	E	15	19	0
1/09/2024	01:20pm	24.4	55	E	13	19	0
1/09/2024	01:30pm	24.4	58	ENE	13	19	0
1/09/2024	01:40pm	24.5	61	ENE	11	17	0
1/09/2024	01:50pm	24.8	57	ENE	13	17	0
1/09/2024	02:00pm	24.9	55	ENE	13	19	0
1/09/2024	02:10pm	24.9	56	ENE	13	17	0
1/09/2024	02:20pm	24.9	57	ENE	11	15	0
1/09/2024	02:30pm	25.1	55	ENE	13	15	0

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
1/09/2024	02:40pm	24.8	59	ENE	15	19	0
1/09/2024	02:50pm	24.9	54	ENE	13	15	0
1/09/2024	03:00pm	24.9	55	E	15	19	0
1/09/2024	03:10pm	24.5	56	E	15	19	0
1/09/2024	03:20pm	25	53	E	13	15	0
1/09/2024	03:30pm	24.7	55	ENE	13	17	0
1/09/2024	03:40pm	24.1	59	E	15	17	0
1/09/2024	03:50pm	24.2	58	E	15	17	0
1/09/2024	04:00pm	24	59	E	15	17	0

APPENDIX 3 – DAILY SITE BRIEFING

Daily Site Briefing

000137 / Kaban Planned Burn Program 2024

Complete

Document No:	000137
Client:	Neoen & Vestas
Site / Project Name:	Kaban Planned Burn Program 2024
Location:	Hollands Rd Tumoulin QLD 4888 Australia (-17.561026933978933, 145.41368782952446)
Briefing conducted on:	31.08.2024 07:39 AEST
Briefing conducted by:	Francis Hines

Record of Briefing:	
Site induction:	
Site induction complete by all workers?	Yes
Site rules and procedures understood?	Yes
Work health and safety:	
JSEA/Safety documentation still current? Fireland Prescribed Burn JSEA Kaban 2024 V0.2 JSEA Polaris V1.1	Yes
Any site changes since yesterday?	No
Fatigue management:	
Workers rested and fit for work?	Yes
Traffic Management:	
Daily Traffic Management Plan communicated?	Yes
Plant and equipment:	
All equipment pre-starts completed?	Yes
Operators have competency for plant and equipment and Verification of Competency (VOC) provided?	Yes
Communications:	
Work site communications channel?	UHF 17 & FC 1
Emergency procedures:	
Location of first aid kits identified?	Yes
First aid qualified staff identified?	Yes
Emergency response procedure discussed?	Yes
Daily muster point location?	Sawmill
Fauna, Flora and Cultural Heritage:	

Fauna Management - Plant operators

Fauna management procedure - plant operators.pdf

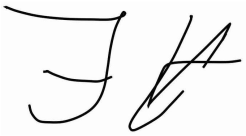
Fauna/flora management procedure understood?	Yes
Cultural Heritage procedure understood? **1. FIND: A potential Cultural Heritage item or object is found.** **2. STOP: STOP WORK IMMEDIATELY and install an exclusion zone around the area.** **3. NOTIFY: Notify a responsible person (e.g. Site Supervisor, Project Manager).** **4. MANAGE: Report the discovery to the Project Manager for advice on management.**	Yes
Environmental Clearance Certificate understood?	N/A
Tool Box talk - topic of the day:	
Select a topic for discussion.	Hazard trees

Record of Attendance

Briefing attendees

Briefing attendees 1

Attendees name and signature:



Francis Hines
31.08.2024 07:43 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 2

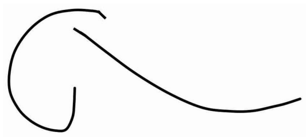
Attendees name and signature:

Cameron Allanson
31.08.2024 07:43 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 3

Attendees name and signature:

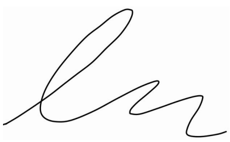


Courtney Dangerfield
31.08.2024 07:44 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 4

Attendees name and signature:



Miles Cross
31.08.2024 07:44 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 5

Attendees name and signature:

Emma Henry
31.08.2024 07:44 AEST

Agency/Company	Fireland Consultancy

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S28 – A OPERATIONAL POST BURN REPORT

BURN NAME	Kaban Windfarm LMZ 12	**Lot/Plan/s No.** (all approvals obtained) ☒ Yes	2/RP735194 35/CWL391
Burn No.	2024_LMZ_12		
Location	Kaban Green Power Hub	**Road Segment No.**	NA
LGA	Tablelands Regional	**Proposed Timing**	June – Sept 2024
Date burn started	02/09/2024	**Time**	07:20
Date burn deemed out	03/09/2024	**Time**	13:00
Permit #	F506578	**Complexity**	CR – 2 (71)

Incident Controller	Francis Hines	Fireland
	Name	Position

SITUATION – OUTCOMES

Area to be treated	8.5Ha	Percentage aim	<30	Last fire	Unknown
Actual treated area	8.5Ha	Percentage achieved	<30% at landscape level ~90% coverage	Severity class	Low

MISSION – OUTCOMES

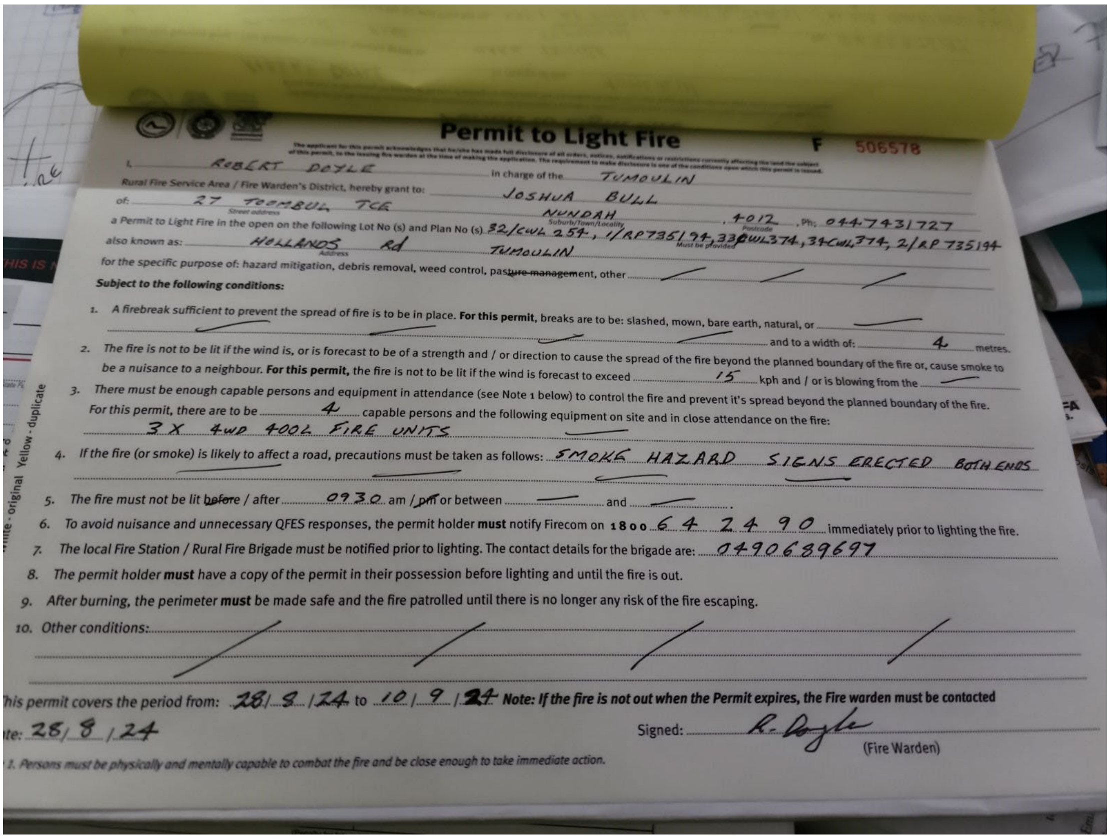
Aim & Objectives (Outline the general intent of the proposed burn and the specific objectives. Consider fuel load, fuel structure & mosaic effect)	• To reduce the likelihood of high-intensity wildfires that may impact site vegetation and species habitat suitability. • Implement Low to Moderate intensity planned burns with <30% coverage (at a landscape level) • Exclude fire from Unit LMZ 12.1 due to potential Magnificent Brood Frog Habitat.
Outcomes (Outline if the objectives were met, if not why not)	Objectives met. Desired coverage achieved at a landscape level through operational programming. Fire excluded from Unit 12.1.
List recommendations (For burn area, may include fire trail works)	Ongoing maintenance of Fire Trail W22 that forms an internal boundary of this unit is required as per the recommendations contained in the Landscape Fire Management Plan (April 2023).

EXECUTION – DETAILS				
Weather observations	Refer to: • Appendix 1 for weather forecast information. • Appendix 2 for weather observation data.			
Comments (List any weather conditions that significantly impacted operations)	Overall site conditions were at the drier end of desired conditions. As a result burn coverage and fuel consumption was high.			
	Fire danger index	5	Estimated KBDI	73
Ignition used (Describe the ignition)	☒ On ground ignition ☐ Aerial Ignition Hand ignition undertaken using predominately backing fire.			
Implementation overview	Backing fire used throughout the operation. Ignition commenced at high point near WTG 08 and fire allowed to back down hill to the north and east.			
Implementation details	**02/09/24** 07:00 – briefed crews. 07:15 – updated Firecom. 07:20 – commenced ignition of LMZ 12 at 12l. One crew working north down the power easement towards 12m. Second crew working east towards 12j. 09:00 – ignition complete along eastern edge down to 12m. Second crew within 100m of the eastern end of internal track (Track W22). 09:15 – ignition along internal track and southern edge is complete. Allowing fire to back down through the block to the north. 09:45 – all edge ignition complete. 10:00 – crews working to secure edges. 14:00 – burn secure. 16:30 – crews left site. Updated Neoen and Vestas. **03/09/24** 07:00 – crews back onsite. 13:00 – all burns secure. Crews departed site.			

ADMINISTRATION	
Complaints ☒ **No Issues**	Nil.
Infrastructure damage ☒ **No Issues**	Nil.
Impact on road network ☒ **No Issues**	Nil.
Impact on community ☒ **No Issues**	Nil.
Impact on direct residents or stakeholders ☒ **No Issues**	Nil.
Other (Include any other comments)	Nil.

SAFETY	
JSEA / Briefing	Refer to Appendix 3 – for Daily Site Briefing.
Any incidents	Nil

PERMIT TO LIGHT FIRE



Permit to Light Fire F 506578

I, ROBERT DOYLE in charge of the TUMOULIN Rural Fire Service Area / Fire Warden's District, hereby grant to: JOSHUA BULL

of: 27 TOOMBUL TCE (Street address) NUNDAH (Suburb/Town/Locality), 4012 (Postcode), Ph: 0447431727 (Must be provided)

a Permit to Light Fire in the open on the following Lot No (s) and Plan No (s) 32/CWL 254, 1/RP735194, 33CWL374, 34CWL374, 2/RP 735194

also known as: HOLLANDS Rd (Address) TUMOULIN

for the specific purpose of: hazard mitigation, debris removal, weed control, pas~~ture management~~, other

Subject to the following conditions:

1. *A firebreak sufficient to prevent the spread of fire is to be in place.* **For this permit,** breaks are to be: slashed, mown, bare earth, natural, or and to a width of: 4 metres.
2. *The fire is not to be lit if the wind is, or is forecast to be of a strength and / or direction to cause the spread of the fire beyond the planned boundary of the fire or, cause smoke to be a nuisance to a neighbour.* **For this permit,** the fire is not to be lit if the wind is forecast to exceed 15 kph and / or is blowing from the
3. *There must be enough capable persons and equipment in attendance (see Note 1 below) to control the fire and prevent it's spread beyond the planned boundary of the fire.* For this permit, there are to be 4 capable persons and the following equipment on site and in close attendance on the fire: 3 X 4WD 400L FIRE UNITS
4. *If the fire (or smoke) is likely to affect a road, precautions must be taken as follows:* SMOKE HAZARD SIGNS ERECTED BOTH ENDS
5. *The fire must not be lit ~~before~~ / after* 0930 am / ~~pm~~ or between and .
6. *To avoid nuisance and unnecessary QFES responses, the permit holder* **must** *notify Firecom on* 1800 64 24 90 *immediately prior to lighting the fire.*
7. *The local Fire Station / Rural Fire Brigade must be notified prior to lighting. The contact details for the brigade are:* 0490689697
8. *The permit holder* **must** *have a copy of the permit in their possession before lighting and until the fire is out.*
9. *After burning, the perimeter* **must** *be made safe and the fire patrolled until there is no longer any risk of the fire escaping.*
10. *Other conditions:*

This permit covers the period from: 28/8/24 to 10/9/24 ***Note: If the fire is not out when the Permit expires, the Fire warden must be contacted***

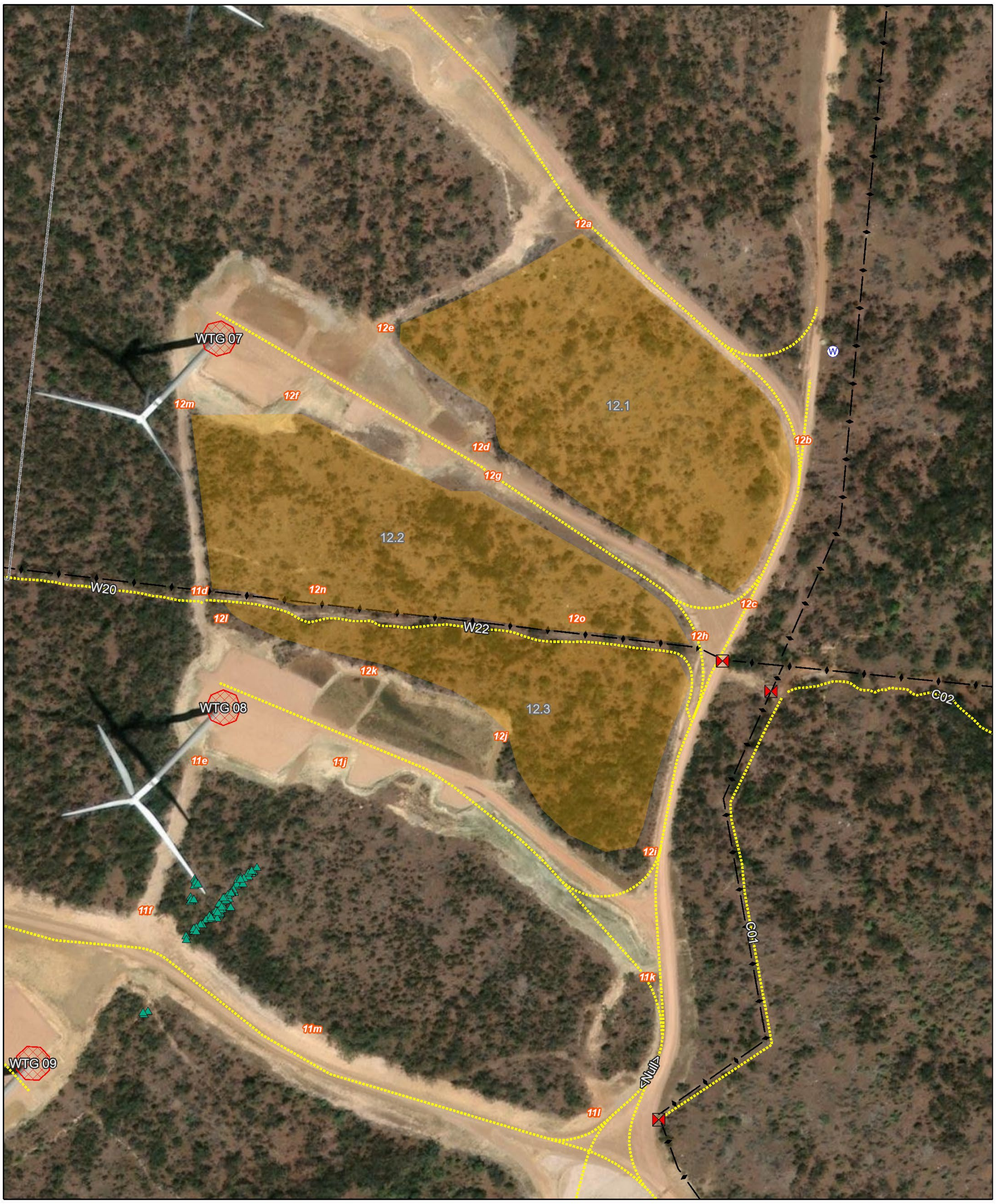
Date: 28/8/24

Signed: R. Doyle (Fire Warden)

1. Persons must be physically and mentally capable to combat the fire and be close enough to take immediate action.

OPERATIONAL MAP

LMZ 12



8/5/2024

Brood Frog sighting recod
Kaban_Extent
Kaban_Site_polygons
Tower site
Operational Burn Points
Location Reference
Burn Plan Area
Standard Point Assets
Access Control
Water
Standard Roads Tracks Trails
Standard Lineal Assets
World Imagery
Low Resolution 15m Imagery
High Resolution 60cm Imagery
High Resolution 30cm Imagery
Citations
60cm Resolution Metadata

1:2,500

0 0.03 0.06 0.11 mi
0 0.04 0.09 0.17 km

Maxar

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PHOTOS

PHOTOS

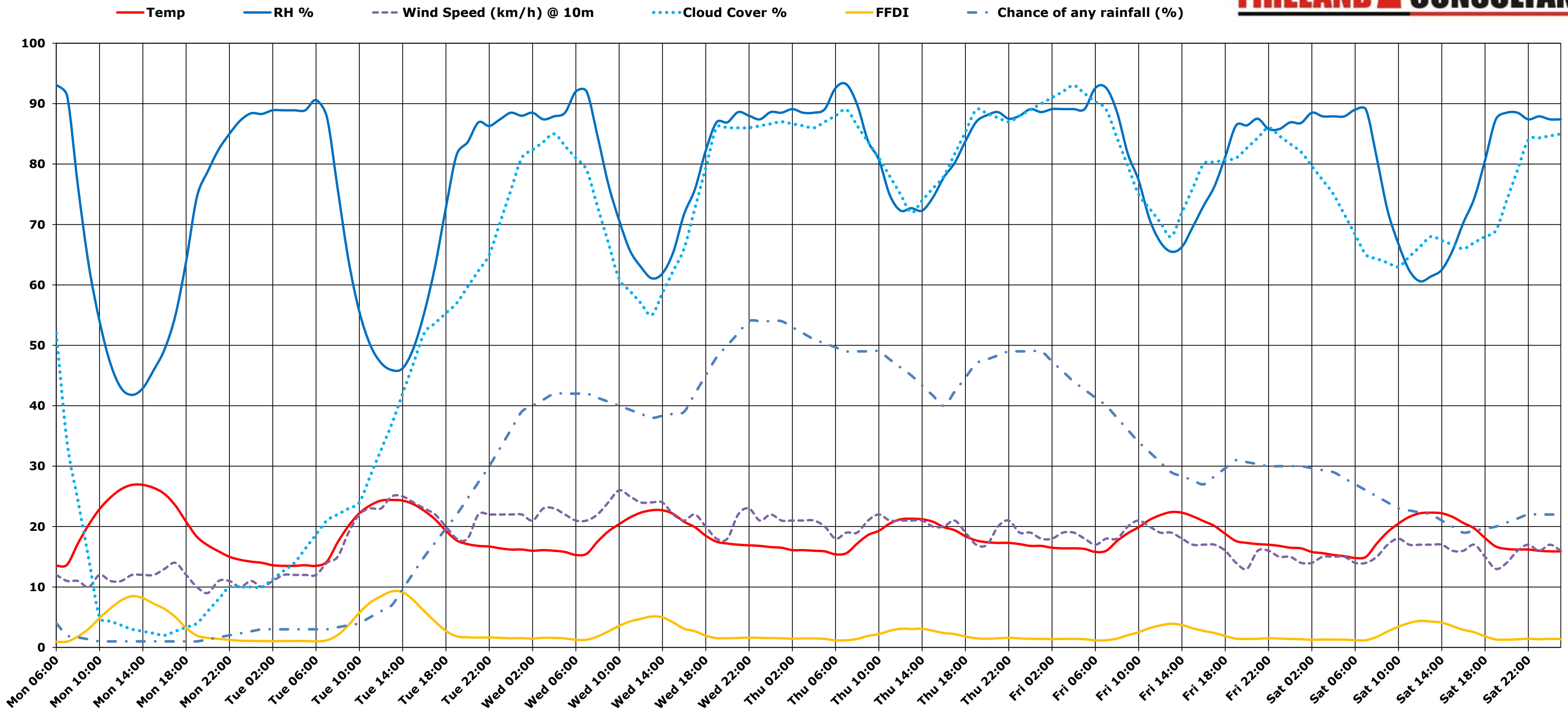
PHOTOS

PHOTOS

APPENDIX 1 – WEATHER FORECAST INFORMATION

Forecast location:	**Kaban**	**KBDI:**	**73**
Forecast start:	**Monday, 2 September 2024**	**DF:**	**9**
Forecast end:	**Saturday, 7 September 2024**		

6 Day Lookahead - Temp, RH, WS, Cloud Cover and FFDI



Time and Date forecast data published: **06:19** **on** **Monday, 2 September 2024**

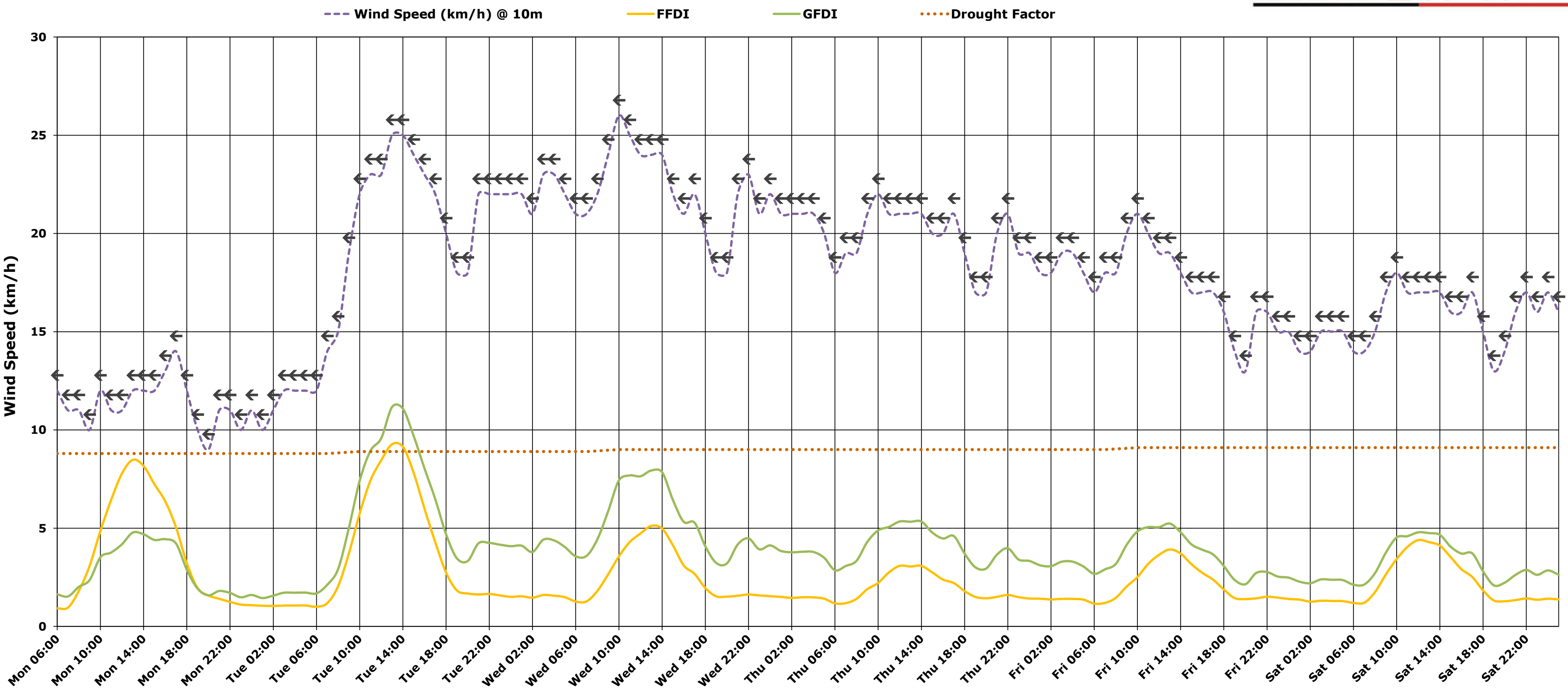
Forecast Location: -17.57, 145.40

Forecast location: Kaban **KBDI:** 73

Forecast start: Monday, 2 September 2024 **DF:** 9

Forecast end: Saturday, 7 September 2024

6 Day Lookahead - Surface Wind Speed and Direction, FFDI, GFDI & DF



Note: Wind Direction has been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: 06:19 on Monday, 2 September 2024

Forecast Location: -17.57, 145.40

Forecast location: Kaban

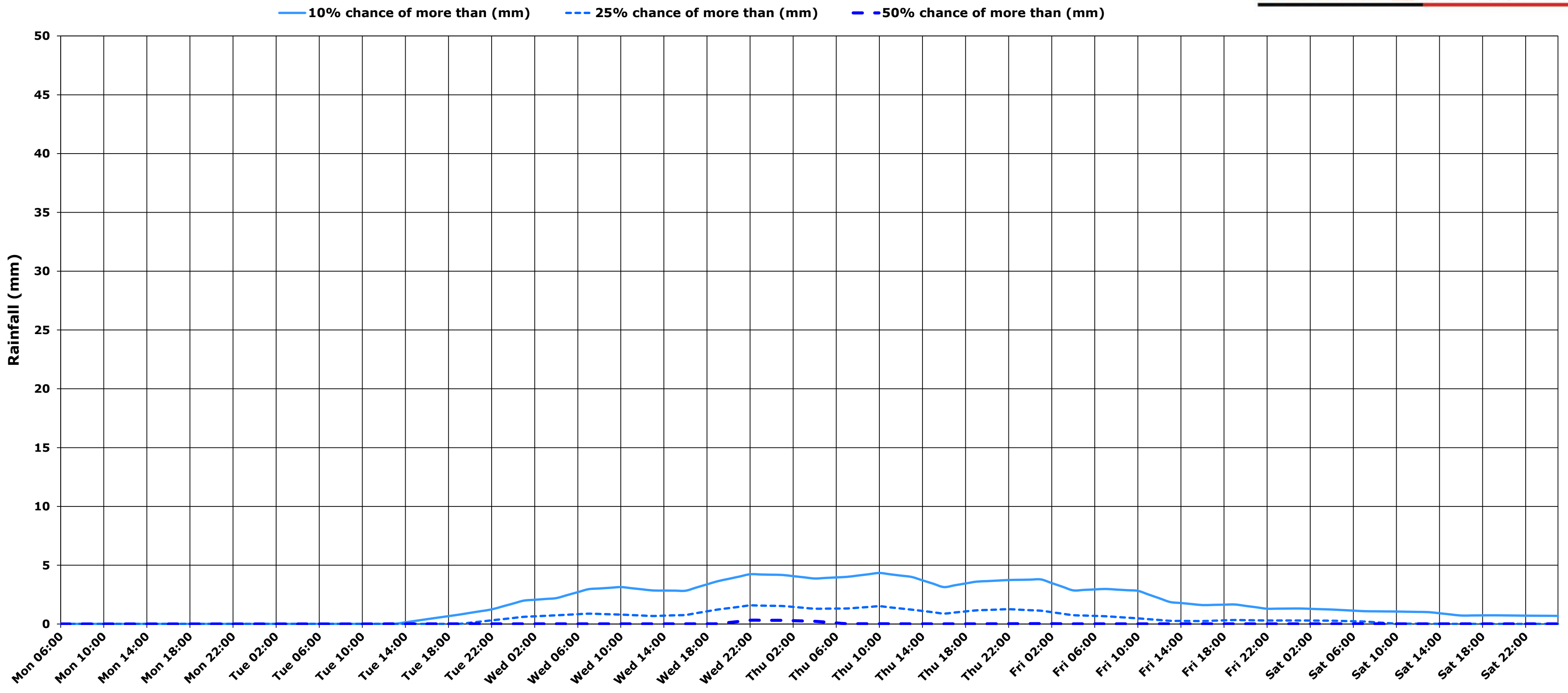
Forecast start: Monday, 2 September 2024

Forecast end: Saturday, 7 September 2024

KBDI: 73

DF: 9

6 Day Lookahead - % Chance of more than XXmm of rainfall

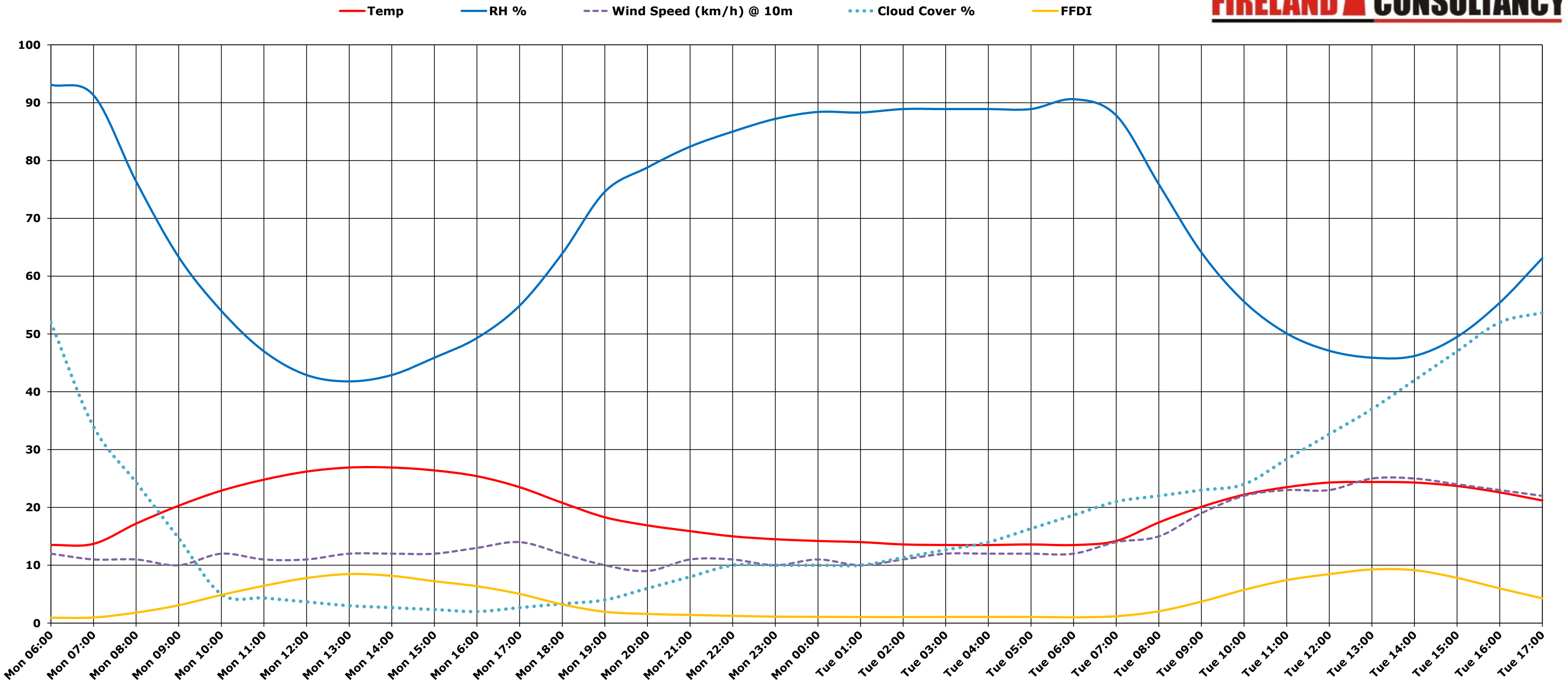


Time and Date forecast data published: 06:19 on Monday, 2 September 2024

Forecast Location: -17.57, 145.40

Forecast Location:	**Kaban**	**KBDI:**	**73**
Forecast start:	**Monday, 2 September 2024**	**DF:**	**9**
Forecast end:	**Tuesday, 3 September 2024**		

36 Hour Forecast - Temp, RH, WS, Cloud Cover and FFDI

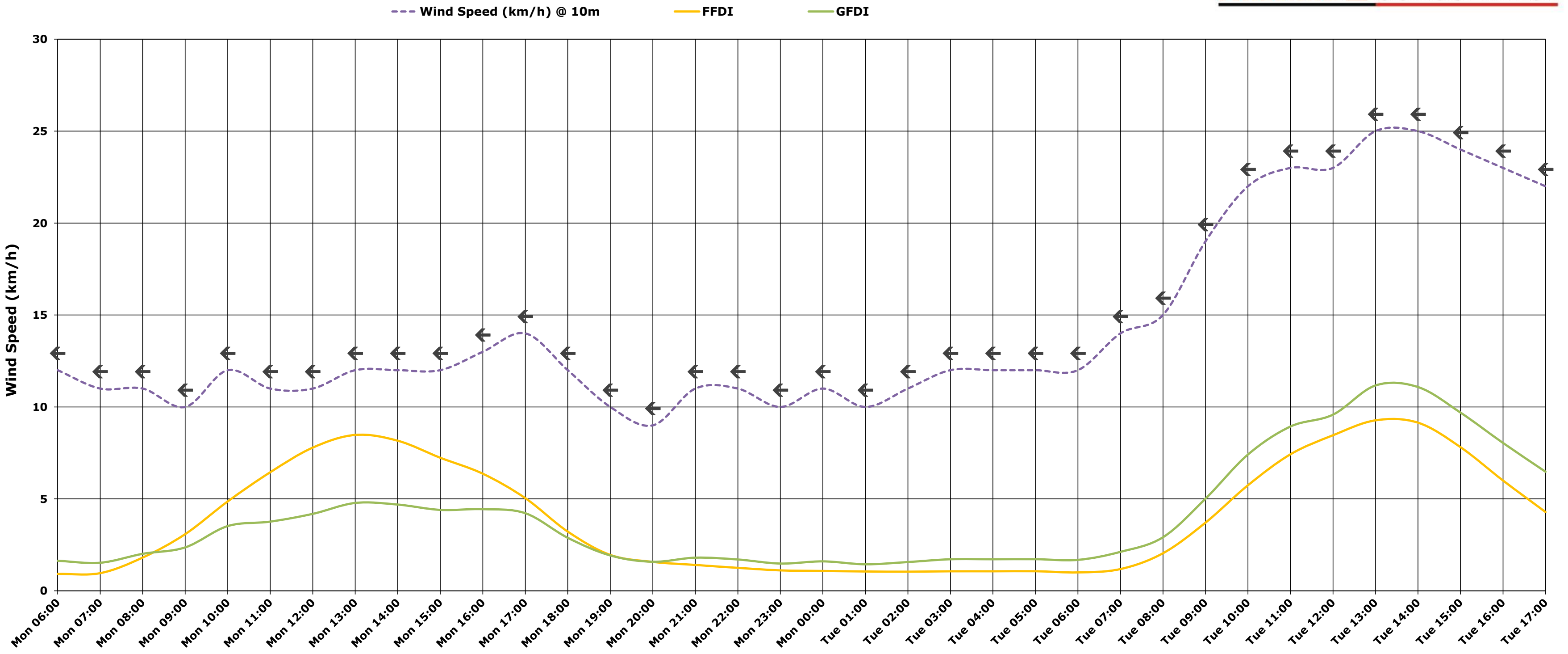


Time and Date forecast data published: **6:19 AM** **on** **Monday, 2 September 2024**

Forecast Location: -17.57, 145.40

Forecast Location: Kaban **KBDI:** 73
Forecast start: Monday, 2 September 2024 **DF:** 9
Forecast end: Tuesday, 3 September 2024

36 Hour Forecast - Surface Wind Speed and Direction, FFDI & GFDI



Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: **06:19 on Monday, 2 September 2024**

Forecast Location: -17.57, 145.40

Forecast Location: Kaban **KBDI:** 73

Forecast start: Monday, 2 September 2024 **DF:** 9

Forecast end: Tuesday, 3 September 2024

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Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Drought Factor	Leaflet 80 FMC (%)	Combined Forest FMC (%)	FFDI	GFDI	Cloud Cover %	Mixing Height (m ASL)	Wind Dir (Cardinal 8pt) @ 1000m	Wind Dir (Arrow 8pt) @ 1000m	Wind Speed (km/h) @1000m	Wind Dir (Cardinal 8pt) @ 1500m	Wind Dir (Arrow 8pt) @ 1500m	Wind Speed (km/h) @ 1500m
Mon 06:00	14	93	E	←	12	9	19.1		1	2	52	795	E	←	24	SE	↖	20
Mon 07:00	14	91	E	←	11	9	18.9		1	2	34	842	E	←	22	SE	↖	22
Mon 08:00	17	76	E	←	11	9	16.2	19.1	2	2	24	1,067	E	←	22	SE	↖	22
Mon 09:00	20	63	E	←	10	9	13.9	18.8	3	2	15	1,202	E	←	20	SE	↖	22
Mon 10:00	23	54	E	←	12	9	12.1	16.2	5	4	5	1,324	E	←	19	SE	↖	22
Mon 11:00	25	47	E	←	11	9	10.8	13.9	6	4	4	1,508	E	←	19	SE	↖	19
Mon 12:00	26	43	E	←	11	9	8.0	12.1	8	4	4	1,809	E	←	19	SE	↖	17
Mon 13:00	27	42	E	←	12	9	7.8	10.8	8	5	3	1,910	E	←	19	E	←	15
Mon 14:00	27	43	ESE	←	12	9	7.9	7.0	8	5	3	1,898	E	←	19	E	←	15
Mon 15:00	26	46	ESE	←	12	9	8.4	6.8	7	4	2	1,852	E	←	20	E	←	15
Mon 16:00	25	49	ESE	←	13	9	9.0	6.9	6	4	2	1,778	E	←	20	SE	↖	15
Mon 17:00	24	55	ESE	←	14	9	10.1	7.3	5	4	3	1,642	E	←	22	SE	↖	19
Mon 18:00	21	64	ESE	←	12	9	11.7	7.9	3	3	3	1,435	E	←	24	SE	↖	20
Mon 19:00	18	75	E	←	10	9	13.6	8.8	2	2	4	1,272	E	←	26	SE	↖	26
Mon 20:00	17	79	E	←	9	9	14.4	10.3	2	2	6	1,067	E	←	26	SE	↖	31
Mon 21:00	16	82	E	←	11	9	15.0	11.9	1	2	8	974	E	←	26	SE	↖	39
Mon 22:00	15	85	E	←	11	9	15.5	12.6	1	2	10	882	E	←	30	SE	↖	41
Mon 23:00	15	87	E	←	10	9	15.9	13.2	1	1	10	878	E	←	30	SE	↖	44
Mon 00:00	14	88	E	←	11	9	18.4	13.6	1	2	10	872	E	←	30	SE	↖	48
Tue 01:00	14	88	E	←	10	9	18.5	13.9	1	1	10	851	E	←	30	SE	↖	50
Tue 02:00	14	89	E	←	11	9	18.6	18.4	1	2	11	781	E	←	31	SE	↖	54
Tue 03:00	14	89	E	←	12	9	18.7	18.4	1	2	13	781	E	←	33	SE	↖	57
Tue 04:00	14	89	E	←	12	9	18.7	18.6	1	2	14	796	E	←	33	SE	↖	59
Tue 05:00	14	89	ESE	←	12	9	18.6	18.6	1	2	16	824	E	←	37	SE	↖	63
Tue 06:00	14	91	E	←	12	9	18.9	18.6	1	2	19	821	E	←	39	SE	↖	67
Tue 07:00	14	88	ESE	←	14	9	18.3	18.6	1	2	21	885	E	←	41	SE	↖	70
Tue 08:00	17	76	ESE	←	15	9	16.1	18.8	2	3	22	1,144	E	←	41	SE	↖	72
Tue 09:00	20	64	ESE	←	19	9	14.0	18.3	4	5	23	1,399	E	←	41	E	←	72
Tue 10:00	22	56	ESE	←	22	9	12.5	16.1	6	7	24	1,603	E	←	41	E	←	70
Tue 11:00	24	50	ESE	←	23	9	11.5	14.0	7	9	28	1,791	E	←	43	E	←	63
Tue 12:00	24	47	ESE	←	23	9	8.9	12.5	8	10	33	1,871	E	←	44	E	←	57
Tue 13:00	24	46	ESE	←	25	9	8.7	11.5	9	11	37	1,930	E	←	44	E	←	52
Tue 14:00	24	46	ESE	←	25	9	8.8	7.8	9	11	42	1,989	E	←	44	E	←	52
Tue 15:00	24	50	ESE	←	24	9	9.3	7.7	8	10	47	1,983	E	←	44	E	←	50
Tue 16:00	23	55	ESE	←	23	9	10.3	7.7	6	8	52	1,931	E	←	44	E	←	48
Tue 17:00	21	63	ESE	←	22	9	11.6	8.2	4	6	54	1,768	E	←	43	E	←	56

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes. **GFDI is calculated using a user entered Grass Curing Value of: 100**

Time and Date forecast data published: 06:19 on Monday, 2 September 2024

Forecast Location: -17.57, 145.40

Forecast Location: Kaban

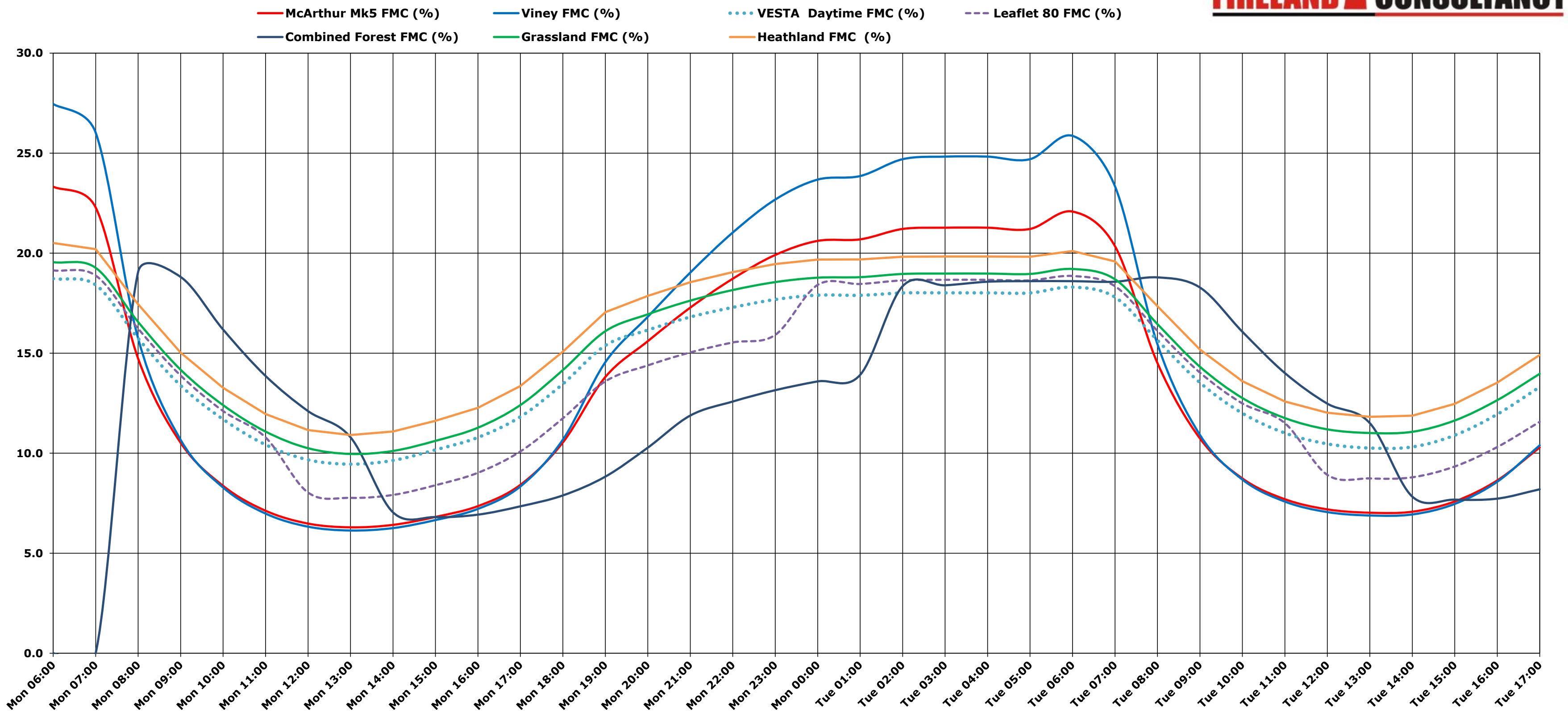
Forecast start: Monday, 2 September 2024

Forecast end: Tuesday, 3 September 2024

KBDI: 73

DF: 9

36 Hour Forecast - Fuel Moisture Content



Time and Date forecast data published: 06:19 on Monday, 2 September 2024

Forecast Location: -17.57, 145.40

36 Hour Fire Behaviour Estimates

Forecast location: Kaban **KBDI:** 73 **Grass curing:** 100
Forecast start: Monday, 2 September 2024 **DF:** 9 **Grass fuel load (t/ha):** 4
Forecast end: Tuesday, 3 September 2024

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						McArthur - Leaflet 80															CSIRO Fire Spread Meter for Northern Australia Grasslands									
						Dry Sclerophyll Forest Light fuels = 8t/ha (40 - 60% canopy cover)								Dry Sclerophyll Forest Moderate - Heavy fuels = 12t/ha (40 - 60% canopy cover)							Grassy Woodland Assumes 100% grass curing (5 - 7m high, canopy cover <30%)					Grassy Open Forest Assumes 100% grass curing (10 - 15m tall, canopy cover 30-70%)				
Date and Time	Temp	RH %	Wind Dir (Cardinal 16pt) @ 10m	Wind Dir (Arrow) @ 10m	Wind Speed (km/h) @ 10m	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	QWPS PGB Fire Severity Class - Light fuels (Intensity)	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	Wind Speed (km/h) @ 1.5m	FROS (m/h)	Flame Height (m)	Scorch Height (m)	QWPS PBG Optimum conditions	Burrows Scorch Height (Spring - Fh)	Burrows Scorch Height (Summer/ Autumn - Fh)	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning	FROS (m/h)	Flame Height (m)	Fireline Intensity (kW/m)	FBI Range	AFDRS Implications for Planned Burning
Mon 06:00	14	93	E	←	12	3.8	2	0.0	0.5	Below	Low	0.7	2.4	3.8	3	0.1	0.9	Below	1.0	2.8	290	0.5	600	6 - 11	Generally suitable	174	0.5	360	6 - 11	Generally suitable
Mon 07:00	14	91	E	←	11	3.6	2	0.0	0.5	Below	Low	0.7	2.4	3.6	3	0.1	0.9	Below	1.0	2.9	280	0.5	579	6 - 11	Generally suitable	168	0.4	347	6 - 11	Generally suitable
Mon 08:00	17	76	E	←	11	3.6	4	0.1	0.8	Below	Low	0.9	2.7	3.6	6	0.2	1.3	Below	1.3	3.4	441	0.6	911	6 - 11	Generally suitable	264	0.5	547	6 - 11	Generally suitable
Mon 09:00	20	63	E	←	10	3.5	7	0.1	1.1	Below	Low	1.1	3.1	3.5	10	0.3	1.9	Below	1.8	4.2	464	0.6	959	6 - 11	Generally suitable	278	0.5	576	6 - 11	Generally suitable
Mon 10:00	23	54	E	←	12	3.8	11	0.2	1.5	Below	Low	1.4	3.7	3.8	16	0.4	2.6	Below	2.4	5.4	757	0.7	1564	6 - 11	Generally suitable	454	0.6	939	6 - 11	Generally suitable
Mon 11:00	25	47	E	←	11	3.6	14	0.2	1.8	Below	Low	1.7	4.1	3.6	21	0.5	3.1	Yes	2.9	6.3	786	0.7	1624	6 - 11	Generally suitable	472	0.6	975	6 - 11	Generally suitable
Mon 12:00	26	43	E	←	11	3.6	27	0.4	2.7	Yes	Low	2.6	5.7	3.6	40	0.9	4.7	Yes	4.8	9.4	860	0.7	1777	6 - 11	Generally suitable	516	0.6	1066	6 - 11	Generally suitable
Mon 13:00	27	42	E	←	12	3.8	29	0.5	2.9	Yes	Low	2.8	6.0	3.8	44	0.9	5.0	Yes	5.1	10.0	977	0.8	2019	6 - 11	Generally suitable	586	0.7	1211	6 - 11	Generally suitable
Mon 14:00	27	43	ESE	←	12	3.8	28	0.4	2.8	Yes	Low	2.7	5.8	3.8	42	0.9	4.9	Yes	5.0	9.8	961	0.8	1986	6 - 11	Generally suitable	577	0.7	1192	6 - 11	Generally suitable
Mon 15:00	26	46	ESE	←	12	3.8	25	0.4	2.6	Yes	Low	2.5	5.5	3.8	38	0.8	4.5	Yes	4.6	9.1	910	0.8	1881	6 - 11	Generally suitable	546	0.6	1129	6 - 11	Generally suitable
Mon 16:00	25	49	ESE	←	13	4.0	23	0.4	2.5	Yes	Low	2.3	5.2	4.0	34	0.7	4.2	Yes	4.2	8.4	924	0.8	1910	6 - 11	Generally suitable	555	0.6	1146	6 - 11	Generally suitable
Mon 17:00	24	55	ESE	←	14	4.2	18	0.3	2.1	Yes	Low	2.0	4.6	4.2	27	0.6	3.6	Yes	3.5	7.3	892	0.8	1843	6 - 11	Generally suitable	535	0.6	1106	6 - 11	Generally suitable
Mon 18:00	21	64	ESE	←	12	3.8	12	0.2	1.6	Below	Low	1.5	3.8	3.8	18	0.4	2.7	Yes	2.6	5.6	642	0.7	1328	6 - 11	Generally suitable	385	0.6	797	6 - 11	Generally suitable
Mon 19:00	18	75	E	←	10	3.5	7	0.1	1.2	Below	Low	1.2	3.2	3.5	11	0.3	2.0	Below	1.8	4.4	311	0.5	642	6 - 11	Generally suitable	186	0.5	385	6 - 11	Generally suitable
Mon 20:00	17	79	E	←	9	3.3	6	0.1	1.0	Below	Low	1.0	3.0	3.3	9	0.2	1.7	Below	1.6	4.0	214	0.5	443	6 - 11	Generally suitable	129	0.4	266	6 - 11	Generally suitable
Mon 21:00	16	82	E	←	11	3.6	5	0.1	0.9	Below	Low	1.0	2.9	3.6	8	0.2	1.6	Below	1.5	3.8	377	0.6	780	6 - 11	Generally suitable	226	0.5	468	6 - 11	Generally suitable
Mon 22:00	15	85	E	←	11	3.6	5	0.1	0.9	Below	Low	1.0	2.8	3.6	7	0.2	1.5	Below	1.4	3.7	346	0.6	715	6 - 11	Generally suitable	208	0.5	429	6 - 11	Generally suitable
Mon 23:00	15	87	E	←	10	3.5	4	0.1	0.8	Below	Low	0.9	2.8	3.5	6	0.2	1.4	Below	1.3	3.5	115	0.4	238	6 - 11	Generally suitable	69	0.3	143	6 - 11	Generally suitable
Mon 00:00	14	88	E	←	11	3.6	3	0.1	0.6	Below	Low	0.7	2.5	3.6	4	0.1	1.0	Below	1.0	2.9	309	0.5	639	6 - 11	Generally suitable	186	0.5	384	6 - 11	Generally suitable
Tue 01:00	14	88	E	←	10	3.5	2	0.1	0.5	Below	Low	0.7	2.5	3.5	4	0.1	0.9	Below	1.0	2.9	96	0.4	197	6 - 11	Generally suitable	57	0.3	118	6 - 11	Generally suitable
Tue 02:00	14	89	E	←	11	3.6	2	0.0	0.5	Below	Low	0.7	2.5	3.6	4	0.1	0.9	Below	1.0	2.9	298	0.5	617	6 - 11	Generally suitable	179	0.5	370	6 - 11	Generally suitable
Tue 03:00	14	89	E	←	12	3.8	2	0.1	0.6	Below	Low	0.7	2.5	3.8	4	0.1	0.9	Below	1.0	2.9	327	0.6	677	6 - 11	Generally suitable	196	0.5	406	6 - 11	Generally suitable
Tue 04:00	14	89	E	←	12	3.8	2	0.1	0.6	Below	Low	0.7	2.5	3.8	4	0.1	0.9	Below	1.0	2.9	327	0.6	677	6 - 11	Generally suitable	196	0.5	406	6 - 11	Generally suitable
Tue 05:00	14	89	ESE	←	12	3.8	2	0.1	0.6	Below	Low	0.7	2.5	3.8	4	0.1	0.9	Below	1.0	2.9	329	0.6	679	6 - 11	Generally suitable	197	0.5	407	6 - 11	Generally suitable
Tue 06:00	14	91	E	←	12	3.8	2	0.0	0.5	Below	Low	0.7	2.4	3.8	4	0.1	0.9	Below	1.0	2.9	312	0.5	645	6 - 11	Generally suitable	187	0.5	387	6 - 11	Generally suitable
Tue 07:00	14	88	ESE	←	14	4.2	3	0.1	0.6	Below	Low	0.8	2.5	4.2	4	0.1	1.0	Below	1.1	3.0	408	0.6	843	6 - 11	Generally suitable	245	0.5	506	6 - 11	Generally suitable
Tue 08:00	17	76	ESE	←	15	4.4	5	0.1	0.9	Below	Low	0.9	2.8	4.4	7	0.2	1.5	Below	1.4	3.6	623	0.7	1288	6 - 11	Generally suitable	374	0.6	773	6 - 11	Generally suitable
Tue 09:00	20	64	ESE	←	19	5.1	9	0.2	1.3	Below	Low	1.3	3.4	5.1	13	0.3	2.2	Below	2.1	4.8	1011	0.8	2090	6 - 11	Generally suitable	607	0.7	1254	6 - 11	Generally suitable
Tue 10:00	22	56	ESE	←	22	5.6	13	0.2	1.7	Below	Low	1.6	4.0	5.6	20	0.5	3.0	Yes	2.8	6.1	1352	0.9	2794	6 - 11	Generally suitable	811	0.7	1676	6 - 11	Generally suitable
Tue 11:00	24	50	ESE	←	23	5.8	17	0.3	2.1	Below	Low	1.9	4.5	5.8	26	0.6	3.5	Yes	3.4	7.1	1546	0.9	3196	12 - 49	Generally unsuitable	928	0.8	1918	6 - 11	Generally suitable
Tue 12:00	24	47	ESE	←	23	5.8	31	0.5	3.1	Yes	Low	2.9	6.2	5.8	47	1.0	5.2	Yes	5.4	10.6	1643	0.9	3397	12 - 49	Generally unsuitable	986	0.8	2038	6 - 11	Generally suitable
Tue 13:00	24	46	ESE	←	25	6.1	34	0.5	3.3	Yes	Low	3.1	6.6	6.1	51	1.1	5.6	Yes	5.9	11.3	1812	0.9	3745	12 - 49	Generally unsuitable	1087	0.8	2247	6 - 11	Generally suitable
Tue 14:00	24	46	ESE	←	25	6.1	34	0.5	3.2	Yes	Low	3.1	6.6	6.1	51	1.1	5.5	Yes	5.8	11.2	1800	0.9	3721	12 - 49	Generally unsuitable	1080	0.8	2233	6 - 11	Generally suitable
Tue 15:00	24	50	ESE	←	24	6.0	29	0.5	2.9	Yes	Low	2.8	6.0	6.0	43	0.9	5.0	Yes	5.1	10.1	1630	0.9	3370	12 - 49	Generally unsuitable	978	0.8	2022	6 - 11	Generally suitable
Tue 16:00	23	55	ESE	←	23	5.8	23	0.4	2.5	Yes	Low	2.3	5.2	5.8	34	0.8	4.2	Yes	4.2	8.5	1423	0.9	2941	6 - 11	Generally suitable	854	0.7	1765	6 - 11	Generally suitable
Tue 17:00	21	63	ESE	←	22	5.6	16	0.3	2.0	Below	Low	1.9	4.4	5.6	25	0.6	3.4	Yes	3.3	6.9	1206	0.8	2492	6 - 11	Generally suitable	724	0.7	1495	6 - 11	Generally suitable

Note: Wind Direction Arrows have been simplified to the 8 major Cardinal points for display purposes.
Time and Date forecast data published: 6:19 AM **on** Monday, 2 September 2024

Some data on this app. is sourced from the Bureau of Meteorology. Click here for details.

Forecast Location: -17.57, 145.40

Draft product - under development.

Sources of equations used for Modelling and assumptions:
Leaflet 80 Equations used in this table are taken from Gould, J.S. (1994) *Evaluation of McArthur's control burning guide in regrowth Eucalyptus sieberi forest*. Australian Journal of Forestry, 57:2, 86-93.
QWPS PBG Optimum conditions for planned burns is taken from Table A - Light fuels = 8 t/ha and Table B Moderate - heavy fuels = 12t/ha in the QWPS *PBG - How to assess if your burn is ready to go*.
QWPS PBG Fire Severity Class is taken from Table 3 Open forests/woodlands in the QWPS *PBG - How to assess if your burn is ready to go*. Determined using fire intensity values.
Burrows Scorch Height is calculated using equations taken from Burrows (1997) *Predicting canopy scorch height in jarrah forests*. Flame height equations have been used.
Equations for the CSIRO Fire Spread Meter for Northern Australia Grasslands is taken from Cheney, N.P., Gould, J.S. and Catchpole, W.R. (1998) *Prediction of Fire Spread in Grasslands*. International Journal of Wildland Fire 8. 1 - 13.
AFDRS Fire Behaviour Index calculations are based on the Matthews, S. (2022) *AFDRS Fire Behaviour Index Technical Guide*.
AFDRS Implications for Planned Burning are taken from the AFDRS *Fire Behaviour Index Reference Manual Version 1*.
Grass curing is assumed to be 100% by default for grass fire behaviour calculations.
All fire behaviour calculations assume no slope.

APPENDIX 2 – WEATHER OBSERVATION DATA

Weather Observations for PORTABLE QFRK (Ravenshoe)

Station Details	ID: 250075	Name: RAVENSHOE (QFRK)
Lat: -17.61	Lon: 145.49	Height: 922.0 m

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
2/09/2024	07:00am	15.2	92	ENE	13	17	0
2/09/2024	07:10am	15.6	90	ENE	13	17	0
2/09/2024	07:20am	15.8	89	ENE	15	19	0
2/09/2024	07:30am	16	88	ENE	15	19	0
2/09/2024	07:40am	16.2	87	ENE	19	24	0
2/09/2024	07:50am	16.4	86	E	20	24	0
2/09/2024	08:00am	16.7	84	E	20	24	0
2/09/2024	08:10am	17	85	E	22	26	0
2/09/2024	08:20am	17.3	82	E	20	26	0
2/09/2024	08:30am	17.6	83	E	20	24	0
2/09/2024	08:40am	17.9	81	E	19	20	0
2/09/2024	08:50am	18.1	79	E	20	26	0
2/09/2024	09:00am	18.5	78	ENE	19	22	0
2/09/2024	09:10am	18.8	77	E	19	22	0
2/09/2024	09:20am	19.1	75	ENE	19	20	0
2/09/2024	09:30am	19.4	75	E	17	22	0
2/09/2024	09:40am	19.8	73	E	17	19	0
2/09/2024	09:50am	20.6	67	ENE	15	17	0
2/09/2024	10:00am	20.5	69	ENE	19	22	0
2/09/2024	10:10am	21	70	E	17	19	0
2/09/2024	10:20am	21.3	64	E	17	20	0
2/09/2024	10:30am	21.5	67	E	17	20	0
2/09/2024	10:40am	21.9	64	E	17	20	0
2/09/2024	10:50am	22	61	E	17	19	0
2/09/2024	11:00am	22.4	62	E	17	20	0
2/09/2024	11:10am	22.5	62	E	15	19	0
2/09/2024	11:20am	22.7	60	E	15	17	0
2/09/2024	11:30am	22.8	58	E	17	20	0
2/09/2024	11:40am	23.5	55	E	15	19	0
2/09/2024	11:50am	23.7	58	ENE	15	19	0
2/09/2024	12:00pm	23.8	52	E	15	19	0
2/09/2024	12:10pm	23.6	57	E	17	20	0
2/09/2024	12:20pm	23.9	57	E	15	20	0
2/09/2024	12:30pm	24	59	E	13	17	0

Date	Time (EST)	Temp °C	Rel Hum %	Wind			Rain since 9am mm
				Dir	Speed km/h	Gust km/h	
2/09/2024	12:40pm	23.9	54	E	17	20	0
2/09/2024	12:50pm	24.2	53	E	13	15	0
2/09/2024	01:00pm	24.3	48	E	15	17	0
2/09/2024	01:10pm	24.4	48	E	15	17	0
2/09/2024	01:20pm	24.7	49	ENE	13	19	0
2/09/2024	01:30pm	24.8	50	E	17	20	0
2/09/2024	01:40pm	24.1	53	E	17	20	0
2/09/2024	01:50pm	24.6	53	E	17	22	0
2/09/2024	02:00pm	24.4	52	ENE	15	17	0
2/09/2024	02:10pm	24.6	51	E	15	17	0
2/09/2024	02:20pm	24.5	53	ENE	15	19	0
2/09/2024	02:30pm	24.6	53	ENE	15	19	0
2/09/2024	02:40pm	24.4	57	ENE	15	19	0
2/09/2024	02:50pm	24.5	52	E	15	17	0
2/09/2024	03:00pm	24.7	56	ESE	11	15	0
2/09/2024	03:10pm	24.4	55	E	13	15	0
2/09/2024	03:20pm	24.4	60	ESE	9	15	0
2/09/2024	03:30pm	24.2	60	ESE	9	13	0
2/09/2024	03:40pm	24.1	60	ESE	9	15	0
2/09/2024	03:50pm	23.7	65	ESE	9	13	0
2/09/2024	04:00pm	23.3	65	E	11	17	0
2/09/2024	04:10pm	22.9	67	E	13	17	0
2/09/2024	04:20pm	22.7	66	E	11	19	0
2/09/2024	04:30pm	22.5	67	ESE	11	17	0

APPENDIX 3 – DAILY SITE BRIEFING

Daily Site Briefing

000138 / Kaban Planned Burn Program 2024.

Complete

Document No:	000138
Client:	Neoen and Vestas
Site / Project Name:	Kaban Planned Burn Program 2024.
Location:	Hollands Rd Tumoulin QLD 4888 Australia (-17.56102639233327, 145.41370248215156)
Briefing conducted on:	01.09.2024 07:41 AEST
Briefing conducted by:	Francis Hines

Record of Briefing:	
Site induction:	
Site induction complete by all workers?	Yes
Site rules and procedures understood?	Yes
Work health and safety:	
JSEA/Safety documentation still current? Fireland Prescribed Burn JSEA Kaban 2024 V0.2 JSEA Polaris V1.1	Yes
Any site changes since yesterday?	No
Fatigue management:	
Workers rested and fit for work?	Yes
Traffic Management:	
Daily Traffic Management Plan communicated?	Yes
Plant and equipment:	
All equipment pre-starts completed?	Yes
Operators have competency for plant and equipment and Verification of Competency (VOC) provided?	Yes
Communications:	
Work site communications channel?	UHF 17 & FC 1
Emergency procedures:	
Location of first aid kits identified?	Yes
First aid qualified staff identified?	Yes
Emergency response procedure discussed?	Yes
Daily muster point location?	Sawmill
Fauna, Flora and Cultural Heritage:	

Fauna Management - Plant operators

Fauna management procedure - plant operators.pdf

Fauna/flora management procedure understood?	Yes
Cultural Heritage procedure understood? **1. FIND: A potential Cultural Heritage item or object is found.** **2. STOP: STOP WORK IMMEDIATELY and install an exclusion zone around the area.** **3. NOTIFY: Notify a responsible person (e.g. Site Supervisor, Project Manager).** **4. MANAGE: Report the discovery to the Project Manager for advice on management.**	Yes
Environmental Clearance Certificate understood?	N/A
Tool Box talk - topic of the day:	
Select a topic for discussion.	Fatigue management

Record of Attendance

Briefing attendees

Briefing attendees 1

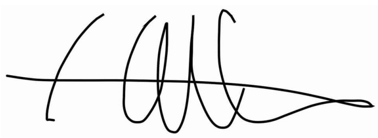
Attendees name and signature:

Francis Hines
01.09.2024 07:45 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 2

Attendees name and signature:



Cameron Allanson
01.09.2024 07:45 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 3

Attendees name and signature:

Emma Henry
01.09.2024 07:46 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 4

Attendees name and signature:

Miles Cross
01.09.2024 07:46 AEST

Agency/Company	Fireland Consultancy

Briefing attendees 5

Attendees name and signature:

Courtney Dangerfield
01.09.2024 07:46 AEST

Agency/Company	Fireland Consultancy