



COMPLIANCE REPORT

EPBC 2011/6228

Mount Emerald Wind Farm

June 2021



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DOCUMENT STATUS

Version	Purpose of Document	Author	Review	Approval	Date
1	EPBC - Annual Compliance Report	P McDonald	R Dunston	R Dunston	15-06-2021

TABLE OF CONTENTS

1.	Declaration of Accuracy	1
2.	Project Description	2
3.	Project Activity Status	2
4.	Compliance Table	3

ATTACHMENTS

- A. Bird and Bat Collision Mortality Studies Progress Report
- B. MEWF Offset Area Biocondition Survey 2020

1. DECLARATION OF ACCURACY

In making this declaration, I am aware that sections 490 and 491 of the Environmental 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:



Full name (please print):

Robert Dunston

Position (please print):

Executive General Manager

Organisation (please print including ABN/ACN if applicable):

Mount Emerald Wind Farm Pty Ltd

ACN – 149 050 322

ABN – 19 149 050 322

Date:

15 June 2021

2. PROJECT DESCRIPTION

The Mount Emerald wind farm site is a large rural allotment (Lot 7 SP235224) comprising some 2,422ha. It is located approximately 3.5km south-west of Walkamin, off Springmount Road at Arriga on the Atherton Tablelands. Topographically, the site is situated at the northern most end of the Herberton Range (part of the Great Dividing Range) with the north-western section of the site being dominated by Walsh's Bluff.

The site is characterised by rugged terrain with elevations of between 540m up to 1089m ASL (above sea level). The town centre of Mareeba is situated approximately 18km to the north of the site, with the town of Atherton approximately 12km south-east of the site.

Other features of the site include a series of ephemeral drainage lines, including the headwaters of Granite Creek. An established 275kV transmission line (Powerlink: Chalumbin-Woree) and its associated easement traverses the site in an east-west direction, broadly bisecting it.

3. PROJECT ACTIVITY STATUS

The project commenced construction on the 7th February 2017.

On the 22nd February 2019, a notice of Commencement of Operation was issued under the terms of the construction contract, as such the wind farm is now considered to be currently in the "Operation" phase.

On the order of AEMO the wind farm is currently experiencing significant periods where the wind farm generation output is constrained to support network system strength. Work and upgrades are underway in conjunction with network operator (Powerlink) to remove this restriction with an outcome not expected until August 2021.

4. COMPLIANCE TABLE

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
General				
1	The action is limited to the construction of a maximum of 63 wind turbines and associated infrastructure on the wind farm site	Max. 63 WTG	COMPLIANT	No further action in this reporting period. Compliance detailed in Year 2 Compliance Report (Attachment A).
2	To minimise impacts to EPBC Act listed threatened species, the approval holder must not disturb more than 78 ha of habitat for EPBC Act listed threatened species on the wind farm site	Max. 78ha of disturbed area	COMPLIANT	No further action in this reporting period. Compliance detailed in Year 2 Compliance Report (Attachment B).
3	Prior to commencement of the action, the approval holder must submit a Turbine Location and Development Footprint Plan identifying the final position of all proposed turbines, access roads and associated operational and maintenance infrastructure, for the written approval of the Minister	Turbine Location and Development Footprint Plan (TLDFP)	COMPLIANT	Approval received 18/1/17. (Previously supplied in 2018 Year 1 Compliance Report) TLDFP sent to DOEE 13/01/2017 TLDFP (Previously supplied in 2019 Year 2 Compliance Report)
4	The Turbine Location and Development Footprint Plan must demonstrate how the approval holder has avoided and minimised disturbance to denning habitat for the Northern Quoll (<i>Dasyurus hallucatus</i>) and to <i>Grevillea glossadenia</i> and <i>Homoranthus porteri</i> .	Turbine Location and Development Footprint Plan (TLDFP)	COMPLIANT	Approval received 18/1/2017 (Previously supplied in 2018 Year 1 Compliance Report) Documents sent to DOEE 13/01/2017 TLDFP shows locations of plant species (Previously supplied in 2019 Year 2 Compliance Report) Refer to Design Justification Report (Previously supplied in 2018 Year 1 Compliance Report)
5	The approval holder must not commence the action until the Turbine Location and Development Footprint Plan has been approved by the Minister in writing.	Minister Sign-off	COMPLIANT	Approval of TLDFP received 18/1/2017. (Previously supplied in 2018 Year 1 Compliance Report) Date of Commencement 7/2/2017.

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
6	The Turbine Location and Development Footprint Plan must be implemented	Turbine Location and Development Footprint Plan (TLDFP)	COMPLIANT	Construction completed in compliance with TLDFP. No further action in this reporting period. Compliance detailed in Year 2 Compliance Report (Attachment A).
Northern Quoll Management				
7	For the protection of the Northern Quoll, the approval holder must maintain a viable population of Northern Quoll on the wind farm site.	Northern Quoll population ~50		Current estimate of population remains as per previous study. Monitoring studies currently occurring in accordance with the Quoll Outcome Strategy and reporting will be included in Year 5 Compliance Report.
8	The approval holder must prepare and submit an Outcomes Strategy for the Minister's written approval which describes a monitoring program to inform adaptive management and determine whether the outcome required under condition 7 is being or has been met. The Outcomes Strategy must: (a) be prepared by a suitably qualified expert; (b) identify and justify performance measures, which are capable of accurate and reliable measurement, and will be used to measure the outcome required under condition 7; (c) include a monitoring program, to detect changes in the performance measures. The monitoring must include baseline surveys, control sites and experimental design (to test the effectiveness of different management measures); and (d) describe how the baseline and monitoring data will be adequate to: inform adaptive management; enable an objective decision to be made on whether the outcome described in condition 7 has been met.	Northern Quoll Outcomes Strategy (NQOS)	COMPLIANT	Approval received 23/12/16. (Previously supplied in 2018 Year 1 Compliance Report) NQOS submitted 7/12/2016. (Previously supplied in 2018 Year 1 Compliance Report) Monitoring studies currently occurring in accordance with the Quoll Outcome Strategy and reporting will be included in Year 5 Compliance Report.

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
9	The approval holder must not commence construction until the Minister has approved the Outcomes Strategy in writing.	Minister Sign-off	COMPLIANT	Approval received 23/12/2016 (Previously supplied in 2018 Year 1 Compliance Report)
10	The approved Outcomes Strategy must be implemented.		COMPLIANT	All Survey Results have been posted to Project WEBSITE. www.mtemeraldwindfarm.com.au/compliance/ USC Survey Work complete; Mt Emerald Wind Farm – Quoll Monitoring Final Report (Attachment A) Monitoring studies currently occurring in accordance with the Quoll Outcome Strategy and reporting will be included in Year 5 Compliance Report.
11	If the Minister is not satisfied that either the outcomes required under condition 7 are likely to be achieved, or there is insufficient evidence that the outcomes required under condition 7 are being achieved, the Minister may (in writing) require the approval holder to submit a plan for the Minister's approval to reduce, mitigate, remediate, or offset impacts to matters protected under the controlling provisions of this approval within a designated timeframe. The Minister may require the plan be prepared or reviewed by a suitably qualified person or another person specified or agreed to by the Minister. If the Minister approves the plan then the approved plan must be implemented.	Northern Quoll Mitigation Plan	NOT APPLICABLE	Not required at this time.
Bare-rumped Sheathtail Bat and Spectacled Flying-fox Management				
12	Prior to commissioning, the approval holder must evaluate the effectiveness of suitable measures, including changed cut-in speed, avian radar system and SCADA system, to avoid and mitigate the impacts of turbine collision to Spectacled Flying-fox (<i>Pteropus conspicillatus</i>) and Bare-rumped Sheathtail Bat (<i>Saccolaimus saccolaimus nudicluniatatus</i>) on the wind farm site.	Evaluation of Potential Measures to Reduce Turbine Collision	COMPLIANT	Email from DoEE confirming requirements met - 2/6/2017 (Previously supplied in 2018 Year 1 Compliance Report) Report provided to DoEE 5/5/2017. (Previously supplied in 2018 Year 1 Compliance Report)

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
13	<p>Prior to commissioning, the approval holder must submit to the Minister for written approval, a Wind Farm Implementation Plan that is informed by the results of the evaluation required by condition 12. The Wind Farm Implementation Plan must include:</p> <p>(a) details of intended outcomes and measurable performance criteria for the Spectacled Flying-fox and Bare-rumped Sheath-tail Bat which are based on information contained in relevant guidance material including;</p> <p>- <i>Matters of National Environmental Significance: Significant Impact Guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999 (2013);</i></p> <p>- <i>EPBC Act Policy Statement 2.3 Wind Farm Industry (2009); and</i></p> <p>- <i>Draft Referral Guideline for 14 birds listed as migratory species under the EPBC Act (2015).</i></p> <p>(aa) a program to implement a <i>Low Windspeed Curtailment Study</i>;</p> <p>(b) a program to monitor the effectiveness of progress against performance criteria; and</p> <p>(c) contingency measures and corrective actions that will be implemented if performance criteria are not being or are not likely to be met.</p>	Wind Farm Implementation Plan (WFIP)	COMPLIANT	<p>WFIP approved 4/05/2018 (Previously supplied in 2019 Year 2 Compliance Report)</p> <p>Final WFIP submitted to DoEE 24/4/2018. (Previously supplied in 2019 Year 2 Compliance Report)</p>
14	<p>The Wind Farm Implementation Plan must be reviewed by a suitably qualified expert prior to submission to the Minister for approval. The Wind Farm Implementation Plan must include the findings of the review undertaken by the suitably qualified expert and details of how any recommendations made by the suitably qualified expert have been addressed.</p>	Wind Farm Implementation Plan Review (WFIP)	COMPLIANT	<p>WFIP approved 4/5/2018 (Previously supplied in 2019 Year 2 Compliance Report)</p>

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
15	The approval holder must not commission the wind farm until the Wind Farm Implementation Plan has been approved by the Minister in writing.	Minister Sign-off	COMPLIANT	WFIP approved 4/5/2018 (Previously supplied in 2019 Year 2 Compliance Report)
16	The approved Wind Farm Implementation Plan must be implemented.		IN PROGRESS	<p>Environmental consultant engaged to undertake the activities as per WFIP.</p> <p>Bird and Bat Collision Mortality Studies Progress Report R2019-016 (previously supplied in Year 3 Compliance Report - Attachment B)</p> <p>Bird and Bat Collision Mortality Data Report (Attachment A) completed for 1st year of Low Windspeed Curtailment Study.</p>
17	Upon the direction of the Minister, the approval holder must cease to operate any specified wind turbine generator/s if the Minister considers that, based on compliance reporting required by condition 26, they are having an impact on Bare-rumped Shearwater and Spectacled Flying-fox greater than the performance criteria required by condition 13(a) that cannot be mitigated or compensated.	Operational Strategy		
Offsets				
18	To compensate for residual significant impacts to EPBC Act listed threatened species, the approval holder must provide environmental offsets that comply with the principles of the EPBC Act Environmental Offsets Policy.	Offset Area Management Plan (OAMP)	COMPLIANT	<p>Approval of OAMP provided 20/12/2016 (Previously supplied in 2018 Year 1 Compliance Report)</p> <p>Response and final OAMP submitted 16/12/2016. (Previously supplied in 2018 Year 1 Compliance Report)</p>

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
19	<p>The approval holder must prepare and submit an Offset Management Plan to the Minister for approval in writing . The Offset Management Plan must include:</p> <p>(a) details of the minimum offset areas proposed to compensate for the loss of habitat for EPBC Act listed threatened species from the wind farm site,</p> <p>(b) information about how the offset area/s provide connectivity with other relevant habitats and biodiversity corridors, including a map depicting the offset areas in relation to other habitats and biodiversity corridors;</p> <p>(c) a description of the management measures that will be implemented on the offset site for the protection and management of habitat for EPBC Act listed threatened species, including a discussion of how measures proposed are consistent with the measures in conservation advice, recovery plans and relevant threat abatement plans;</p> <p>(d) performance and completion criteria for evaluating the management of the offset area/s, and criteria for triggering remedial action (if necessary);</p> <p>(e) a program, including timelines to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria;</p> <p>(f) a description of potential risks to the successful implementation of the plan, and a description of the contingency measures that would be implemented to mitigate against these risks;</p> <p>(g) the proposed legal mechanism and timelines for securing the offset/s; and</p> <p>(h) a textual description and map to clearly define the location and boundaries of the offset area. This must be accompanied with the offset attributes and a shapefile.</p>	Offset Area Management Plan (OAMP)	COMPLIANT	<p>Approval of OAMP provided 20/12/2016 (Previously supplied in 2018 Year 1 Compliance Report)</p> <p>Response and final OAMP submitted 16/12/2016. (Previously supplied in 2018 Year 1 Compliance Report)</p>

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
20	The approval holder must not commence construction until the Offset Management Plan has been approved by the Minister in writing.	Minister Sign-off	COMPLIANT	Approval of OAMP provided 20/12/2016 (Previously supplied in 2018 Year 1 Compliance Report)
21	The approved Offset Management Plan must be implemented		COMPLIANT	2017 Monitoring Report submitted 17/04/2018 2018 Monitoring Report submitted 6/12/2018 2019 Monitoring Report submitted 17/7/2019 2020 BioCondition Survey submitted 4/12/2020 (Attachment B to this report)
Administrative Conditions				
22	<p>To avoid duplication, the approval holder may provide the Minister with plans and strategies prepared for the State and/or an Authority provided the plans, and/or strategies meets the conditions specified in this approval. The plans and/or strategies must include a cross reference table that clearly identifies:</p> <p>(a) the condition specified in the approval for which the plan or strategy is being provided; and</p> <p>(b) the relevant folder, chapter, section number and page number in the plan or strategy where the condition has been addressed.</p>		NOT APPLICABLE	Plans and Strategies have been provided to directly address conditions of this approval.

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
23	Within 10 business days after the commencement of the action, the approval holder must advise the Department in writing of the actual date of commencement.	Notification of Commencement of Construction	COMPLIANT	Date of Commencement 7 February 2017. Notice provided 13/2/2017 (Previously supplied in 2018 Year 1 Compliance Report) and acknowledged. (Previously supplied in 2018 Year 1 Compliance Report)
24	<p>The approval holder must maintain a dedicated webpage on compliance with these conditions that is publically available on the approval holder's website for the life of the approval. The webpage must include:</p> <ul style="list-style-type: none"> • a copy of the approval conditions (and any subsequent variations or other formal changes to the approval); • all monitoring results and • documentation required under these conditions and any other relevant information as directed by the Minister in writing. <p>Unless otherwise agreed to in writing by the Minister, the approval holder must provide a copy of documents required to be published on the dedicated webpage to members of the public upon request, within a reasonable time of the request.</p>	Website	COMPLIANT	EPBC Decision Notice and Conditions placed on website. www.mtemeraldwindfarm.com.au/compliance/

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
25	<p>The approval holder must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement any plans and strategies required by this approval and measures taken to achieve the outcomes specified in conditions 7 and 13 and make them available upon request to the Department.</p> <p>Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.</p>	File management		
26	<p>Within three months of every 12 month anniversary of the commencement of the action, the approval holder must publish a report on the webpage required in condition 24 addressing compliance with each of the conditions of this approval, including implementation of any plans and strategies as specified in these conditions and whether the outcome required by conditions 7 and 13 have been or are track to being met. The compliance report must consider the Department's Annual Compliance Report Guidelines.</p> <p>Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the Department at the same time as the compliance report is published.</p>	EIS Compliance Report	COMPLIANT	<p>Date of Commencement 7 February 2017.</p> <p>2018 Year 1 Compliance Report – issued.</p> <p>2019 Year 2 Compliance Report – issued.</p> <p>2020 Year 3 Compliance Report – issued.</p>
27	<p>The approval holder must report any contravention of the conditions of this approval to the Department within 2 business days of the approval holder becoming aware of the contravention.</p>	Notification of Contravention	COMPLIANT	No contravention identified.

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
28	Upon the direction of the Minister, the approval holder must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The audit must not commence until the Minister has approved the independent auditor and audit criteria. The audit report must address the criteria to the satisfaction of the Minister.	Independent Audit	NOT APPLICABLE	No direction from Minister at this time.
29	<p>The approval holder may choose to revise a plan or strategy approved by the Minister under conditions 3, 8, 13 and 19 without submitting it for approval under section 143A of the EPBC Act, if the taking of the action in accordance with the revised plan or strategy would not be likely to have a new or increased impact. If the approval holder makes this choice they must:</p> <p>(a) notify the Department in writing that the approved plan or strategy has been revised and provide the Department with an electronic copy of the revised plan or strategy;</p> <p>(b) implement the revised plan or strategy from the date that the plan or strategy is submitted to the Department; and</p> <p>(c) for the life of this approval, maintain a record of the reasons the approval holder considers that taking the action in accordance with the revised plan or strategy would not be likely to have a new or increased impact.</p>	<p>Revised Plans:</p> <p>#3 - Turbine Location and Development Footprint Plan</p> <p>#8 - Northern Quoll Outcomes Strategy</p> <p>#13 - Wind Farm Implementation Plan</p> <p>#19 - Offset Area Management Plan</p>	NOT APPLICABLE	<p>TLDFP submitted 13/1/2017; approved 18/1/2017</p> <p>TLDFP as-built (Previously supplied in 2019 Year 2 Compliance Report)</p> <p>NQOS submitted 7/12/2016; approved 23/12/2016</p> <p>WFIP submitted 24/4/2018; approved 4/5/2018</p> <p>OAMP submitted 16/12/2016; approved 20/12/2016</p>
30	The approval holder may revoke its choice under condition 29 at any time by notice to the Department. If the approval holder revokes the choice to implement a revised plan without approval under section 143A of the Act, the approval holder must implement the version of the plan most recently approved by the Minister.	Revised Plans	NOT APPLICABLE	No revisions made at this time.

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
31	Condition 29 does not apply if the revisions to the approved plan or strategy include changes to environmental offsets provided under the plan or strategy in relation to a matter protected by a controlling provision for the action, unless otherwise agreed in writing by the Minister. This does not otherwise limit the circumstances in which the taking of the action in accordance with a revised plan or strategy would, or would not, be likely to have new or increased impacts.	Revised Plans	NOT APPLICABLE	No revisions made at this time.
32	<p>If the Minister gives a notice to the approval holder that the Minister is satisfied that the taking of the action in accordance with the revised plan would be likely to have a new or increased impact, then:</p> <p>(a) condition 29 does not apply, or ceases to apply, in relation to the revised plan; and</p> <p>(b) the approval holder must implement the version of the plan most recently approved by the Minister.</p> <p>To avoid any doubt, this condition does not affect any operation of conditions 29 and 30 in the period before the day after the notice is given.</p>	Revised Plans	NOT APPLICABLE	No revisions made at this time.
33	At the time of giving a notice under condition 32, the Minister may also notify that for a specified period of time condition 29 does not apply for one or more specified plans required under the approval.	Revised Plans	NOT APPLICABLE	No revisions made at this time.
34	Conditions 29, 30, 31 and 32 are not intended to limit the operation of section 143A of the EPBC Act which allows the approval holder to submit a revised plan to the Minister for approval.	Revised Plans	NOT APPLICABLE	No revisions made at this time.
35	If, at any time after five years from the date of this approval, the approval holder has not substantially commenced the action, then	Drop Dead Date - 26 November 2020	COMPLIANT	Refer to Condition 23.

No.	CONDITION	DELIVERABLE	DESIGNATION	CURRENT STATUS
	the approval holder must not commence the action without the written agreement of the Minister.			

A. BIRD AND BAT COLLISION MORTALITY STUDIES PROGRESS REPORT



Bird and Bat Collision Mortality Data Report

Mount Emerald Wind Farm (2019-2020)



4 elements

Bird and Bat Collision Mortality Studies

Mount Emerald Wind Farm (2019-2020)

Revision History

Version	Purpose	Issued by	Date	Reviewer	Date
1	Draft	C Starr	28/05/2020	M Brown	29/05/2020
2	Final	C Starr	02/06/2020	T. Johannesen/P. McDonald	04/06/2020

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Contents

1.0	Introduction	1
2.0	Collision mortality	2
2.1	Experimental design.....	2
	2.1.1 Carcass surveys	2
	2.1.2 Carcass persistence trials.....	2
	2.1.3 Searcher Efficiency Trials	3
2.2	Analysis	3
	2.2.1 Searcher efficiency.....	4
	2.2.2 Scavenger efficiency	4
	2.2.3 Mortality projection inputs.....	6
3.0	Results.....	9
3.1	Mortality Projection Results	9
3.2	Bat mortality estimate.....	9
4.0	References	12

1.0 Introduction

This summary report provides data for the first year of studies on Mount Emerald Windfarm (hereafter MEWF), and followed the recommendations of the approved *'Implementation plan for two species of bats at Mount Emerald Wind Farm'* (BIOSIS 2018). This work meets the requirements of Condition 13 of approval for MEWF under the provisions of the EPBC Conservation Act 1999. The primary objective is to ensure the wind farm does not have a significant impact on the local population viability of Spectacled flying fox (*Pteropus conspicillatus*) and Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*).

The implementation report (BIOSIS 2018) identified that based on criteria identified to determine 'significant impact' on nationally listed Vulnerable species under the *Matters of National Environmental Significance: Significant impact guidelines 1.1. (2013)* that the works were unlikely to result in the specified impact identified for either species based on their criteria. The *EPBC Act Policy Statement 2.3 Wind Farm Industry* (Commonwealth of Australia, 2009) provided further potential impact criteria specifically from wind farms based on forming an 'important population', neither Vulnerable species at Mount Emerald were likely to fall under the set criteria identified (BIOSIS 2018).

The concept of impact on an 'ecologically significant proportion' of a population has been elaborated in the *Draft referral guideline for 14 birds listed as migratory species under the EPBC ACT* (Commonwealth of Australia 2015) and may be useful for establishing what is considered a significant impact for the two-priority species at MEWF, as well as setting performance criteria for the assessments. This draft identifies in terms of individual animals, annual mortality which meets or exceeds 1% of the population would cause significant impact to the species. Further, it suggests any impact which met or exceeded 0.1% of the population requires further investigation and may be subject to mitigation. Therefore, for Mount Emerald the implementation plan (BIOSIS 2018) has identified that for these two species mortalities of $\geq 1\%$ would be significant, and any impact $\geq 0.1\%$ would instigate a management response. Recent population estimates for the Australian populations for these species are: greater than 10,000 individuals for Bare-rumped sheath-tail bat (Woinarski *et al.* 2014); and 100,000 individuals for Spectacled flying-fox (Westcott *et al.* 2015). Severe decline in Spectacled flying fox occurred following a heat wave in 2019, reducing current population estimates to 70,000 (Dave Westcott pers. comm. 2020) Using these conservative estimates, annual thresholds must not exceed 10 Bare-rumped sheath-tail bats and 70 Spectacled flying foxes (BIOSIS 2018). If these numbers are reached/exceeded a management response is to be instigated.

2.0 Collision mortality

2.1 Experimental design

2.1.1 Carcass surveys

Field surveys for carcasses were carried out by ecologists across all 53 turbines in the 'fall zone'. Huso and Dalthorp (2014) identified that when assessing numerous carcass survey models, carcass density reached zero at approximately 70 m horizontally from the turbine base, and this radius was used in the study. Surveys were carried out on day 1, 4 and 28 of each month, for 12 consecutive months. One month prior to commencing the study, each turbine was swept to remove any carcasses before starting the surveys, to account for animals which have perished prior to the monthly survey schedule in the first sampling period.

Data on the frequency of collision is necessary for use in extrapolation to estimate total fatality. Therefore, a 3-day interval between two searches at the beginning of the search cycle was designed to provide information on collision frequency to feed into the model- as there is a high probability a new carcass is found on day 4 must have collided in the preceding three days. Animals detected on day 1 were marked by surveyor tape/paint to identify them as an old animal on subsequent survey days. There was a 27-day interval before the next round of sampling (day 28). The survey on day 28 became day one on the next survey cycle. This cycle was repeated across the year.

Records of all birds and bats were logged; however, implications of collisions in regard to management responses relate only to Bare-rumped sheathtail bat and Spectacled flying-fox. Photographs were taken of all animals recorded in the study. All threatened taxa were collected on day 4 and stored in a deep freezer on-site.

2.1.2 Carcass persistence trials

Carcasses of small microbats are unlikely to persist in the field for long periods; therefore, extrapolation is required from those detected to estimate total deaths more accurately. Carcass persistence trials were carried out to determine a 'correction factor' in the analysis. These were carried out in February and August 2019 (one wet, one dry season). Due to a large die off in Spectacled flying foxes prior to the study, actual carcasses were able to be collected and utilised for the study. Given the difficulty in acquiring microbats of similar size to Bare-rumped sheathtail bat, surrogates had to be utilised, and

young rats were used on the site. These were all marked to ensure they were not confused with animals killed by turbines, or from the site.

Persistence trials were carried out at 20 representative turbines, and utilised 10 microbat surrogates and 10 flying foxes for each sampling period. Camera traps were placed in front of the carcasses and set to record all movement and take a photograph every hour (day and night). Censored analysis must be used to account for carcasses that persist longer than the trial period (Klein and Moschberger 2003).

To improve the likelihood of detecting any moved carcass, these surveys were undertaken one week prior to the next targeted carcass survey. This enabled locating any moved animals so they are not lost from the trial and can be reused/placed. Each trial ran for one month, with an ecologist checking all stations are operational at 14 days. Removed carcasses which could not be found were replaced on day 14 with a new carcass to maximise the data collected.

This data was used for calculation of average carcass persistence times for the collision estimates.

2.1.3 Searcher Efficiency Trials

Correction factors are required in the analysis to account for searchers not always finding all carcasses. This was done through blind trials, where a number of carcasses are placed prior to a search (minimum of 10 flying foxes, 10 microbats at a minimum of 10 turbines). Two searcher trials were carried out during the study period; with one in February and the second in December 2019. The wet season had not commenced in December, and it represents the dry season for the purpose of this study. The number of detected animals by the surveyors was used to develop correction factors for the final analysis.

2.2 Analysis

Annual collision mortalities were calculated by Symbolix Pty Ltd for the two key threatened species accounting for carcass persistence times relative to search interval and searcher efficiency. Their methodology is provided below.

In order to estimate the mortality loss at a given wind farm site (in a way that is comparable with other facilities) account must be made for differences in survey effort, searcher and scavenger efficiency by using a Monte-Carlo simulation. The analysis used survey data to estimate the average time to

scavenge loss and searcher efficiency (and related confidence intervals). The algorithm then simulated different numbers of virtual mortalities. An estimate could then be made on how many carcasses were truly in the field, given the range of searcher and scavenger efficiencies, and the survey frequency and coverage, and the true “found” details. After many simulations, an estimation of the likely range of mortalities that could have resulted in the recorded survey outcome.

2.2.1 Searcher efficiency

Four searcher efficiency trials were held (2019-02-19, 2019-02-20, 2019-12-17, and 2019-12-20). No evidence was found (using binomial regression) that the searcher efficiency differed between the trials held in February 2019 and December 2019 ($z = 1.844$, $p = 0.065$). There were differences in searcher efficiency depending on ground type when comparing Vegetation to Hardstand and Rockface ($p = 0.004$). Because the distribution of ground types amongst the search areas for each turbine differed, we used shape files of the search area for each turbine to determine an average detection probability. This accounts for differences in detectability due to ground type, the areas of hardstand and vegetated regions, and the fall zone distribution for bats. **Table 1** summarises the result. Overall Bat detectability in vegetated regions is 21%, with a 95% confidence interval of [12%, 32%]. On hardstand and rockface, the detectability is 62%, with a 95% confidence interval of [32%, 86%].

Table 1 Detection efficiency for bats.

Variable	Vegetation	Hardstand
Number found	14	8
Number placed	68	13
Mean detection proportion	0.21	0.62
Detectability lower bound (95% confidence interval)	0.12	0.32
Detectability upper bound (95% confidence interval)	0.32	0.86

2.2.2 Scavenger efficiency

Scavenger efficiency trials were also conducted. Trials ran over 28 days and used Spectacled flying foxes, and Sheathtail Bat proxies (Rats). Survival analysis (Kaplan and Meir 1958) was used to determine the average time until complete loss from scavenge. Survival analysis was required to account for the

fact the exact time of scavenge loss is unknown and only an interval in which the scavenge event happened. By performing survival analysis, we can estimate the average survival percentage after a given length of time, despite these unknowns. Based on these surveys there is no evidence that the different trials had significantly different scavenge rates ($\chi^2 = 6.575$, $p = 0.087$). Similarly, there was no evidence for an effect of ground type ($\chi^2 = 4.211$, $p = 0.122$). There was a significant difference between scavenge rates for Spectacled flying foxes and Sheathtail proxies ($z = -3.265$, $p = 0.001$). Thus, separate mortality estimates are provided for Spectacled flying foxes and other bats using the different scavenge rates. **Figure 1** shows a survival curve fitted to the Spectacled flying foxes and Sheathtail bat proxies. The survival curves (solid lines) show the estimated proportion of the sets remaining at any given time. The shaded portions are the 95% confidence intervals on the estimates. For example, a range of 32% to 66% of Flying Fox carcasses are anticipated to remain after ten days with the expectation being around 46%. For Sheathtail bat proxies, a range of 11% to 38% of carcasses are anticipated to remain after ten days with the expectation being around 21%. Under these assumptions, the mean time to total loss via scavenge for flying foxes is 25.9 days, with a 95% confidence window of [16.7, 40.2] days. For Sheathtail proxies, the mean time to total loss via scavenge is 10.1 days, with a 95% confidence window of [7.1, 14.4] days. In the following mortality estimate, the Flying fox scavenger rate is used for Flying foxes only, and use the Sheathtail proxy scavenger rate for all other bats.

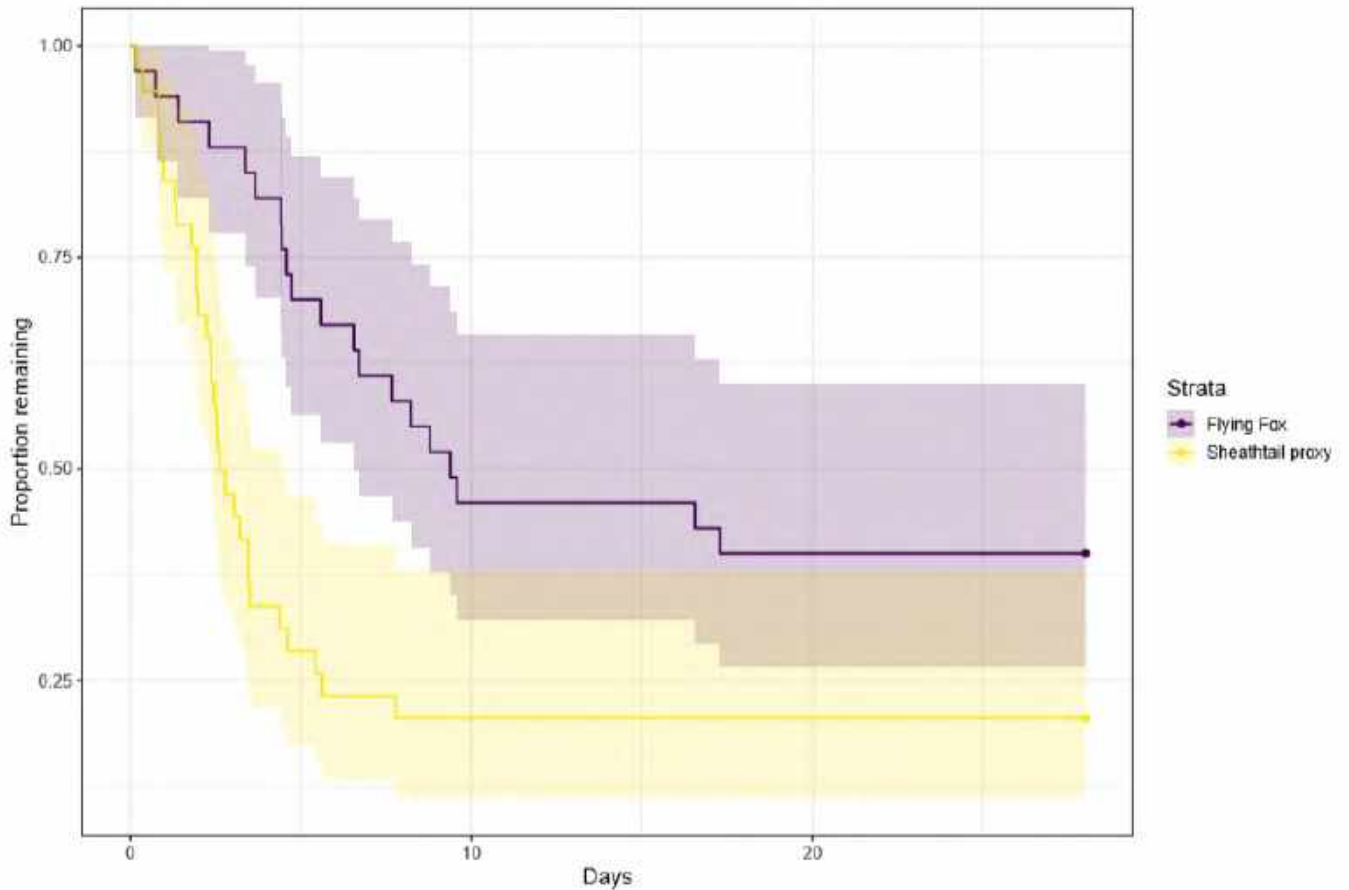


Figure 1 Combined survival curves for Flying foxes and Sheathtail proxies, with 95% confidence interval shaded.

2.2.3 Mortality projection inputs

2.2.3.1 *Carcass search data*

The mortality estimate was based on a dated list of turbine surveys. The survey frequency is summarised in **Table 2**. All turbines were surveyed approximately twice each month, with the second monthly survey occurring three days after the first. The hardstand and road areas within a radius of 70 metres of each turbine were surveyed. Inaccessible areas were surveyed with binoculars.

Table 2 Number of surveys per month

Date	No. surveys
2019 May	106
2019 June	106
2019 Jul	106
2019 Aug	106
2019 Sep	106
2019 Oct	159
2019 Nov	159
2019 Dec	106
2020 Jan	78
2020 Feb	106
2020 Mar	106
2020 Apr	94

2.2.3.2 Mortality estimation

The estimates for scavenge loss and searcher efficiency were then used to convert the number of flying fox and other bat carcasses detected into estimates of overall mortality at Mount Emerald Wind Farm from 2019-04-20 to 2020-04-09 (we allow for collisions to occur up to a month prior to the first survey). The mortality estimation is done via Monte-Carlo simulation. Some 25,000 simulations were undertaken 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 complete set of model assumptions are:

- There were 53 turbines on site;
- Search frequency for each turbine was taken from a list of actual survey dates (see **Table 2** for a summary);

-
- Mortalities were allowed to occur up to a month before the initial survey (2019-04-20) and until the final surveyed date (2020-04-09);
 - Bats are on-site at all times during this period;
 - Finds are random and independent, and not clustered with other finds;
 - There was equal chance of any turbine individually being involved in a collision / mortality;
 - An assumed exponential scavenge shape ("perfect" scavengers);
 - Scavenge loss and search efficiency rates as outlined above; and
 - All 53 turbines were surveyed. Each turbine was typically surveyed monthly with a pulse survey three days after the initial survey. The search area consisted of the hardstand and road area within an approximately 70 metre radius of the turbine (which covers approximately 99% of the bat fall zone). Due to the complex distribution of ground types in the search areas for different turbines and these differences in searcher efficiencies based on ground type, we calculated a weighted average detection probability. This depended on the area of hardstand and vegetated regions and the fall zone distribution over the searched area (using fall zone estimates from Hull and Muir (2010)). The weighted average detectability was 48% with a 95% confidence interval of [40, 56].

3.0 Results

3.1 Mortality Projection Results

After running the simulation Symbolix investigated the distribution of mortalities that could have resulted from the actual numbers found during the surveys. The breakdown of found carcasses per species are summarised in **Table 3**. While focussing on bat mortalities, it should be noted bird mortalities have also been included for completeness. Some carcasses were quite decomposed, and at times identification was not possible.

Table 3 Carcasses found during formal surveys over year one

Species	Bat	Bird
Northern Freetail Bat <i>Chaerephon jobensis</i>	78	
Little Red Flying Fox <i>Pteropus scapulatus</i>	19	
White-striped Freetail Bat <i>Tadarida australis</i>	6	
Bent-winged bat <i>Miniopterus sp.</i>	5	
Spectacled Flying Fox <i>Pteroptus conspicillatus</i>	3	
Yellow-bellied Sheathtail-Bat <i>Saccolaimus flaviventris</i>	1	
Unidentified microbat species	3	
Freetail bat sp.	2	
Wedge-tailed eagle <i>Aquila audax</i>		3
Australian bustard <i>Ardeotis australis</i>		1
Brown falcon <i>Falco berigora</i>		1
White-throated Needletail <i>Hirundapus caudacutus</i>		1
Nankeen kestrel – <i>Falco cenchroides</i>		1
Glossy Ibis <i>Plegadis falcinellus</i>		1
Unidentified bird species.		1

3.2 Bat mortality estimate

During the one year of surveys a total of 117 bats were found during formal surveys, including 22 flying foxes. Three of which were spectacled flying foxes (**Table 3**). The resulting estimate of total mortality for Spectacled flying fox, accounting for searcher efficiency, scavenge rate, search area and timing of surveys is an expectation (mean) of seven, and with 95% confidence predict this number to be fewer than 13 individuals per year. There were no recorded Bare-rumped sheathtail bats. The estimate for all other bats is an expectation of 341 and a median of 334. **Table 4**, **Figure 2** and **Figure 3** display the percentiles of the distributions, to show the confidence interval in these averages. It is

expected the total site loss of other bat species was approximately 423 bats and are 95% confident that fewer than 550 individuals were lost.

Table 4 Percentiles of estimated total losses over the one-year study period for flying foxes and other bats.

Bat type	0%	50% (median)	90%	95%	99%	99.9%
Flying foxes	3	6	11	13	17	19
Other bats	288	418	508	550	610	626

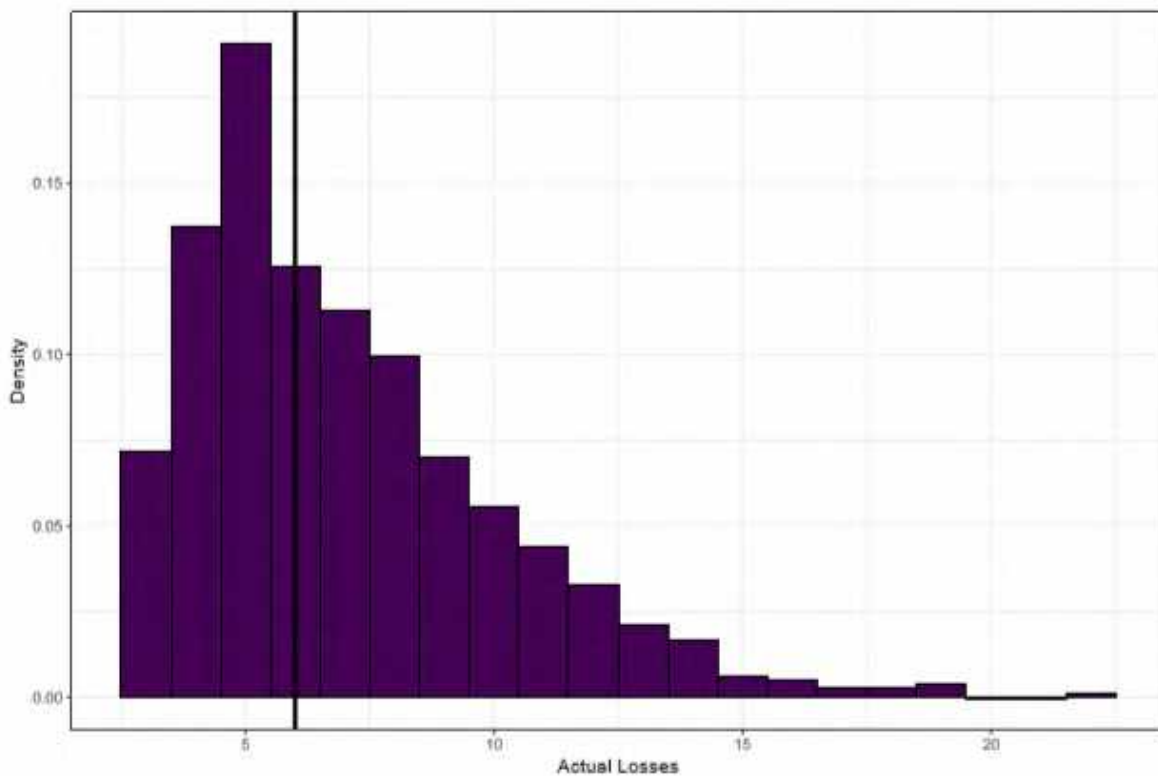


Figure 2 Histogram of the total losses distribution (Spectacled flying foxes), given 3 were detected on-site. The black solid line shows the median.

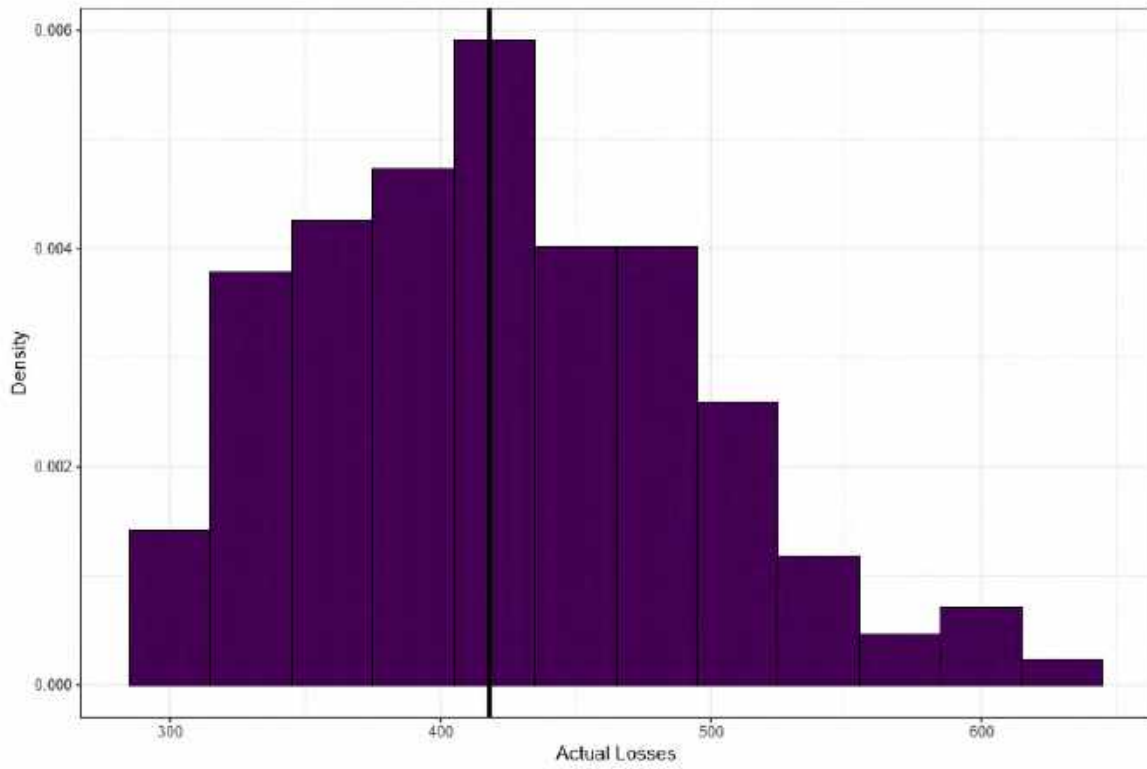


Figure 3 Histogram of the total losses distribution (bats, excluding Spectacled flying foxes), given 114 were detected on-site. The black solid line shows the median.

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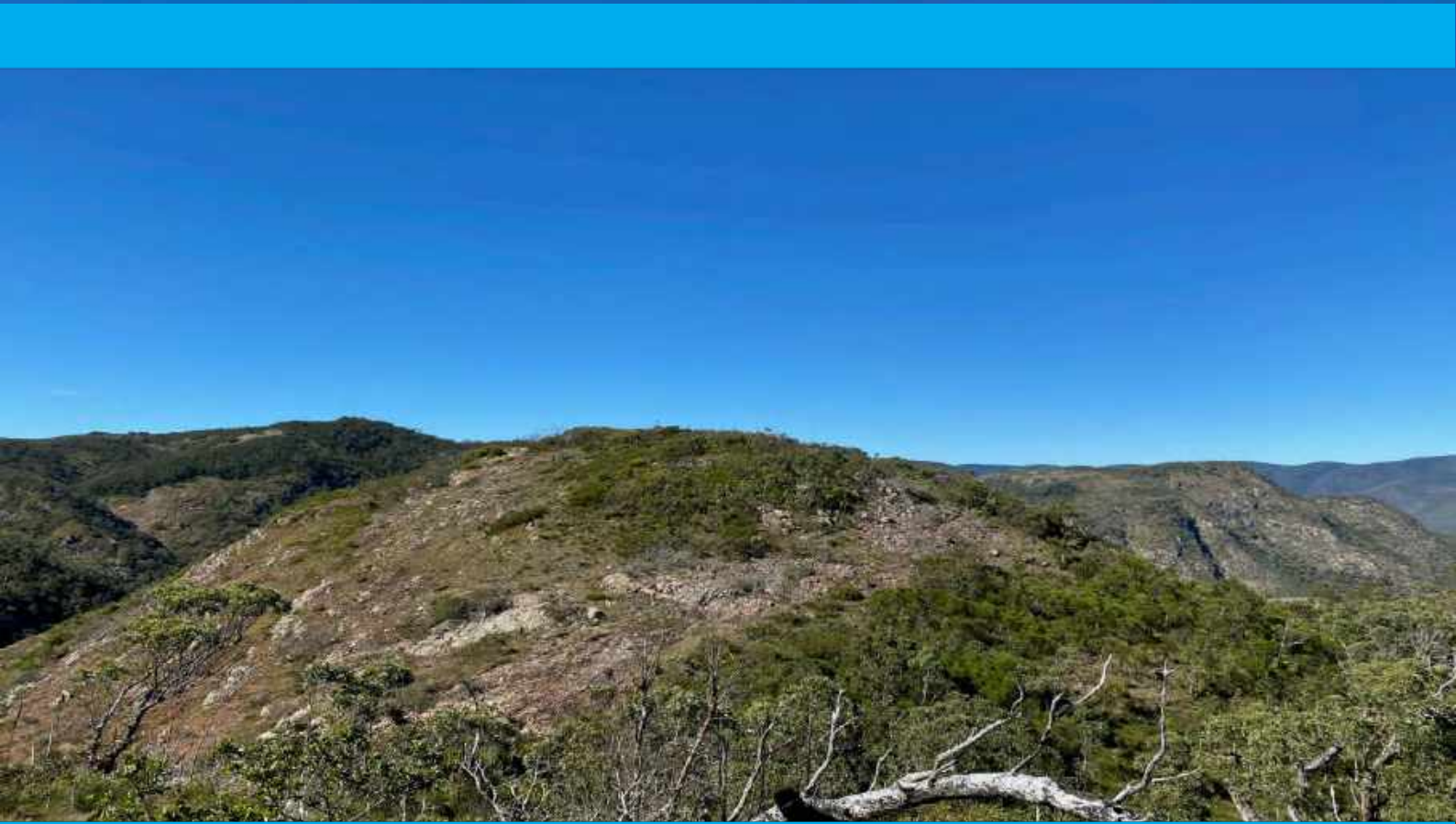
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B. MEWF OFFSET AREA BIOCONDITION SURVEY 2020



Bio-condition Survey

Mount Emerald Wind Farm Offset Site

April 2020



4 elements

Bio-condition Survey

Mount Emerald Wind Farm Offset Site

April 2020

Revision History

Version	Purpose	Issued by	Date	Reviewer	Date
0.01	Draft	Ryan Hughes	18-06-2020	Mellissa Brown	18-06-2020
0.01	Final	Ryan Hughes	05.-08-2020	Mellissa Brown	05-08-2020

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Contents

1.0	Introduction	1
1.1	Site Threatened Flora.....	1
2.0	Methodology.....	2
2.1	Time of Survey	2
2.2	Survey Limitations	2
3.0	Bio-condition Report Summary.....	5
3.1	Threatened Flora Results.....	5
4.0	Discussion.....	50
5.0	References	51

Tables

Table 1	Bio-condition Sampling Frequency on the MEWF Offset Site.....	3
Table 2	Bio-condition Site 1.....	7
Table 3	Bio-condition site 2.....	9
Table 4	Bio-condition site 3.....	11
Table 5	Bio-condition site 4.....	13
Table 6	Bio-condition site 5.....	16
Table 7	Bio-condition Site 6.....	18
Table 8	Bio-condition Site 7.....	21
Table 9	Bio-condition site 8.....	23
Table 10	Bio-condition Site 9.....	25
Table 11	Bio-condition Site 10.....	28
Table 12	Bio-condition Site 11.....	30
Table 13	Bio-condition Site 12.....	33
Table 14	Bio-condition Site 13.....	35

Table 15	Bio-condition Site 14	37
Table 16	Bio-condition Site 15	41
Table 17	Bio-condition Site 16	43
Table 18	Bio-condition Site 17	45
Table 19	Bio-condition Site 18	48

Figures

Figure 1	MEWF Offset Bio-condition Assessment Locations	4
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1.0 Introduction

Bio-condition assessments on the Mount Emerald Wind Farm (MEWF) Offset Site have been provided by 4 Elements Consulting on behalf of RATCH Australia Corporation Ltd (RATCH). This has been completed as part of the Mount Emerald Offset Management Plan monitoring requirements.

The purpose of these Bio-condition assessments is to provide detailed information on a range of vegetation communities that are present within the MEWF Offset site and repeat this effort biennially to monitor vegetation condition through time. It is important that the widest variety of regional ecosystems are captured in the baseline round of survey to detect any future changes to vegetation condition across the site. For this purpose, a total of 18 permanent sites have been located throughout the MEWF offset site. The first round of monitoring occurred over two consecutive years (2018/19) see (4 Elements, 2019). From this point forward it is expected that all 18 bio-condition plots will be monitored biennially in the same year. A summary of survey results for the latest survey period (April 2020) is provided in the below report body. Biennial surveys will continue until 2028 as per the Offsets Area Management Plan (RPS, 2016).

1.1 Site Threatened Flora

To offset impacts to threatened flora as a result of the construction of the Mount Emerald Wind Farm, a biodiversity offset (MEWF Offset site) was established and subsequently gazetted as a nature refuge in 2018 under the *Nature Conservation Act 1992*. A survey was conducted over this property (Gleed, 2016) to determine the presence of threatened flora listed under the *Nature Conservation Act 1992* and the *EPBC Act 1999* on the MEWF offset site. All listed threatened flora that was known to be present on the wind farm site has been recorded on the MEWF offset site with an additional species being recorded, *Prostanthera albohirta*. All listed species on the MEWF offset site are listed below;

- ▶ *Acacia purpureopetala* (Purple-flowering Wattle) - Critically Endangered (EPBC Act), Vulnerable (NC Act);
- ▶ *Grevillea glossadenia* (no common name) - Vulnerable (EPBC Act), Vulnerable (NC Act);
- ▶ *Homoranthus porteri* (no common name) - Vulnerable (EPBC Act), Vulnerable (NC Act);
- ▶ *Melaleuca sylvana* (no common name) – Endangered (NC Act);
- ▶ *Melaleuca uxorum* (no common name) - Endangered (NC Act);
- ▶ *Plectranthus amoenus* (Plectranthus) - Vulnerable (NC Act); and
- ▶ *Prostanthera clotteniana* (Mint Bush) - Critically Endangered (EPBC Act), Endangered (NC Act).

The bio-condition monitoring surveys are often located so the threatened species recorded on the MEWF site so that the survey plots may act as a monitoring tool of the threatened flora population health on the site. All species present on MEWF are present within a bio-condition plot with the exception of *Melaleuca sylvana*.

2.0 Methodology

The methodology of this year's Bio-condition sampling follows closely the work in the previous monitoring period that was split over two years (Gleed, 2018) and (4 Elements, 2019). The methods used for the Bio-condition assessments followed those described by Eyre et al. (2017) and Neldner et al. (2017). The method works on a series of plots and transects nested within a survey area of 10,000 m² (1 ha).

The location of the bio-condition sites provides the opportunity to monitor a subset of the threatened flora present on site. All new records of threatened flora are recorded when traversing the offset site. All threatened flora species present within any bio-condition plots are recorded and tallied in the results summary tables for each site (see section 3 results). Any sign of dieback or disease are recorded along with any flowering, fruiting and juvenile plant recruitment is recorded to monitor population health and persistence through time.

2.1 Time of Survey

The survey period was conducted over multiple days between the dates of 21st April and the 27th May 2020. This matched the dates for the previous survey effort in 2018/19. All ground forbs, herbs and grasses were readily detectable and could be confidently identified to species. The exception was for a small number of grass species that could occasionally only be identified to the genus level. This did not impact on the species abundance tally for the bio-condition assessment.

2.2 Survey Limitations

Under the MEWF Offset Area Management Plan, (RPS, 2016), the schedule of two replicates for each of the Offset properties Regional Ecosystems was determined to be a requirement under the MEWF approval with conditions (EPBC 2011/6228). Although this monitoring schedule uses the bio-condition conditional assessment (Eyre *et al* 2015) to assess vegetation condition, a bio-condition score is unable to be applied to the sampled vegetation communities. This is primarily due to the fact that there are currently no published reference sites for any vegetation communities within the Wet Tropics Bio-region to which the property is located entirely within. Therefore, a requirement to survey a minimum of three (3) external reference sites are required to be surveyed for each Regional Ecosystem that has been sampled within the offset property. This is outside the scope of this monitoring schedule as determined in the project approval conditions.

Every effort was made to provide two replicate sites for each of the discreet remnant vegetation communities and relevant sub-categories mapped under the Regional Ecosystem Description Database Version 11.1 (REDD 2019). Due to difficulty in accessing some regional ecosystems (RE's) associated with steep and loose rocky terrain, not all could be replicated twice. Both RE 712.57a and RE 7.12.26e were only sampled with a single replicate due to difficulty in site access. Other regional ecosystems were rare on site occurring only at a single location and therefore, these RE's were also only sampled utilizing a single replicate. These included the vine forest and riverine communities of RE 7.12.9, RE 7.12.7c, RE 7.3.26a and RE 7.2.16a. These regional ecosystems are also not represented on the Mount Emerald Wind Farm site and therefore not considered as high a priority

for monitoring. All other regional ecosystems have two (2) independent replicates for future monitoring. Summary of sampled vegetation communities are summarised in **Table 1**.

For some Regional Ecosystems (e.g. RE 7.12.65k and RE 7.12.57a) a 100 m transect within the plot was not possible due to the limited extent of the community on narrow rock outcrops or within narrow rocky gullies. A 50 m transect was used in these situations and data extrapolated to the 1 ha survey area. Where a 50m transect was utilised it is listed in (**Table 1**) below.

Table 1 Bio-condition Sampling Frequency on the MEWF Offset Site

Regional Ecosystem (REDD)	Survey Number	No. of Replicates	Transect Length (m)
RE 7.12.58	Site 1, Site 18	2	100
RE 7.12.65k	Site 2, Site 17	2	50
RE 7.12.57a	Site 15	1	50
RE 7.12.57c	Site 3, Site 16	2	100
RE 7.12.30d	Site 4, Site 8	2	100
RE 7.12.9	Site 5	1	50
RE 7.12.16a	Site 6	1	50
RE 7.3.26a	Site 7	1	100
RE 7.12.29a	Site 9, Site 14	2	50
RE 7.12.26e	Site 10	1	100
RE 7.12.7c	Site 11	1	100
RE 7.12.34	Site 12, Site 13	1	100

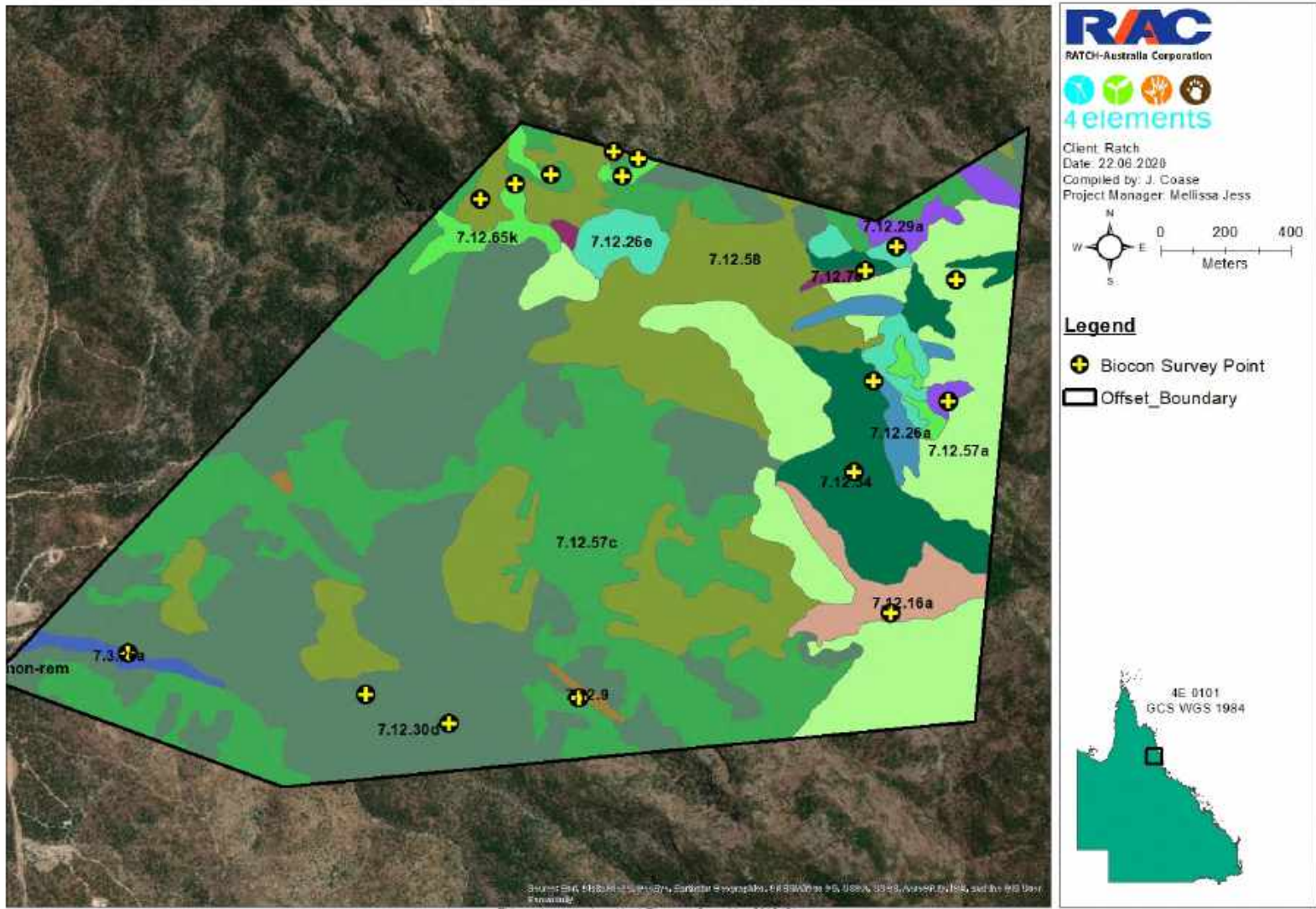


Figure 1 MEWF Offset Bio-condition Assessment Locations

3.0 Bio-condition Report Summary

3.1 Threatened Flora Results

In addition to monitoring the vegetation condition throughout the offset property, the bio-condition assessment has provided opportunity to monitor the distribution of threatened flora populations. All of the six known threatened flora species known to be present in the initial 2016 survey were recorded in the current monitoring period. All species except for EPBC listed *Critically Endangered Prostanthera albohirta* and *Prostanthera clotteniana* and the *Endangered Melaleuca sylvana* were recorded within individual bio-condition monitoring plots as indicated in **Table 2-19** below.







Plate 1 Flowering *Acacia purpureopetala* at Bio-condition site 4 (April 2020)

During the most recent monitoring period, a new population of the *Nature Conservation Act 1992 Vulnerable* listed *Eleutheroglossum fellowsii* syn *Dendrobium fellowsii* was recorded on site at two (2) separate locations in the north east of the site (**Plate 1**) (**Table 11 & 13**). This species is an epiphytic orchid found growing in moist cool environments on the sides of rough barked trees. Both populations were located within *Syncarpia glommulifera* and *Corymbia intermedia* dominated open forest with an understorey of *Allocasuarina littoralis* on the top of a high elevation forested ridge facing the predominate south east cloud moisture.







Plate 2 *E. fellowsii* growing as an epiphyte at Bio-condition site 12 (April 2020)

Table 2 Bio-condition Site 1

Bio-condition Site 1				
Date:	21-04-2020			
Plot Origin:	Zone: 55K	Easting: 0329103	Northing: 8097846	Elevation: 1036
Plot Centre:	Zone 55K	Easting: 0329142	Northing: 8097874	Elevation: 1043
Plot Bearing:	NE	Plot Alignment:	Parallel to contour	
				
North		East		
				
South		West		
Habitat Description:	<i>Eucalyptus reducta</i> open woodland with a canopy height ranging from 8-10m. A shrubby understory consisting of <i>Leptospermum sp</i> , <i>Xanthorrhoea johnsonii</i> and <i>Acacia calyculata</i> 0.5-1m in height. The ground cover species consist of <i>Cleistochloa subjuncea</i> and <i>Leptosperma laterale</i> to 0.25m tall.			
Regional Ecosystem (Mapped):	RE 7.12.58 <i>Eucalyptus reducta</i> +/- <i>E. granitica</i> +/- <i>Corymbia dimorpha</i> +/- <i>C. citriodora</i> woodland to open forest on granite and rhyolite.			
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):			100%
	Native plant species richness:		Trees:	2
			Shrubs:	11

Bio-condition Site 1			
		Grasses:	3
		Forbs/Other:	11
	Tree Canopy	Median Height (m)	9
		Tree Canopy Cover (%)	27.1
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	31.4
	Large Trees	Large Eucalypt tree DBH threshold (cm)	35
		Large Eucalypt trees per hectare	20
		Large non-eucalypt trees threshold (cm)	NA
		Large non-eucalypt trees per hectare	NA
	Shrubs	Native Shrub Cover (%)	39.4
	Ground Cover	Native Perennial Grass Cover (%)	24
		Forbs and Non-grass (%)	2
		Shrubs (%)	33
		Organic litter cover (%)	14
		Rock (%)	22
		Bare Ground (%)	4.4
		Cryptograms (%)	3
		Non-native plant cover (%)	<1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	257
Native Species Richness:	Trees	<i>Eucalyptus reducta, Syncarpia glomulifera</i>	
	Shrubs	<i>Acacia calyculata, Comesperma anemosmaragdinum, Exocarpos cuppressiformis, Hakea plurinervia, Leptospermum amboinense, Monotoca scaparia, Persoonia falcata, Pimelia linarifolia, Platysace vallida, Pultenaea millarii, Xanthorrhoea johnsonii</i>	
	Grasses	<i>Aristida sp., Cleistochloa subjuncea, Eriachne pallescens.</i>	
	Forbs and Others	<i>Fimbristylus sp, Hovea nana, Hybanthus enneaspermus, Lepidosperma laterale, Lomandra filiformis, Melicris adpressus, Pseudanthus ligulatus, Stylidium graminifolium, Trichoryne anceps, Zieria cytisoides</i>	
Non-native Species	Nil		
Threatened flora	Nil		

Table 3 Bio-condition site 2

Bio-condition Site 2				
Date:	21-04-2020			
Plot Origin:	Zone: 55K	Lat: 329249	Long: 8097871	Elevation: 1019m
Plot Centre:	Zone: 55K	Lat: 329250	Long: 8097921	Elevation: 1034m
Plot Bearing:	N	Plot Alignment:	Upslope across rock pavement	
				
North		East		
				
South		West		
Habitat Description:	Rock pavement community that slopes southward. Shrubland community consisting of <i>Acacia aulacocarpa</i> , <i>Eucalyptus lockyeri</i> and <i>Leptospermum ambionense</i> as the dominant shrubs on the site.			
Regional Ecosystem (Mapped):	7.12.65k: Granite and rhyolite rock outcrop, of dry western areas, associated with shrublands to closed forests of <i>Acacia spp.</i> and/or <i>Lophostemon spp.</i> and/or <i>Allocasuarina spp.</i> In the Mount Emerald area, shrubs may include <i>Acacia umbellata</i> , <i>Melaleuca borealis</i> , <i>Homoranthus porteri</i> , <i>Leptospermum neglectum</i> , <i>Melaleuca recurva</i> , <i>Melaleuca uxorum</i> , <i>Grevillea glossadenia</i> , <i>Corymbia abergiana</i> , <i>Eucalyptus lockyeri</i> , <i>Sannantha angusta</i> , <i>Pseudanthus ligulatus subsp. ligulatus</i> ,			

Bio-condition Site 2

	<i>Acacia aulacocarpa</i> , <i>Leptospermum amboinense</i> , <i>Xanthorrhoea johnsonii</i> and <i>Jacksonia thesioides</i> . Ground-cover species may include <i>Borya septentrionalis</i> , <i>Lepidosperma laterale</i> , <i>Eriachne</i> spp., <i>Cleistochloa subjuncea</i> , <i>Boronia occidentalis</i> , <i>Cheilanthes</i> spp., <i>Coronidium newcastlianum</i> , <i>Schizachyrium</i> spp., <i>Tripogon loliiformis</i> , <i>Gonocarpus acanthocarpus</i> and <i>Eragrostis</i> spp. Dry western areas. Granite and rhyolite. (BVG1M: 29b)		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	4
		Shrubs:	10
		Grasses:	10
		Forbs/Other:	11
	Tree Canopy	Median Height (m)	NA
		Tree Canopy Cover (%)	NA
	Tree Sub-canopy	Tree sub-canopy median Height (m)	NA
		Tree Sub-canopy Cover	NA
	Large Trees	Large Eucalypt tree DBH threshold (cm)	NA
		Large Eucalypt trees per hectare	NA
		Large non-eucalypt trees threshold (cm)	NA
		Large non-eucalypt trees per hectare	NA
	Shrubs	Native Shrub Cover (%)	6.3
	Ground Cover	Native Perennial Grass Cover (%)	3.2
		Forbs and Non-grass (%)	0.2
		Shrubs (%)	3
		Organic litter cover (%)	8
		Rock (%)	13
		Bare Ground (%)	NA
Cryptograms (%)		69.6	
Non-native plant cover (%)		<1	
Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	0	
Native Species Richness:	Trees	<i>Corymbia abergiana</i> , <i>Eucalyptus atrata</i> , <i>E. lockyeri</i> , <i>E. reducta</i>	
	Shrubs	<i>Acacia aulacocarpa</i> , <i>Astrotricha pterocarpa</i> , <i>Melaleuca recurva</i> , <i>Hibbertia bicarpellata</i> , <i>Homoranthus porteri</i> , <i>Keraudrenia lanceolata</i> ,	

Bio-condition Site 2	
	<i>Leucopogon sp. Leptospermum amboinense, Notelaea punctata, Plectranthus amoenus.</i>
Grasses	<i>Aristida sp., Arundinella setosa, Cleistochloa subjuncea, Cymbopogon bombycinus, Digitaria sp, Eragrostis schultzei, Panicum similli, Schizachyrium pachyarthron, Themeda triandra, Tripogon loliiformis.</i>
Forbs and Others	<i>Cheilanthes siberii, C. nitidum, Commelina ensifolia, Drynaria rigidula, Gahnia aspera, Gonocarpus acanthocarpus, Hovea nana, Hypericum gramineum, Lomandra filiformis, Plectranthus parviflorus, Sedopsis sp Bulimba station.</i>
Non-native Species	<i>Praxelis clematidea*</i>
Threatened Flora	<i>Homoranthus porteri</i>

Table 4 Bio-condition site 3

Bio-condition Site 3				
Date:	21-04-2020			
Plot Origin:	Zone: 55K	Easting: 329366	Northing: 8097925	Elevation: 1033m
Plot Centre:	Zone: 55K	Easting: 329361	Northing: 8097949	Elevation: 1020m
Plot Bearing:	NNW	Plot Alignment:	Upslope across centre of vegetation type	
				
North		East		

Bio-condition Site 3



South

West

Habitat Description: Low shrubland/heathland 1-2.5m high with a patchy rock pavement surface. The ground layer occurs at a height of 0.25-0.5m, with the dominant grass species occurring as *Cleistochloa subjuncea*. *Xanthorrhoea johnsonii*, *Acacia calyculata* and *Eucalyptus lockyeri* are dominant species.

Regional Ecosystem (Mapped): **7.12.57c** 7.12.57c: Shrubland/low woodland (1.5-9 m tall) mosaic with variable dominance, often including *Eucalyptus cloeziana*, *Corymbia abergiana*, *E. portuensis*, *E. reducta*, *E. lockyeri*, *C. leichhardtii*, *Callitris intratropica*, *E. atrata*, *E. pachycalyx*, *E. shirleyi*, *E. drepanophylla* and *Homoranthus porteri*, on rhyolite and granite

Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	4
		Shrubs:	7
		Grasses:	8
		Forbs/Other:	14
	Tree Canopy	Median Height (m)	2
		Tree Canopy Cover (%)	1.2
	Tree Sub-canopy	Tree sub-canopy median Height (m)	NA
		Tree Sub-canopy Cover	NA
	Large Trees	Large Eucalypt tree DBH threshold (cm)	40
		Large Eucalypt trees per hectare	4
		Large non-eucalypt trees threshold (cm)	0
		Large non-eucalypt trees per hectare	0
	Shrubs	Native Shrub Cover (%)	23.2
	Ground Cover	Native Perennial Grass Cover (%)	36
		Forbs and Non-grass (%)	2
Shrubs (%)		43	
Organic litter cover (%)		12	

Bio-condition Site 3			
		Rock (%)	6
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	0
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	0
Native Species Richness:	Trees	<i>Eucalyptus reducta, Eucalyptus lockyeri, Allocasurina inophloia, Eucalyptus atrata</i>	
	Shrubs	<i>Acacia calyculata, Astrotricha pterocarpa, Eucalyptus lockyeri, Hakea benthamii, Leptospermum ambionense, Sannantha angusta, Xanthorrhoea johnsonii</i>	
	Grasses	<i>Cleistochloa subjuncea, Cymbopogon bombycinus, Eragrostis schultzi, E. pallescens, Panicum simile, Schizachyrium fragile, Tripogon loliiformis, Themeda triandra</i>	
	Forbs and Others	<i>Gonocarpus acanthocarpus, Hibiscus normanii, Hibbertia longifolia, Lepidosperma laterale, Leucopogon sp, Lomandra filiformis, Melicris adpressus, Platysace vallida, Peripleura diffusa, Persoonia falcata, Poranthera microphylla, Phyllanthus dallachyana, Thysanotus tuberosa, Tricoryne anceps.</i>	
Non-native Species		Nil	
Threatened Flora		Nil	

Table 5 Bio-condition site 4

Bio-condition site 4				
Date:	23-04-2020			
Plot Origin:	Zone: 55K	Lat: 17.19669	Long: 145.39780	Elevation: 1036m
Plot Centre:	Zone: 55K	Lat: 17.19627	Long: 145.39784	Elevation: 1036m
Plot Bearing:	S	Plot Alignment:	Along contour of hillslope. North-south orientation.	

Bio-condition site 4



North

East



South

West

Habitat Description:

Steep hillslope of dry open forest/woodland. The dominant tree species consist of *Eucalyptus cloezianna*, *Eucalyptus pachycalyx*, *Callitris introtropica* and *Allocasuarina inophloia* in the sub canopy. The shrub layer is sparse with a thicker grass layer. Grass layer consists largely of *Triodia microstachya* and *Cleistochloa subjuncea* with a shrub layer of mostly of *Acacia calyculata* and *Hibbertia sterlingii*.

Regional Ecosystem (Mapped):



7.12.30d: Open woodland to open forest (10-20m tall) mosaic with variable dominance, often including *Eucalyptus cloeziana*, *C. citriodora*, *E. portuensis*, *E. lockyeri*, *C. leichhardtii*, *E. atrata*, *E. pachycalyx*, *E. reducta*, *C. intermedia* and *E. shirleyi*. There is often a very sparse to mid-dense secondary tree layer of *C. abergiana* and/or *C. stockeri*. A very sparse to sparse tall shrub layer may be present and can include *Acacia flavescens*, *Persoonia falcata*, *Bursaria spinosa* subsp. *spinosa*, *Allocasuarina inophloia*, *Petalostigma pubescens* and *Grevillea glauca*. A sparse to dense lower shrub layer may include *Jacksonia thesioides*, *Acacia calyculata*, *Xanthorrhoea johnsonii* and *Grevillea glossadenia*. The ground layer may be dominated by species such as *Themeda triandra*, *Heteropogon triticeus*,

Bio-condition site 4

	<i>Mnesithea rottboellioides</i> , <i>Arundinella setosa</i> , <i>Cleistochloa subjuncea</i> , <i>Eriachne pallescens</i> var. <i>pallescens</i> , <i>Lepidosperma laterale</i> and <i>Xanthorrhoea johnsonii</i> . Rocky slopes on granite and rhyolite. (BVG1M: 9d).		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%)	100	
	Native plant species richness:	Trees:	5
		Shrubs:	15
		Grasses:	11
		Forbs/Other:	13
	Tree Canopy	Median Height (m)	10
		Tree Canopy Cover (%)	30.6
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	2.2
	Large Trees	Large Eucalypt tree DBH threshold (cm)	35
		Large Eucalypt trees per hectare	10
		Large non-eucalypt trees threshold (cm)	23
		Large non-eucalypt trees per hectare	4
	Shrubs	Native Shrub Cover (%)	11.9
	Ground Cover	Native Perennial Grass Cover (%)	26
		Forbs and Non-grass (%)	3.4
		Shrubs (%)	6
		Organic litter cover (%)	20.6
		Rock (%)	44
		Bare Ground (%)	0
Cryptograms (%)		0	
Non-native plant cover (%)		<1	
	Total Non-native species richness	2	
Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	90	
Native Species Richness:	Trees	<i>Eucalyptus pachycalyx</i> , <i>Eucalyptus cloezianna</i> , <i>Callitris introtropica</i> , <i>Corymbia leichhardtii</i> , <i>Corymbia erythrophloia</i> .	
	Shrubs	<i>Acacia calyculata</i> , <i>Acacia multisiliqua</i> , <i>Acacia umbellata</i> , <i>Acacia purpureopetala</i> , <i>Capparis canescens</i> , <i>Dodonaea dodecandra</i> , <i>Denhamia cuminghamii</i> , <i>Grevillia glossadenia</i> , <i>Hibbertia stirlingii</i> , <i>Hibbertia longifolia</i> , <i>Larsenaikia ochreatea</i> , <i>Psydrax attenuata</i> .	

Bio-condition site 4	
Grasses	<i>Arundinella setosa</i> , <i>Aristida sp.</i> , <i>Cleistochloa subjuncea</i> , <i>Cymbopogon bombycinus</i> , <i>Digitaria sp.</i> , <i>Eriachne mucronata</i> , <i>Urochloa holosericea</i> , <i>Panicum simile</i> , <i>Themeda triandra</i> , <i>Triodia microstachya</i> .
Forbs and Others	<i>Acacia galioides</i> , <i>Cheilanthes nitida</i> , <i>Cheilanthes brownii</i> , <i>Curculigo ensifolia.</i> , <i>Cyanthilium cinereum</i> , <i>Gonocarpus acanthocarpus</i> , <i>Mitrasacme sp.</i> , <i>Platysace vallida</i> , <i>Poranthera microphylla.</i> , <i>Tricoryne anceps</i> , <i>Velleia spathulata</i> , <i>Waltheria indica</i> .
Non-native Plant Species	<i>Praxelis clematidea</i> , <i>Bidens bipinnata</i>
Threatened Flora	<i>Acacia purpureopetala</i> , <i>Grevillea glossadenia</i>

Table 6 Bio-condition site 5

Bio-condition Site 5				
Date:	23-04-2020			
Plot Origin:	Zone: 55K	easting: 329465	northing: 8096347	Elevation: 725m
Plot Centre:	Zone: 55K	easting: 3294483	northing: 8096336	Elevation: 726m
Plot Bearing:	W	Plot Alignment:	Upslope through a boulder strewn gully	
				
North		East		

Bio-condition Site 5



South

West

Habitat Description:	Dry vine forest within a rocky granite gully.		
Regional Ecosystem (Mapped):	7.12.9 <i>Acacia celsa</i> open forest to closed forest. Foothills, uplands and highlands on granites and rhyolites, of the very wet and wet rainfall zone. (BVG1M: 5d)		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%)		100%
	Native plant species richness:	Trees:	19
		Shrubs:	8
		Grasses:	2
		Forbs/Other:	16
	Tree Canopy	Median Height (m)	16
		Tree Canopy Cover (%)	88.4
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	39
	Large Trees	Large Eucalypt tree DBH threshold (cm)	nil
		Large Eucalypt trees per hectare	nil
		Large non-eucalypt trees threshold (cm)	28
		Large non-eucalypt trees per hectare	32
	Shrubs	Native Shrub Cover (%)	9.2
	Ground Cover	Native Perennial Grass Cover (%)	nil
		Forbs and Non-grass (%)	34
		Shrubs (%)	2
Organic litter cover (%)		23	
Rock (%)		38	
Bare Ground (%)		1	
Cryptogams (%)		8	
Non-native plant cover (%)		<1	
Total Non-native species richness	3		

Bio-condition Site 5			
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	21.3
Native Species Richness:	Trees	<i>Acronychia laevis, Atractocarpus fitzalanii, Bursaria tenuifolia, Callitris introtropica, Chionanthus ramiflorus, Davidsonia pruriens, Drypetes deplanchei, Euroschinus falcata, Ficus rubiginosa, Ficus virens, Homalium circumpinnatum, Gossia bidwillii, Ligustrum australianum, Myrsine variabilis Olea paniculata Pleiogynium timorense, Pittosporum venulosum, Sersalisia sericea.</i>	
	Shrubs	<i>Acacia Celsa, Bursaria spinosa, Drypetes deplanchei, Alyxia spicata, Wikstroemia indica, Myrsine variabilis, Flueggea virosa, Turraea pubescens.</i>	
	Grasses	<i>Oplismenus compositus, Arundinella setosa.</i>	
	Forbs and Others	<i>Cissus oblonga, Commelina ensifolia, Cyanthillium cinereum, Proiphys amboinensis, Parsonsia straminea, Tetrastigma nitens, Adiantum atroviride, Neochamandra cunninghamii, Tectaria confluens, Plectranthus mirus, Asystasia sp., Scleria mackaviensis, Dioscorea transversa, Paraceterach muelleri, Smilax calophylla, Dockrillia teretifolium</i>	
Non-native species		<i>Praxelis clematidea*, Lantana camara, Solanum seaforthianum</i>	
Threatened Flora		Nil	

Table 7 Bio-condition Site 6

Bio-condition Site 6				
Date:	22-04-2020			
Plot Origin:	Zone: 55K	easting: 330389	northing: 8096572	Elevation: 793m
Plot Centre:	Zone: 55K	easting: 330409	northing: 8096598	Elevation: 792m
Plot Bearing:	E	Plot Alignment:	Crosses braided watercourse channel.	

Bio-condition Site 6



North

East



South

West

Habitat Description:	Vine forest across rocky stream and terrace.		
Regional Ecosystem (Mapped):	7.12.16a: Simple notophyll vine forest on wet and moist uplands, granite and rhyolite. Uplands of the cloudy wet to moist rainfall zones. Granite and rhyolite. (BVG1M: 6b)		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	20
		Shrubs:	6
		Grasses:	2
		Forbs/Other:	19
	Tree Canopy	Median Height (m)	17
		Tree Canopy Cover (%)	72.4
Tree Sub-canopy	Tree sub-canopy median Height (m)	10	
	Tree Sub-canopy Cover	64	
Large Trees	Large Eucalypt tree DBH threshold (cm)	28	

Bio-condition Site 6			
		Large Eucalypt trees per hectare	0
		Large non-eucalypt trees threshold (cm)	28
		Large non-eucalypt trees per hectare	20
	Shrubs	Native Shrub Cover (%)	3.6
	Ground Cover	Native Perennial Grass Cover (%)	0
		Forbs and Non-grass (%)	34
		Shrubs (%)	4
		Organic litter cover (%)	22
		Rock (%)	40
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	0
		Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)
Native Species Richness:	Trees	<i>Achronychia laevis, Agathis robusta, Alectryon tomentosus, Atractocarpus fitzilanii, Bursaria tenuifolia, Chionanthus ramiflorus, Cupaniopsis anacardioides, Drypetes deplanchei, Eleodendron meanocarpum, Euroschinus falcata, Gossia bidwillii, Harpulia pendula, Larsenaikia ochreatea, Lophostemon grandiflorus, Olea paniculata, Pleiogynium timorense, Polyscias elegans Psydrax dallachiana, Sersalisia sericea, Glochidion sumatranum</i>	
	Shrubs	<i>Alyxia ruscifolia, Wikstroemia indica, Clerodendrum longiflorum, Pittosporum revolutum, Psydrax sp, Gahnia aspera,</i>	
	Grasses	<i>Entolasia stricta, Oplismenus compositus</i>	
	Forbs and Others	<i>Abrus precatorius, Adiantum hispidulum, Adiantum atroviride, Asystasia sp., Cymbidium maddidum, Dockrillia teretifolium, Drynaria rigidula, Eustrephus latifolius, Microsorium punctatum, Parsonsia straminea, Peperomia blanda, Plectranthus amoenus, Plectranthus mirus, Proiphys amboinensis, Scleria mackaviensis, Smilax calophylla, Tetrastigma nitens, Trophis scandens, Ventilago ecorollata</i>	
Non-native Species		<i>Praxelis clematidea</i>	
Threatened Flora		Nil	

Table 8 Bio-condition Site 7


Bio-condition Site 7				
Date:	22-04-2020			
Plot Origin:	Zone: 55K	easting: 328005	northing: 8096481	Elevation: 596m
Plot Centre:	Zone: 55K	easting: 328056	northing: 8096475	Elevation: 596m
Plot Bearing:	SE	Plot Alignment:	Upstream between ephemeral stream beds	
				
North		East		
				
South		West		
Habitat Description:	Braided seasonal watercourse with sandy and rocky bars. <i>Eucalyptus tereticornis</i> dominant, 15m high. Subcanopy of <i>Callitris introtropica</i> , <i>Acacia disperma</i> at 1-4m high. Grassy ground layer, 0.5m high.			
Regional Ecosystem (Mapped):	7.3.26a <i>Casuarina cunninghamiana</i> , <i>Eucalyptus tereticornis</i> , <i>Lophostemon suaveolens</i> , <i>Melaleuca leucadendra</i> , <i>M. fluviatilis</i> , <i>Buckinghamia celsissima</i> , <i>Mallotus philippensis</i> woodland and forest with an understorey of <i>Melaleuca viminalis</i> and <i>Bursaria tenuifolia</i> . Fringing forests of larger streams. Riverine wetland or fringing riverine wetland. (BVG1M: 16a).			

Bio-condition Site 7

Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):	100%	
	Native plant species richness:	Trees:	16
		Shrubs:	15
		Grasses:	12
		Forbs/Other:	21
	Tree Canopy	Median Height (m)	15
		Tree Canopy Cover (%)	12.2
	Tree Sub-canopy	Tree sub-canopy median Height (m)	7
		Tree Sub-canopy Cover	25.3
	Large Trees	Large Eucalypt tree DBH threshold (cm)	45
		Large Eucalypt trees per hectare	16
		Large non-eucalypt trees threshold (cm)	24
		Large non-eucalypt trees per hectare	8
	Shrubs	Native Shrub Cover (%)	12.7
	Ground Cover	Native Perennial Grass Cover (%)	22
		Forbs and Non-grass (%)	2
		Shrubs (%)	4
		Organic litter cover (%)	44
		Rock (%)	4
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	12
		Total Non-native species richness	4
Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	29m	
Native Species Richness:	Trees	<i>Acacia flavescens, Alphitonia excelsa, Bursaria tenuifolia, E. crebra, Eucalyptus dallyachiana, Corymbia leichhardtii, Corymbia erythrophloia, C. clarksoniana, Callitris introtropica, Canarium australianum, Eucalyptus tereticornis, Acacia disparrima, Larsenaikea ochreate, Lophostemon grandiflora, Sersalisia sericea, Santalum lanceolatum</i>	
	Shrubs	<i>Acacia nesophila, Acacia simsii, Breynia oblongifolia, Cajanus confertiflorus, Dodonaea lanceolata, Dodonea doecandra, Exocarpus latifolius, Grevillea glossadenia Grevillia parrallela, Hibiscus meraukensis, Homalium</i>	

Bio-condition Site 7	
	<i>brachybotrys, Trema aspera, Petalostigma banksii, Petalostigma pubescens, Wikstroemia indica</i>
Grasses	<i>Arundinella setosa, Cymbopogon bombycinus, Digitaria sp, Themeda triandra, Cleistochloa subjuncea, Heteropogon contortus, Heteropogon triticeus, Entolasia marginata, Aristida queenslandica, Panicum effusum, Panicum simile, Setaria surgens</i>
Forbs and Others	<i>Alyxia spicata, Commelina ensifolia, Crotalaria medicaginea, Cyanthilum cinereum, Dianella nervosa, Dioscorea bulbifera, Eustrephus latifolius, Heliotropium tabuliplagae, Hibbertia longifolia, Lomandra filiformis, Phyllanthus fuernrohrii, Pimelia sericostachya, Tacca leontopetaloides, Tricoryne anceps, Proiphys amboinensis, Hibiscus meraukensis, Senna aciphylla, Cassytha filiformis, Grewia retusifolia, Scleria mackaviensis, Xenostegia tridentata</i>
Non-native Species	<i>Praxelis clematidea, Melinis minutiflora, Lantana camara, Melinis repens</i>
Threatened Flora	<i>Grevillea glossadenia</i>

Table 9 Bio-condition site 8

Bio-condition Site 8				
Date:	22-04-2020			
Plot Origin:	Zone: 55K	easting: 328826	northing: 8096354	Elevation: 630m
Plot Centre:	Zone: 55K	easting: 328788	northing: 8096345	Elevation: 624m
Plot Bearing:	SW	Plot Alignment:	Parallel with contour of rounded hill.	
				
North		East		

Bio-condition Site 8



South

West

Habitat Description: Grassy woodland open woodland with *Eucalyptus cloeziana* and *Corymbia leichardtii* dominant trees, 9-11m tall. Subcanopy consists of *Callitris introtropica* and *Acacia disparrima* 4-5m tall. Shrub layer 0.5-1.5m tall. Ground cover to half a metre.

Regional Ecosystem (Mapped): **7.12.30d** Open woodland to open forest (10-20m tall) mosaic with variable dominance, often including *Eucalyptus cloeziana*, *C. citriodora*, *E. portuensis*, *E. lockyeri*, *C. leichardtii*, *E. atrata*, *E. pachycalyx*, *E. reducta*, *C. intermedia* and *E. shirleyi*.

Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		N/A
	Native plant species richness:	Trees:	8
		Shrubs:	18
		Grasses:	11
		Forbs/Other:	18
	Tree Canopy	Median Height (m)	10
		Tree Canopy Cover (%)	42.2
	Tree Sub-canopy	Tree sub-canopy median Height (m)	5
		Tree Sub-canopy Cover	7.1
	Large Trees	Large Eucalypt tree DBH threshold (cm)	35
		Large Eucalypt trees per hectare	12
		Large non-eucalypt trees threshold (cm)	23
		Large non-eucalypt trees per hectare	4
	Shrubs	Native Shrub Cover (%)	11
	Ground Cover	Native Perennial Grass Cover (%)	21
Forbs and Non-grass (%)		3	
Shrubs (%)		9	
Organic litter cover (%)		28	

Bio-condition Site 8			
		Rock (%)	18
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	4
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	10.5m
Native Species Richness:	Trees	<i>Acacia disparrima, Callitris intratropica, Eucalyptus atrata, E. shirleyi, E. granitica, E. cloeziana, Corymbia leichhardtii, C. erythrophloia.</i>	
	Shrubs	<i>Acacia calyculata, Acacia simsii, Acacia flavescens, Antidesma parviflorum, Breynia oblongifolia, Capparis canescens, Dodonaea lanceolata, Grevillea glauca, Hibbertia stirlingii, Planchonia careya, Psydrax saligna, Jacksonia theisoides, Pogonolobus reticulatus, Wikstroemia indica, Xanthorrhoea johnsonii, Grevillea glossadenia, Gastrolobium grandiflorum, Flueggia viscosa,</i>	
	Grasses	<i>Aristida queenslandica, Arundinella setosa, Capillipedium parviflorum, Cleistochloa subjuncea, Cymbopogon bombycinus, Digitaria sp, Heteropogon triticeus, Mnesithia rottbelliodes, Panicum simili, Urochloa holosericea, Schizachyrium fragile.</i>	
	Forbs and Others	<i>Hybanthus enneaspermus, Hibbertia longifolia, Crotalaria brevis, Commelina ensifolia, Clematicissus opaca, Cyathillium cinereum, Cheilanthes sieberii, Cheilanthes brownii, Cheilanthes nitidum, Dianella nervosa, Lomandra longifolia, Gompholobium nitidum, Tacca leontopetaloides, Picnoria lutescens, Tricoryne anceps, Wahlenbergia queenslandica, Zornia prostrata, Scleria mackaviensis,</i>	
Non-native Plant Species		<i>Praxelis clematidea, Bidens bipenata, Emilia sonchifolia Stylosanthes guianensis</i>	
Threatened Flora		<i>Grevillea glossadenia</i>	

Table 10 Bio-condition Site 9

Bio-condition Site 9				
Date:	29-05-2020			
Plot Origin:	Zone: 55K	Lat: 17.19718	Long: 145.40770	Elevation: 984m
Plot Centre:	Zone 55K	Lat: 17.19741	Long: 145.40807	Elevation: 980m
Plot Bearing:	SW	Plot Alignment:	Mid-slope running parallel to the hill contour.	
				
North		East		
				
South		West		
Habitat Description:	Open forest with a canopy dominated by <i>Corymbia intermedia</i> , <i>Eucalyptus drepanophylla</i> and <i>Eucalyptus tereticornis</i> . Sparse shrub layer (5m) contains <i>Allocasuarina littoralis</i> , <i>Acacia flavescens</i> and <i>Lophostemon suaveolens</i> . Grassy understorey (<1.5m) of <i>Themeda triandra</i> and <i>Mnesithea rottboellioides</i> .			
Regional Ecosystem (Mapped):	RE 7.12.29a <i>Corymbia intermedia</i> and/or <i>Lophostemon suaveolens</i> open forest to woodland +/- areas of <i>Allocasuarina littoralis</i> and <i>A. torulosa</i> on uplands on granite and rhyolite.			
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):			100%
	Native plant species richness:	Trees:		6
		Shrubs:		9
		Grasses:		6

Bio-condition Site 9			
		Forbs/Other:	21
	Tree Canopy	Median Height (m)	9
		Tree Canopy Cover (%)	60.2
	Tree Sub-canopy	Tree sub-canopy median Height (m)	N/A
		Tree Sub-canopy Cover	N/A
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	14
		Large non-eucalypt trees threshold (cm)	20
		Large non-eucalypt trees per hectare	6
	Shrubs	Native Shrub Cover (%)	5.7
	Ground Cover	Native Perennial Grass Cover (%)	49
		Forbs and Non-grass (%)	8
		Shrubs (%)	1
		Organic litter cover (%)	39
		Rock (%)	1
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	2
		Total Non-native species richness	1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	111
Native Species Richness:	Trees	<i>Allocasuarina littoralis</i> , <i>Corymbia intermedia</i> , <i>Eucalyptus drepanophylla</i> , <i>Eucalyptus tereticornis</i> , <i>Eucalyptus reducta</i> , <i>Euroschinus falcata</i> .	
	Shrubs	<i>Acacia calyculata</i> , <i>Acacia flavescens</i> , <i>Alphitonia excelsa</i> , <i>Breynia oblongifolia</i> , <i>Capparis canescens</i> , <i>Coelospermum reticulatum</i> , <i>Xanthorrhoea johnsonii</i> , <i>Lophostemon suaveolens</i> , <i>Pimelia seriostachys</i> .	
	Grasses	<i>Arundinella setosa</i> , <i>Capillipedium spicigerum</i> , <i>Themeda triandra</i> , <i>Heteropogon triticeus</i> , <i>Mnesithia rottboellioides</i> , <i>Sarga plumosum</i> .	
	Forbs and Others	<i>Adiantum hispidulum</i> , <i>Commelina ensifolia</i> , <i>Coronidium newcastlanum</i> , <i>Cyanthillium cinereum</i> , <i>Desmodium rhytidophyllum</i> , <i>Dianella nervosa</i> , <i>Drynaria rigidula</i> , <i>Flemingia parviflora</i> , <i>Glycine clandestina</i> , <i>Hibbertia longifolia</i> , <i>Lomandra filiformis</i> , <i>Lomandra longifolia</i> , <i>Phyllanthus simplex</i> , <i>Lepidosperma laterale</i> <i>Praxelis clematidea</i> *, <i>Pteridium esculentum</i> , <i>Poranthera</i>	

Bio-condition Site 9		
		<i>microphylla</i> , <i>Rostellularia adscendens</i> , <i>Scleria mackaviensis</i> , <i>Widelia spilanthoides</i> , <i>Indigofera bancroftii</i> , <i>Xerochrysum bracteatum</i> .
Non-native Species	<i>Praxelis clematidae</i>	
Threatened Flora	Nil	



Table 11 Bio-condition Site 10

Bio-condition Site 10				
Date:	29-05-2020			
Plot Origin:	Zone: 55K	Lat: 17.19918	Long: 145.40564	Elevation: 1061m
Plot Centre:	Zone: 55K	Lat: 17.19905	Long: 145.4540	Elevation: 1062m
Plot Bearing:	SW	Plot Alignment:	Mid-slope running parallel to the hill contour	
				
North		East		
				
South		West		
Habitat Description:	Open forest with a canopy (11m) dominated by <i>Syncarpia glomulifera</i> with occasional <i>Eucalyptus drepanophylla</i> . Open shrub layer (5m) contains <i>Acacia aulococarpa</i> and <i>Leptospermum amboinense</i> . Grassy understorey (0.5m) of <i>Entolasia stricta</i> and <i>Ottochloa gracimila</i> .			

Bio-condition Site 10			
Regional Ecosystem (Mapped):	7.12.26e <i>Syncarpia glomulifera</i> low open forest and low woodland. Uplands on steep rocky slopes, of the moist and dry rainfall zone. Granite and rhyolite.		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):	100%	
	Native plant species richness:	Trees:	2
		Shrubs:	16
		Grasses:	5
		Forbs/Other:	27
	Tree Canopy	Median Height (m)	11
		Tree Canopy Cover (%)	62.2
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	17.8
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	12
		Large non-eucalypt trees threshold (cm)	30
		Large non-eucalypt trees per hectare	24
	Shrubs	Native Shrub Cover (%)	26.0
	Ground Cover	Native Perennial Grass Cover (%)	38
		Forbs and Non-grass (%)	14
		Shrubs (%)	7
		Organic litter cover (%)	25
		Rock (%)	12
		Bare Ground (%)	3
		Cryptograms (%)	1
		Non-native plant cover (%)	<1
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	160
Native Species Richness:	Trees	<i>Syncarpia glomulifera, Eucalyptus drepanophylla</i>	
	Shrubs	<i>Acacia aulocarpa, Acrothamnus spathaceus, Achronychia leavis, Astrotricha pterocarpa, Alyxia spicata, Breynia oblongifolia, Bursaria Spinosa Clerodendrum longiflorum, Glochidion sumatranum, Hovea densivellosa, Leptospermum amboinense, Notolaea venosa, Pittosporum venulosum, Pomaderris argyrophylla, Psychotria loniceroides, Rhodamnia sessiliflora.</i>	
	Grasses	<i>Entolasia stricta, Oplismenus aemulus, Ottochloa gracimila, Panicum effusum, Panicum simile.</i>	

Bio-condition Site 10	
Forbs and Others	<i>Acianthus borealis, Adiantum aethiopicum, Adiantum hispidulum, Bulbophyllum spp., Clematis pickeringii, Coronidium rupicola, Eleutheroglossum fellowsii, Dianella caerulea, Drynaria rigidula, Eustrephus latifolius, Geitonoplesium cymosum, Lindsaea microphylla, Lepidosperma laterale, Lomandra multiflora, Parsonsia straminea, Plectranthus hirtus, Plectranthus parviflorus, Plexaure crassicula, Pterostylis stricta, Scleria mackaviensis, Smilax australis, Smilax calophylla, Tricoryne anceps, Viola hederacea, Widelia spilanthis, Xerochrysum bracteatum.</i>
Non-native Species	<i>Praxelis clematidea*</i>
Threatened Flora	<i>Eleutheroglossum fellowsii</i>

Table 12 Bio-condition Site 11

Bio-condition Site 11				
Date:	29-05-2020			
Plot Origin:	Zone: 55K	Lat: 17.19979	Long: 145.40494	Elevation: 1008m
Plot Centre:	Zone: 55K	Lat: 17.19971	Long: 145.40448	Elevation: 984m
Plot Bearing:	NW	Plot Alignment:	Running NW downslope across the contour line within a steep rocky gully	
				
North		East		

Bio-condition Site 11






South

West

Habitat Description:	Open forest with a canopy (18m) dominated by <i>Olea paniculata</i> , <i>Mallotus philippensis</i> , <i>Pleigynium timorense</i> , <i>Pittosporum venulosum</i> , <i>Euroshinus falcata</i> and <i>Cupaniopsis anacardioides</i> . Emergent (25m) <i>Agathis robusta</i> .		
Regional Ecosystem (Mapped):	7.12.7c Simple to complex microphyll to notophyll vine forest, often with <i>Agathis robusta</i> or <i>A. microstachya</i> , on granites and rhyolites of moist foothills and uplands.		
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):		100%
	Native plant species richness:	Trees:	20
		Shrubs:	16
		Grasses:	3
		Forbs/Other:	28
	Tree Canopy	Median Height (m)	18
		Tree Canopy Cover (%)	72.4
	Tree Sub-canopy	Tree sub-canopy median Height (m)	8
		Tree Sub-canopy Cover	15.5
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	1
		Large non-eucalypt trees threshold (cm)	25
		Large non-eucalypt trees per hectare	24
	Shrubs	Native Shrub Cover (%)	13.8
	Ground Cover	Native Perennial Grass Cover (%)	0
		Forbs and Non-grass (%)	24
		Shrubs (%)	0
Organic litter cover (%)		26	
Rock (%)		45	

Bio-condition Site 11			
		Bare Ground (%)	5
		Cryptogams (%)	0
		Non-native plant cover (%)	<1
		Total Non-native species richness	3
	Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	70
Native Species Richness:	Trees	<i>Acronychia laevis, Agathis robusta, Atractocarpus fitzilanii, Brachychiton acerifolius, Chionanthus ramiflorus, Corymbia intermedia, Cupaniopsis anacardioides, Drypetes deplanchii, Elaeodendron melanocarpum, Euroshinus falcata, Gossia bidwilli, Guioa acutifolia, Mallotus phillipensis, Olea paniculata, Pittosporum venulosum, Pleigynium timorensis, Polyscias elegans, Polyalthia nitidissima, Schefflera actinophylla, Syncaria glomulifera,</i>	
	Shrubs	<i>Alyxia ruscifolia, Alyxia spicata, Alectryon tomentosus, Breynia oblongifolia, Callicarpa pedunculata, Clerodendrum longiflorum, Codiaeum variegatum var. moluccanum, Dendrocnide moroides, Glochidion sumatranum, Myrsine variabilis, Pipturus argenteus, Pomaderris argyrophylla, Psychotria loniceroides, Syzigium johnsonii, Wikstroemia indica, Wilkea pubescens.</i>	
	Grasses	<i>Ottochloa gracimilis, Oplismenus aemulus, Oplismenus compositus</i>	
	Forbs and Others	<i>Adiantum aethiopicum, Adiantum atroviride, Adiantum hispidulum, Alpinia caerulea, Aristolochia spp., Asplenium nidus, Calochlaena dubia, Christella dentata, Clematis pickeringii., Commelina diffusa, Dianella caerulea, Dioscorea transversa, Drynaria rigidula, Eustrephus latifolius, Gahnia aspera, Microsorium punctatum, Oxalis corniculata, Parsonsia straminea, Parsonsia velutina, Peperomia blanda, Plectranthus hirtus, Plectranthus amoenus, Plectranthus spp., Pseuderanthemum variable, Pyrrosia rupestris, Scleria mackaviensis, Smilax australis, Smilax calophylla, Stephaina japonica, Tetrastigma nitens.</i>	
Non-native Species		<i>Ageratum spp., Lantana camara, Melinis repens</i>	
Threatened Flora		Nil	

Table 13 Bio-condition Site 12

Bio-condition Site 12				
Date:	25-05-2020			
Plot Origin:	Zone: 55K	Lat: 17.20494	Long: 145.40387	Elevation: 1075m
Plot Centre:	Zone: 55K	Lat: 17.20531	Long: 145.40411	Elevation: 1071m
Plot Bearing:	W	Plot Alignment:	Near to ridge top following the contour	
				
North		East		
				
South		West		
Habitat Description:	Open forest with a canopy (12m) dominated by <i>Eucalyptus drepanophylla</i> , <i>Corymbia intermedia</i> and <i>Syncarpia glommulifera</i> . Sparse shrub layer (3m) contains <i>Acrothamnus spathaceus</i> , <i>Allocasuarina torulosa</i> , <i>Acacia aulococarpa</i> and <i>Lophostemon grandiflorus</i> . Grassy understorey (0.5m) of <i>Themeda triandra</i> and <i>Mnesithea rottboellioides</i>			
Regional Ecosystem (Mapped):	7.12.34 <i>Eucalyptus portuensis</i> and/or <i>E. drepanophylla</i> , +/- <i>C. intermedia</i> +/- <i>C. citriodora</i> , +/- <i>E. granitica</i> open woodland to open forest on uplands on granite			
Vegetation Attributes:	Recruitment of Dominant Canopy Species (%):			100%
	Native plant species richness:	Trees:	4	
		Shrubs:	24	

Bio-condition Site 12			
		Grasses:	5
		Forbs/Other:	27
	Tree Canopy	Median Height (m)	12
		Tree Canopy Cover (%)	40.9
	Tree Sub-canopy	Tree sub-canopy median Height (m)	7
		Tree Sub-canopy Cover	11.3
	Large Trees	Large Eucalypt tree DBH threshold (cm)	30
		Large Eucalypt trees per hectare	24
		Large non-eucalypt trees threshold (cm)	30
		Large non-eucalypt trees per hectare	2
	Shrubs	Native Shrub Cover (%)	5.1
	Ground Cover	Native Perennial Grass Cover (%)	72
		Forbs and Non-grass (%)	0
		Shrubs (%)	3
		Organic litter cover (%)	18
		Rock (%)	4
		Bare Ground (%)	0
		Cryptograms (%)	0
		Non-native plant cover (%)	3
		Total Non-native species richness	1
Coarse Woody Debris (CWD)	Total length >10cm width and >1m length (m)	60	
Native Species Richness:	Trees	<i>Syncarpia glommulifera, Eucalyptus drepanophylla, Corymbia intermedia, Allocasuarina torulosa</i>	
	Shrubs	<i>Acacia aulococarpa, Acacia flavescens, Acacia implexa, Acrothamnus spathaceus, Achronychia leavis, Alphitonia excelsa, Allocasuarina inophloia, Alyxia spicata, Astrotricha pterocarpa, Bursaria spinosa, Breynia oblongifolia, Euroschinus falcata, Glochidion sumatranum, Maytenus disperma, Notelaea punctata, Persoonia falcata, Pittosporum venulosum, Platysace vallida, Plectranthus amoenus, Pomaderris argyrophylla, Polyscias elegans, Psychotria loniceroides, Trema tomentosa, Xanthorrhoea johnsonii,</i>	
	Grasses	<i>Entolasia stricta, Mnesithea rottboelioides, Ottochloa gracillima, Panicum simile, Themeda triandra,</i>	